Behavior Management in Dentistry for Children

2nd EDITION

Edited by Gerald Z. Wright and Ari Kupietzky

WILEY Blackwell

BEHAVIOR MANAGEMENT IN DENTISTRY FOR CHILDREN

BEHAVIOR MANAGEMENT IN DENTISTRY FOR CHILDREN

SECOND EDITION

Edited by

Gerald Z. Wright
Ari Kupietzky

WILEY Blackwell

Editorial Offices
1606 Golden Aspen Drive, Suites 103 and 104, Ames, Iowa 50010, USA
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK
9600 Garsington Road, Oxford, OX4 2DQ, UK

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at www.wiley.com/wiley-blackwell.

Library of Congress Cataloging-in-Publication Data

Behavior management in dentistry for children / [edited by] Gerald Z. Wright, Ari Kupietzky. – Second edition.
1 online resource.
Preceded by Behavior management in dentistry for children / by Gerald Z. Wright. 1975.
Includes bibliographical references and index.
Description based on print version record and CIP data provided by publisher; resource not viewed.
ISBN 978-1-118-80433-9 (Adobe PDF) – ISBN 978-1-118-80435-3 (ePub) – ISBN 978-1-118-54753-3 (pbk.)
I. Wright, Gerald Z., editor of compilation. II. Kupietzky, Ari, editor of compilation. III. Wright, Gerald Z. Behavior management in dentistry for children. Preceded by (work):
[DNLM: 1. Behavior Control–methods. 2. Dental Care for Children–methods. 3. Adolescent. 4. Anesthesia, Dental–methods. 5. Child Behavior. 6. Child. 7. Dentist-Patient Relations. 8. Infant. WU 480]
RK55.C5
617.6′450019–dc23

2013043130

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Cover image: (top right, clockwise) photographed by Shiloh Terry, Mirva Maki and Dr. Aharon Itzkovitz.
Cover design by Modern Alchemy LLC.

Set in 9.5/12pt Palatino by SPi Publishers Services, Pondicherry, India

1 2014

This book is dedicated to our grandchildren, Akiva, Alexis, Benaya, Choni, Itai, Joshua, Lavi, Lily, Maxine, Simone, Theo, and their generation all over the world. Those of us who communicate with children and provide their dental care share something important–a love of children.

Contents

Editors

Gerald Z. Wright, DDS, MSD, FRCD (C)
Diplomate of the American Board of
Pediatric Dentistry
Emeritus Professor
Schulich School of Medicine and Dentistry
Western University
London, Ontario, Canada

Ari Kupietzky, DMD, MSc
Visiting Professor
Department of Pediatric Dentistry
Rutgers School of Dental Medicine
Rutgers, The State University of New Jersey
Newark, New Jersey, USA
Clinical Instructor
Department of Pediatric Dentistry
The Hebrew University–Hadassah School of Dental Medicine
Jerusalem, Israel

Contributors

Marcio A. da Fonseca, DDS, MS
Chair and Program Director
Department of Pediatric Dentistry
University of Illinois at Chicago College of Dentistry
Chicago, Illinois, USA

Dimitris Emmanouil, DDS, MS, PhD
Lecturer
Department of Pediatric Dentistry, Dental School, University of Athens, Greece
Adjunct Assistant Professor
Washington State University, School of Pharmacy
Pullman, Washington, USA

Anna B. Fuks, DDS
Professor Emeritus
Department of Pediatric Dentistry
The Hebrew University–Hadassah School of Dental Medicine
Jerusalem, Israel

Gunilla Klingberg, DDS
Professor
Department of Pediatric Dentistry
Faculty of Odontology
Malmö University
Malmö, Sweden

Ari Kupietzky, DMD, MSc
Visiting Professor
Department of Pediatric Dentistry
Rutgers School of Dental Medicine
Rutgers, The State University of New Jersey
Newark, New Jersey, USA
Clinical Instructor
Department of Pediatric Dentistry
The Hebrew University–Hadassah School of Dental Medicine
Jerusalem, Israel

Brian D. Lee, DDS, MSD, FACD
Diplomate of the American Board of Pediatric Dentistry
Private Practice
Foster City, California, USA

Jonathon E. Lee, DDS, FACD
Diplomate of the American Board of Pediatric Dentistry
Diplomate of the American Board of Orthodontics
Private Practice
Foster City, California, USA

Travis Nelson, DDS, MSD, MPH
Acting Assistant Professor
Department of Pediatric Dentistry
University of Washington
Seattle, Washington, USA

Amanda Jo Okundaye, DDS
Clinical Assistant Professor of Endodontics
Oral and Maxillofacial Surgery and Orthodontics
The Herman Ostrow School of Dentistry of the University of Southern California.
Los Angeles, California, USA
Associate Professor in Residence
University of Nevada Las Vegas,
Las Vegas, NV, USA
Lecturer
University of California Los Angeles,
Private Practice Dental Anesthesiology Nevada and California, USA

Kenneth L. Reed, DMD
Attending Dentist in Anesthesia, Lutheran Medical Center
Brooklyn, New York, USA
Clinical Associate Professor, The Herman Ostrow School of Dentistry
of the University of Southern California Los Angeles, California, USA
Affiliate Assistant Professor, The Oregon Health Science University Portland, Oregon, USA
Clinical Instructor, University of Alberta Edmonton, Alberta, Canada
Associate Professor University of Nevada Las Vegas, School of Dental Medicine
Las Vegas, Nevada, USA

Steven Schwartz, DDS
Program Director
Pediatric Dentistry Residency Program
Staten Island University Hospital
New York, New York, USA

Barbara Sheller, DDS, MSD
Attending Pediatric Dentist and Orthodontist
Department of Dentistry, Seattle Children's Hospital
Affiliate Professor
Department of Pediatric Dentistry
Department of Orthodontics
School of Dentistry, University of Washington
Seattle, Washington, USA

Jaap S.J. Veerkamp, DDS, PhD
Paediatric Dentist
Secondary Dental Care Clinic Kindertand
Amsterdam, Netherlands

Stephen Wilson, DMD, MA, PhD
Professor of Clinical Pediatrics
Director, Division of Pediatric Dentistry
Cincinnati Children's Hospital Medical Center
Cincinnati, Ohio, USA

Gerald Z. Wright, DDS, MSD, FRCD (C)
Diplomate of the American Board
of Pediatric Dentistry
Emeritus Professor
Schulich School of Medicine and Dentistry
Western University
London, Ontario, Canada

Eileen Wood, HBA, MA, PhD
Professor, Developmental Psychology
Department of Psychology
Wilfrid Laurier University
Waterloo, Ontario, Canada

Acknowledgments

From Gerald Z. Wright

Few books are solo efforts and this one is no exception. If it were not for three people, it would not have been written and published at all. The first to be acknowledged is Professor Anna Fuks. For years, my good friend Anna had been urging me to write another edition to my first book, Behavior Management in Dentistry for Children. Urging is probably putting it mildly, but her requests went unheeded for many reasons. Finally, she put me in communication with Dr. Ari Kupietzky. His acknowledgments follow mine.

My co-editor Dr. Kupietzky is a very persuasive and persistent individual. We had several discussions about the need for this type of book, the differing approaches to treating children in dentistry in the world today, and the fact that it would be timely to once more consolidate some of the thinking and writing in behavior management. When he offered to co-edit this book with me, I assented and we moved forward with this project. Essentially, the second edition is a new work including new chapters and contributors. Once the planning and writing was under way, I realized that he is a well-organized person, has an excellent knowledge of the most current literature, and possesses a passion to meet deadlines. He has been a pleasure to work with.

The third person who was influential in this project was my wife, Nancy Wright. She knew that I was unsure about involving myself in this commitment; it was twelve years since my retirement from dental teaching and practice. She urged me to go ahead with this book. Not only did she provide encouragement, but Nancy read and commented upon most of the chapters to which I contributed. Her professional background in psychology was instrumental in creating numerous "book discussions" in our home.

Ari and I enlisted fourteen contributors from five different countries to lend their expertise to this book. Each of them provided worthy chapter drafts, met deadlines and accepted our editing with grace and understanding. Consequently, the book was completed ahead of schedule.

There were many others who contributed as well. Rick Blanchette of Wiley supported our project and quickly arranged a book contract. All of the Wiley people have responded to our many questions and made helpful suggestions, especially Melissa Wahl and Teri Jensen, who steered our manuscript through to completion. Jill Wright helped when my computer skills were lacking, and she facilitated copying of the original manuscript, allowing us to get a quick start in the writing. Dr. Sergio Weinberger and his office staff came to my rescue when I needed certain photographs. I also would like to acknowledge the assistance provided to me from the A&B Taylor Library staff at Western University who guided me in finding obscure references.

From Ari Kupietzky

As a postgraduate student I remember studying behavior management from the "original red book," all worn and used, full of admiration for the author, G.Z. Wright. The book has been a bible for me throughout my career. Having the opportunity to work with Gerry has been a challenging experience. He is a true pioneer of pediatric dentistry.

Professor Anna Fuks, both a colleague and mentor, made the introduction to Gerry, which resulted in the writing of this book.

Professor Milton Houpt has been an inspiration throughout my professional career. His expertise on conscious sedation motivated me to focus on this aspect of behavior management in pediatric dentistry. He has always been in the background offering support, guidance, and advice.

Finally, I thank my wife and children, who tolerated the long hours I spent critically reading and writing. I am deeply indebted to them for their understanding, love and support. To them I offer special recognition.

BEHAVIOR MANAGEMENT IN DENTISTRY FOR CHILDREN

Chapter 1

Introductory Remarks

Gerald Z. Wright

Ari Kupietzky

More than a century has elapsed since a dentist, writing in one of the professional journals of the day, voiced concern about the behavior of children in his practice (Raymond 1875). It was his opinion that "getting into the good graces of children is almost half the work to be accomplished." This observation opened the gates to a flood of comments on a subject which hitherto had been unrecognized in the dental literature.

Much attention has been focused on shaping children's behavior in the dental environment. Although some dentists have reacted intuitively to the needs of their child patients, others have been more systematic. They have tried to identify children's behavior patterns and to find the best means of coping with them. Practitioners have adopted and adapted the techniques of their dental colleagues. The better methods have been passed from one generation of practitioners to the next. These procedures have stood the test of time. The cumulative effect of this knowledge and experience has been the gradual development of an area known as behavior management.

When planning the second edition of this book, the change in nomenclature was an initial stumbling block. Forty years ago the foremost national specialty organization in the world, the American Academy of Pedodontics, now known as the American Academy of Pediatric Dentistry (AAPD), used the term behavior management. The AAPD now prefers the term behavior guidance rather than behavior management. Checking with other organizations around the world, many of which were non-existent 40 years ago, we found that behavior management was the global term of choice. Therefore, at the risk of political incorrectness, the term behavior management will be used in this book.

The study of behavior management has undergone changes. Early writing on the subject was essentially subjective and anecdotal. Interest matured in the 1970s . The result has been a more scientific approach to behavior management.

The descriptive terms "subjective" and "anecdotal" might be interpreted as a criticism. This was not the intention. Earlier writers on the subject of behavior management were pioneers. They attempted to list the causes of uncooperativeness. They classified behavior patterns. They made accurate observations. They established guidelines for behavior management, some of which are incorporated into the foundation of contemporary practice.

Professional recognition that the behavior of the child patient is the most influential factor affecting treatment outcomes significantly heightened interest in behavior management. As a consequence, dentists began to confer on the subject the same respect and objectivity that they have accorded other areas of science in dentistry (Teuscher 1973). Collaborations with psychologists and psychiatrists have broadened the theoretical bases of behavior management. The current systematic approach has been referred to as behavioral science research in pediatric dentistry. The maturing interest has resulted in a healthy questioning of our earlier subjective considerations. Investigators have explored various hypotheses, new and old, in an attempt to further enhance our relationships with children.

As one would expect, the practice of behavior management has been a dynamic one. Differing treatment techniques have been recommended and debated by pediatric dentists. The choice and acceptability of technique is directly dependent on the societal norms of specific cultures. As a result, today's practitioners have a wide selection of methods which can be used for managing children's behavior.

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

Aims and Scope of the Second Edition

This book has two main purposes: (l) to introduce current information basic to the understanding of children's behavior and (2) to describe and discuss many of the techniques and methods, new and old, used for promoting the cooperative behavior of children.

Despite the numerous clinical approaches, the increased research output by behavioral scientists and the growing awareness of the importance of this area, no longer is there one up-to-date source which the dentist or dental student could turn to for a comprehensive coverage of the subject. Books dealing with behavior management have come and gone. That is one reason for reviving this book with a second edition. It is intended to integrate current pertinent information from research with current clinical practices.

Another aim has been to balance the practitioner's need for some basic knowledge of child psychology with the requirement of practical clinical instruction. Dental teachers and clinicians have expressed the need for such a book provided that it is relevant to dental practice. Little psychological background on the part of the reader is therefore presumed, but an attempt is made to build a foundation on which a practicing dentist can develop an understanding of the dynamics of children's behavior in the dental environment.

The volume begins by describing in some depth psychological, social and emotional development of children. What is normal behavior for a three-year-old may be unacceptable for a child of five. There are margins of normality which those treating children should understand.

When the first edition of this book was written, maternal anxiety was significantly related to children's cooperative behavior and the primary focus of a chapter. But there are many types of families nowadays—single parent families, same sex families, blended families—to name a few, and they too will be discussed. While the nuclear family is still predominant in society, understanding family environments and how they influence child behaviors is much more complex than in the past. Therefore, much more emphasis has been placed on the study of families of dental patients and an entire chapter is devoted to this subject.

As the reader progresses through the book, a spectrum of techniques for managing the behavior of children is offered. The approach is characterized by eclecticism. It includes clinical management of children using many non-pharmacologic and pharmacologic methods.

The non-pharmacologic techniques generally are those which have been time-tested over generations. They still form the basis of behavior management. However, there has been an increase in the use of sedation and it is obvious that many new pharmacologic methods need to be highlighted. Sedation usage has led to numerous changes in dental practice: new sedation agents along with optimum drug dosages and new drug combinations, guidelines for patient monitoring, and emergency measures are only some of these changes.

An entire chapter is devoted to the management of children with disabilities. Most writings on this topic have been technique-oriented. The present chapter takes a broader approach. A disabled child creates special problems in a family and alters the dynamics of that family. Since the trend today is to maintain the special patient in the community, rather than in an institution, it is apparent that a greater knowledge and understanding of the management of these patients is required. Additionally, much more is known today about communicating with these children than was known when the first edition of this book was created. Some of these communication methods will be addressed in this chapter.

In the last two chapters the book covers practical considerations in the office, discussing a myriad of strategies. The dentist plans and has ultimate responsibility for these strategies, while the office personnel carries them out. There is abundant evidence that successful behavior management is facilitated by a well-run office, the employment of personnel well-trained in relating to children, and the design and appearance of the dental office. The final chapter is devoted to the office environment. Having an office that appeals to children makes management much easier. An appealing office might be considered a starting point in behavior management.

By now it should be apparent that this book has been organized to present an overview of an extremely broad field, rather than an investigation of a few topics. It was designed for all members of the dental health team who deal with children. These team members combine their efforts in the management of children's behaviors. Each makes their own unique contribution as a dental professional. Consequently, certain aspects of this book will be more appealing, or more germane, to one or the other of the team members. It is the sum total of the children's experiences in the dental environment which ultimately determines their cooperative behaviors. All team members have a stake in determining the nature of those experiences: each of the team members should have a mastery of their own profession and an understanding of the roles of office associates.

This book also has a major difference when compared to the original book. To elucidate some of the key points in the writings, cases are presented. The cases provide examples that make the book more clinically relevant. Some of these cases are from the book Managing Children's Behavior in the Dental Office by Wright, Starkey and Gardner (1983).

The Pediatric Dentistry Treatment Triangle

The concept of the pediatric dentistry treatment triangle (Figure 1-1), to some extent, has provided the framework for this entire volume. It is not possible to view any single corner of this triangle in isolation. The child is at the apex of the triangle and is the focus of attention of both the family and the dental team.

The two lines of communication emanating from the dentist's corner emphasize a major difference between children's dentistry and adult dentistry. These lines show that treating children is at least a 1:2 relationship (i.e., dentist:child and parent). Adult dentistry tends to be a 1:1 situation (i.e., dentist:patient). It is extremely important for all dental personnel to communicate in both directions.

The arrows at the end of the lines indicate that communication is reciprocal. They also signify that the dental treatment of the child patient is a dynamic relationship between the corners of the triangle—the child, the family, and the dentist. The importance of this unifying concept will become evident as techniques are described in subsequent chapters.

Note the difference in Figure 1-1 between the triangular illustrations in 1975 and 2013. In 2013, societal expectations have greatly impacted the practice of pediatric dentistry. The pediatric triangle does not represent an isolated environment, but rather exists within and is influenced by the surrounding society, hence the addition of the circle.

Perhaps the greatest societal impact on pediatric dentistry was the law of informed consent. Informing the parent about the nature, risk, and benefits of the technique to be used and any professionally recognized or evidence-based alternative is essential to obtaining informed consent. The impact upon professionals became more widespread in the 1980s. Pediatric dentists became aware that it was far more difficult to obtain legal consent from a parent on behalf of a child than it was to have consent when dealing with an adult on a dentist-patient (1:1) relationship.

The term informed consent first appeared in the United States in court documents in 1957. It was in a civil court ruling for a patient who underwent anesthesia for what he thought was a routine procedure. He woke up permanently paralyzed from the waist down. The doctor had not told him that the procedure carried risks. In a subsequent civil suit, the judge in the case ruled that "a physician violates his duty to his patient and subjects himself to liability if he withholds any facts which are necessary to form the basis for an intelligent consent by the patient to the proposed treatment." Obtaining informed consent for all procedures is now mandatory, and it is an example as to why society has to be considered when illustrating the pediatric treatment triangle.

For those interested in the subject of informed consent, consider reading the book *The Immortal Life of Henrietta Lacks* by Rebecca Skloot (2010). The book relates the story of how doctors at Johns Hopkins Hospital in Baltimore, Maryland took Lacks' cancer cells without asking. Until that time, harvested cancer cells always died. Lacks' cells never died and they launched a medical revolution. They provided researchers with an avenue to investigate cancer. The cells became known as the HeLa cells and they launched a multi-million dollar industry. Cells were produced and sold for research. The Lacks family was totally unaware of this and they did not profit at all.

Societal norms affect all corners of the triangle individually, as well as the interactions between all three

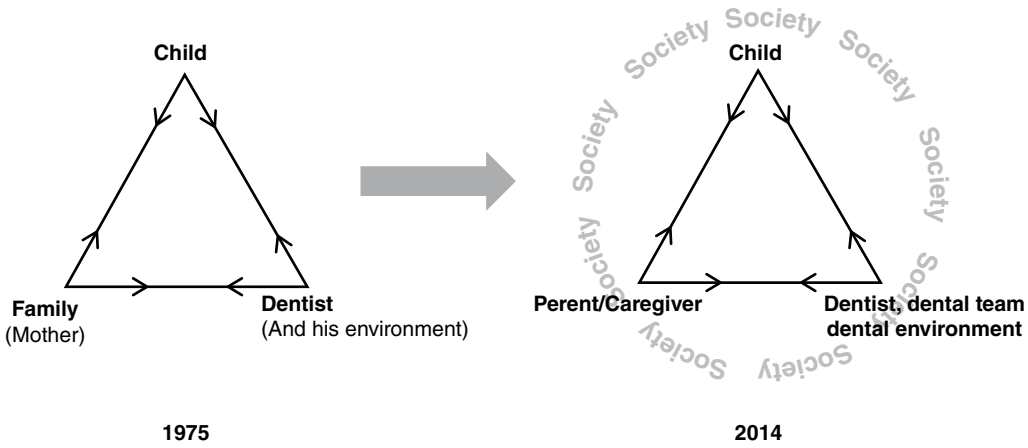

Figure 1-1. The Pediatric Treatment Triangle. The illustration shows how things have changed since the first edition of this book.

components. The intimate relationship between parent and child has been changed by society. The professional relationships between dentist and child and dentist and parent have also evolved, dictated by societal changes. In 1975, it was widely accepted that a mother's attitude significantly affected her offspring's behavior in the dental office. Roles in families are changing and now the total family environment has to be considered. A father bringing a child for treatment is not unusual. Not infrequently, both parents are working and the child presents at the dental office with a caregiver. Hence, the new triangular illustration recognizes the change that has occurred in the last 40 years. This book will highlight some of these changes and identify how they have influenced the practice of pediatric dentistry.

What is Behavior Management?

McElroy (1895) inadvertently provided a definition for behavior management near the beginning of this century. She wrote, "although the operative dentistry may be perfect, the appointment is a failure if the child departs in tears." This was the first mention in the dental literature of measuring the success or failure of a child's appointment on anything other than a technical basis.

The term behavior management, or its synonym child management, has been used repeatedly in dentistry for children. Generally, it has referred to methods used to obtain a child's acceptance of treatment in the dental chair. Considering the frequency with which these terms have been applied, it was somewhat surprising that a precise definition was non-existent when the first edition of this book was produced. For the purpose of that monograph, the term behavior management was defined as follows:

> It is the means by which the dental health team effectively and efficiently performs treatment for a child patient and at the same time instills a positive dental attitude.

Note that this definition makes no mention of any specific techniques or modalities of treatment. Years ago discussions with colleagues led to the belief that behavior management was absolutely non-pharmacologic. Some stated that behavior management was not truly practiced when drugs were employed to allay apprehension.

Drugs are an adjunct to behavior management. Their use depends upon the philosophy and attitudes of the dentist. Personalities and educational backgrounds tend to influence clinical practice (Wright and McAulay 1973). However, as long as the proposed definition has been satisfied, it is behavior management. Not all techniques advocated in this book will be the reader's personal choice. But they are the means by which some dentists successfully practice behavior management with children.

Reasonable cooperation between child and operator is implicit in the proposed definition of behavior management. What is meant by "reasonable" varies from operator to operator. This will be discussed at length in Chapter Three. Meanwhile, consider the meaning of two key words in the proposed definition: effectively and efficiently. They are important to a contemporary definition.

Effective service is the provision of high quality treatment. Treatment should not be modified to the detriment of a child's oral health. For example, totally untreated dental caries exposed to the oral environment until a patient gets older is unacceptable. It is not behavior management, and it is not good dentistry.

Efficient service has to be considered in private practice today. The day is past when the dentist plans to "give a child a ride in the chair" over a series of appointments without accomplishing any treatment objectives. Neither the parent nor the dentist can usually afford this unnecessary expenditure of time. Quadrant dentistry or half-mouth dentistry using auxiliary personnel is the rule when one considers an efficient practice. Introduction to dentistry should be accomplished gently and with the greatest facility.

The final part of the proposed definition of behavior management stresses the importance of creating positive attitudes in children. That attitude may become positive after a single appointment or over a series of appointments. Indeed, the positive attitude sometimes takes years to develop. Many practitioners have believed that getting the job done without taking into consideration their child patients crying is behavior management. This is not good enough.

Since the introduction of this definition, the AAPD guidelines have stated (AAPD Reference Manual, 2011):

> The goals of behavior guidance are to establish communication, alleviate fear and anxiety, deliver quality dental care, build a trusting relationship between dentist and child, and promote the child's positive attitude toward oral/dental health and oral health care.

As the reader can see, these goals are very similar to the definition proposed for this book.

Importance of Behavior Management

If a generalization can be made about dental curricula of the past, it is that the study of human behavior has played a secondary role to the scientific and technical

learning. Recognizing this in academia, behavioral sciences now are included as an integral part of a modern curriculum, and behavior management has been a part of this newly developing course of study. It is taught using a multimedia approach. Educators have an array of literature, films and videotapes to call upon as effective teaching aids.

Concomitant with expanded teaching in behavior management, there was a surge in behavior management research. It was spurred on by educators like McDonald, (1969) who wrote, "Until recently little research has been undertaken to provide answers to even the common problems associated with the guidance of the child's behavior in the dental office." The emphasis on the humanistic aspect in teaching and research has led to many fine studies published in the 1970s into the 1980s. Unfortunately, this research productivity has slowed (Wilson and Cody 2005). This is probably due to practical reasons, such as lack of funding and a greater emphasis on other aspects of pediatric dentistry. Funding has a great impact on research, and behavioral science research primarily is dependent upon government funding.

Considerable effort has been directed toward the question, "Why do people not attend a dentist regularly?" No simple answer has emerged. Indeed, there are so many related variables that it boggles the mind to think of them. Does public opinion vary geographically? Does ethnic background affect viewpoints? What bearing would socioeconomic status have upon the question? Dentists have been aware of the jibes of humorists, artists and authors in the past. Have these reflected or shaped the public attitude? When studying individual behaviors, there are exceptions to cause-effect relationships. When dealing with large population groups with an increased number of variables, the difficulty in establishing relationships becomes more complex. Despite the difficulties, however, certain variables have cropped up repeatedly as sources of the public's negative attitude. The major variables are economics and dental anxiety or fear.

Investigations into dental utilization have repeatedly demonstrated that many children lack care. Most utilization rates are determined through questionnaires, and the data can be skewed depending on the data collection methodology. Nonetheless, there is sufficient information to pay heed to the issue.

In Iowa, utilization rates ranged from 18% for children newly enrolled in a Medicaid program to 58% for children in the State Children's Insurance Program (Damiano et al. 2006). Focusing on adolescents, McBroome et al. (2005) studied the impact of the Iowa State Children's Health Insurance Program on dental care access. They determined that adolescents were least likely to have an annual dental visit and one in six had unmet dental needs. They concluded that non-financial barriers existed for many adolescents. Relative to other services, dental care was reported to have the highest in unmet needs.

The California Health Care Foundation's Step by Step program investigated utilization in eight California Healthy Kids programs. Once more, low utilization was found ranging from 14% in Fresno County to 48.4% in Santa Cruz County with an average of 32.6% (Phipps and Diringer 2006).

Similar findings have been reported in Alberta, Canada (Amin 2011). Using data gathered from telephone interviews of 820 clients selected from the Alberta Child Health Benefit Program, it was found that only 33.7% of children two to four years of age had received dental services in the previous year. Better results were achieved for children five to nine years of age as 83.5% had received one or more dental services.

It is important to point out that progress is being made in the United States. Some locales have found an increase in utilization rates. Wall's dental Medicaid report (2012) compared data from several years of Medicaid children's dental visits. The report showed a steady increase of access to dental care. Approximately 40% of children enrolled in the Medicaid program received a dental service in the previous year. This reflected a 50% increase over the 27% of children who received a dental service in 2000.

Further evidence of improved access to dental care was reported by Isong et al. (2012). These investigators referred to previous studies that repeatedly documented marked racial /ethnic disparities in American children's receipt of dental care. They analyzed data, gathered between 1964 and 2010, on race and dental care utilization for children two to seventeen years of age and were able to demonstrate a dramatic narrowing of African American/white disparities. The disparities in children's dental utilization rates were significantly different in 1964 but were non-significant in 2012. Considering all children, regardless of race, those without a dental visit in the previous 12 months declined significantly from 52.4% in 1964 to 21.7% in 2010.

In a perfect world, every child would receive routine dental care. However, as the foregoing clearly demonstrates, it is not a perfect world and many children go uncared for. Why? Many have attempted to answer the question. It is complex and no single variable can provide the answer. Numerous practical barriers to care have been described, such as a limited availability of dental providers, low reimbursement, and transportation difficulties. The cost of dental care has also been suggested as a chief reason why many do not attend to their dental needs on a regular basis. While this may be a good reason for some, poor attendance at low-income,

government-sponsored dental programs discounts the economic factor as a chief barrier. It is apparent that the reasons many people do not seek regular dental care go well beyond the simplistic contention of some that if the economic impediment were removed, then demand and dental care standards would improve. Other factors obviously affect public attitude and utilization.

The importance of behavior management becomes more important when assessing the effects of dental anxiety. It completely limits, or partially limits, utilization of health care (Berggren and Meynert, 1984; Locker, 2003). A more recent French national cross-sectional survey of dental anxiety found farmers and low-skilled workers significantly more anxious than shopkeepers and executives. Anxiety was also associated with avoidance of care and lack of regular dental visits (Nicholas et al. 2007).

Evidence for the role of conditioning in dental anxiety, through either aversive experiences or family influences, has been provided by Berggren and Meynert (1984) and Shoben and Borland (1954). The latter, working with adults, studied fear and its relationship to dentistry. Using the paper-and-pencil questionnaire method, they found that a significant factor in the population's background appeared to be the attitude of the patient's family toward dentistry. Their widely quoted finding points to the origin of fears in childhood.

While dental anxiety has been studied to determine its effect on dental care, little attention has been given to the age of onset of dental anxiety, even though it may have a bearing on the origins of dental fear. Locker et al. (1999) studied this variable by means of mail surveys. Based upon 1420 responses, 50% of those who replied identified that the onset of their anxiety was in childhood and 22% reported their anxiety stemmed from adolescence. Considering the variables leading to childhood anxiety, there was a strong association with an aversive incident. Interestingly, half who had child anxiety onset also reported that they had a mother, father or sibling who was anxious about dental treatment.

Dental anxiety or fear is not inherited. It is acquired, and it is commonly accepted that genesis occurs in childhood. A reasonable speculation is that these early dental fears shape a patient's attitude in adulthood. Research has demonstrated that adults holding negative dental attitudes can and do convey their feelings to their offspring. Therefore, it can be concluded that negative attitudes tend to be self-perpetuating (Figure 1-2).

The early part of this book focuses on the family and the home environment. If the circular pattern is to be interrupted, that is where we must begin. Since dental anxiety and fears are acquired, the most logical place to interrupt these sequential events is in childhood. It is far simpler to start patients with proper dental attitudes than to attempt to change deeply rooted negative ones.

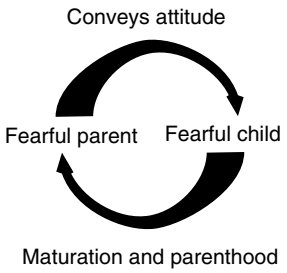

Figure 1-2. Dental attitudes are passed from one generation to another. The illustration is a diagrammatic representation of the circular pattern.

The establishment of a dental home as early as the first year of life will be expanded upon in Chapter Five. The early development of a positive relationship with the dentist will help shape the future behavior of both child and parent. It is obvious that in order to accomplish this, early dental exposures must occur with a minimum of psychological trauma. Thus, the need for continually improving behavior management becomes obvious and extremely important.

To recapitulate, this section has attempted to explain the importance of behavior management. It has provided an overview of the question, "why do people avoid dentistry?" The problem is multidimensional. Two major factors were discussed: economics and dental anxiety or fear. Both are important. However, dental anxiety or fear seems to be most consistently related to negative attitudes toward dentistry.

Considerable effort has been expended by organized dentistry over the years to improve its image. If we are to promote positive dental attitudes and improve the dental health of the public, then children are logically the keys to the future. No greater compliment can be paid to the dentist than when the parent of a young patient says, "I can't understand it, but my kids really look forward to going to the dentist." That is another reason for this book.

References

Amin, M.S. (2011). Utilization of dental services by children in low-income families in Alberta. *Journal of the Canadian Dental Association*, 77:b57.

Berggren, U. and Meynert, G. (1984). Dental fear and avoidance. Causes, symptoms and consequences. *Journal of the American Dental Association*, 109, 247–251.

Borland, L.R., and Shoben, E.J. (1954). Empirical study of the etiology of dental fears. *Journal of Clinical Psychology*, 10, 171.

Damiano, P., Momany, E.T., Crall, J.J. (2006). Determining dental utilization rates for children: an analysis of data from the Iowa Medicaid and SCHIP programs. *Journal of Public Health Dentistry*, 66, 97–103.

Isong, I.A., Soobader, M., Fisher-Owens, S.A., et al. (2012). Racial disparity trends in children's dental visits: US national health interview survey, 1964–2010. *Pediatrics*, 130, 306–314.

Locker, D. (2003). Psychological consequences of dental fear and anxiety. *Community Dentistry and Oral Epidemiology* 31, 144–151.

Locker, D., Liddell, A., Dempster, L., et al. (1999). Age of onset of dental anxiety. *Journal of Dental Research*, 78 , 790–796.

McBroome, K., Damiano, P.C., Willard, J.C. (2005). Impact of the Iowa S-SCHIP program on access to dental care for adolescents. *Pediatric Dentistry*, 27, 47–53.

McDonald, R.E. (1969). *Dentistry for the Child and Adolescent*. St. Louis, C. V. Mosby Co.

McElroy, C.M. (1895). Dentistry for children. *California Dental Association Transactions* 85.

Nicolas, E., Collado, V., Faulks, D., et al. (2007). A national cross-sectional survey of dental anxiety in the French adult population. *BMC Oral Health* 7:12–17.

Phipps, K., Diringer, J., Arpawong, T.E., et al. (2008). Dental Utilization in California's Children's Health Initiatives' Healthy Kids Programs, April 2008. Center for Community Health Studies, Keck School of Medicine, University of Southern California.

Raymond, E. H. (1875). Children as patients. *Dental Cosmos* 17:54.

Reference Manual (2011). *Pediatric Dentistry* 32, 150.

Skloot, R. (2010) The Immortal Life of Henrietta Lacks. pp.131, Broadway Paperbacks, a division of Random House, New York.

Teuscher, C. W. (1973). Editorial. *Journal of Dentistry for Children.* 40, 259.

Wall, T.P. Dental Medicaid 2012, *American Dental Association Health Policy Resources Centre*.

Wilson, S., and Cody, W.E. (2005). An analysis of behavior management papers published in the pediatric dental literature. *Pediatric Dentistry* 27, 331–337.

Wright, G.Z. and McAulay, D.J. (1973). Current premedicating trends in pedodontics. *Journal of Dentistry for Children.* 40, 185–187.

Wright, G.Z., Starkey, P.E., Gardner, D.E. (1983). *Managing Children's Behavior in the Dental Office*. C.V. Mosby Co., St. Louis, Missouri, USA.

Chapter 2

Understanding Key Moments in Child Development

Eileen Wood

Developmental psychologists examine changes in physical, cognitive, and social/emotional development across the lifespan. Understanding how changes in each of these domains occurs allows researchers and practitioners to predict how individuals of different ages and abilities will react and behave in familiar and novel situations. This chapter will summarize changes that occur in each of the physical, cognitive and social/emotional domains in typically developing children, and will provide insight regarding what to expect from children and adolescents. One caveat before reading further is that the developmental sequences summarized here represent "averages," or estimates of children's abilities, expectations and experiences at any given point in development. Individual differences among children are great, and even within an individual child there may be variation in development. For example, while language skills may be high, physical development may lag behind peers of the same age. Thus, we must be careful not to overgeneralize based on a single observation, nor should we expect all children to conform to a single "right" pattern of development.

The information provided here explains how development progresses and identifies when major developmental changes typically are observed with the understanding that practitioners working with children must be ready to shift their expectations depending on their encounters with each individual child. Much of the information in this chapter deals with early childhood and presents information that often is not found in dental writings. However, more and more importance is being placed upon knowledge about the early years and how this contributes to understanding future development.

Why Very Early Development is Critically Important

Before exploring the lives of children, it is important to first think of their very earliest beginnings. An incredible amount of development occurs prior to birth as well as in the first few years of life, and the outcomes of these early experiences can have a lasting legacy. For this reason, knowing a little about a child's early development is important in assessing clinical issues about the child. In addition, having this information reinforces the important role practitioners can play in assisting to-be parents through pregnancy and early infancy. Throughout this section, both nature (i.e., biological/genetic) and nurture (i.e., environmental) issues are highlighted, as both of these factors interact to shape the individual. By adopting this interactionist perspective, it becomes clear why all practitioners should take an active role in providing the best start for young lives.

Setting Good Foundations: Prenatal and Early Development

Advances in technology have allowed us to see that critical brain development occurs much earlier than we originally imagined. Indeed, the vast majority of the neurons an individual will ever have are formed by the end of the second trimester of pregnancy (Kolb and Fantie 1989; Rakic 1991). This is followed by the "brain growth spurt" between the last three prenatal months to the end of an infant's second year, when more than half of an individual's adult brain weight is achieved (Glaser 2000). During the brain growth spurt, more neurons are

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

produced and it has been suggested that this abundance of neurons prepares the infant to face the myriad of possible sensory and motor experiences that could occur (Greenough et al. 1987: 2002). Since no individual experiences every possible form of stimulation, unnecessary neurons fail to thrive or serve as a reserve for injuries or new skill development (Elkind 2001; Huttenlocher 1994; Janowsky and Finlay 1986). In addition, neurons that successfully interconnect with each other crowd out those that do not. Both maturational unfolding and early experience, therefore, are important determinants of brain growth (Greenough et al. 1987; Johnson 1998, 2005; Thompson and Nelson 2001).

Physical growth also occurs at a rapid pace prenatally, during infancy, and through the early childhood years. The pace then tapers until adolescence when it increases again. With some exceptions, growth tends to follow both a cephalocaudal (i.e., from head to toe) and proximodistal (i.e., from the center of the body outward) pattern (Kohler and Rigby 2003). For example, prenatally, the head grows much faster than any other body part–so much so that at birth, infant head sizes are approximately 70% of their later adult head size (Shaffer et al. 2010). This growth in head size is followed by quick growth in the trunk area over the first year, which is then followed by rapid growth in leg length until adolescence, when both the trunk and legs lengthen. Proximodistal growth is also observed prenatally as the chest and internal organs form, followed by the arms and legs, and then the hands and feet. The growth of arms and legs outpaces the growth of hands and feet until puberty, when the hands and feet become the first body parts to reach adult proportions, followed by the arms and legs and, finally, the trunk (Tanner 1990). Muscular development also proceeds in cephalocaudal and proximodistal directions, with muscles in the head and neck maturing before those in the trunk and limbs. This pattern of growth can be used to explain how children acquire some motor movements before others. For example, head control comes in early while precise pincer grasps come in quite a bit later. Major motor milestones follow a fairly constant pattern. For a quick review of actions and expected trajectories see Table 2-1. It is important to keep in mind, however, that although the pattern of change tends to be similar across individuals, there is considerable variation in the acquisition of skills (resulting from differences in the timing of growth spurts, the amount of growth that takes place, and stimulation from the environment). As long as the skill is attained within the expected range, there is no particular advantage for earlier versus later acquisition.

While enriching environments can promote healthy growth, teratogens (e.g., drugs, diseases, environmental hazards such as X-rays or toxic waste) are agents in the environment that can cause birth defects (including facial and dental deformities), intellectual deficits, behavioral problems and death (Kopp and Kaler 1989, Mattson and Riley 2000). Many teratogens do the most harm during the first trimester, when there are critical periods where certain body structures develop. Other

Table 2-1. Developmental milestones in movement and communication.

Motor Skill	Age of Onset/Acquisition	Language	Age of Onset/Acquisition
Raises head and chest while lying on stomach	2–3 months	Cooing—vowel sounds (aaaah)	About 2 months
Rolls over	3–5 months		
Sits without support	4–8 months	Babbling—consonant plus vowel sounds (bababa)	4–6 months
Stands using a support	6–10 months		
Stands alone	7–15 months		
Walks with support	9–13 months		
Walks unsupported	12–16 months	Holophrastic Stage—single words, may be unique words understood only by care providers, words can be used for more than one message (for example—milk can mean "give me milk," "that is milk," "where is the milk" etc.)	12–24 months
Walks up steps	17–22 months		
Runs	24 months	Telegraphic Stage and Vocabulary Spurt—use words to name things, construct simple sentences with only critical information (e.g., noun, verb and adjective)	18–24 months
		Preschool Speech—complex sentences appear	2.5–5 years of age

Note: Motor milestone ages of onset are rounded and the range represents 50% of children versus 90% of children succeeding. Motor milestones adapted from Bayley, 1993, Shaffer, et al., 2010 and WHO 2006. Language milestones source: Shaffer, et al., 2010.

teratogens are particularly problematic later in pregnancy or during the early years. In order to ensure steady, healthy growth of brain and body, practitioners, parents, and researchers need to be aware of, and reduce, the presence of teratogens. One goal within the concept of The Dental Home (see Chapter Five) is to offer supportive instruction that complements healthy lifestyle choices for potential parents. It can provide protection against harm and promote healthy growth.

Coming Prepared for Action: Infants and Young Children

Refinements in physical development prepare infants and children for increased mobility. Mobility is one important foundation for encouraging exploration. For example, once infants attain head and neck control they can orient themselves toward interesting things to watch or hear. Rolling, sitting, standing, and walking (milestones shown in Table 2-1), continue to expand access to intriguing, novel, and familiar stimuli that fill children's worlds. Indeed, infants are not the "helpless," dependent, and passive participants in the world that we viewed them as in the past. We now know that infants arrive as active, engaged learners equipped with an impressive range of reflexes and sensory skills that allow them to respond to the vast array of stimuli that the world presents.

Among their repertoire of early reflexes are sucking, swallowing, coughing, and blinking, which serve important survival and protective functions. Similarly, other, less well-known reflexes such as the rooting reflex–which occurs when an infant is stroked on the cheek, resulting in the infant opening its mouth and preparing to latch to a nipple–also provide infants with skills to help them survive. In some cases, problems with reflexes such as sucking may lead to referral to a dentist. For example, mothers may be referred to a lactation consultant, who, in turn, sometimes calls upon a pediatric dentist to assess the need for a lingual frenectomy. Thus pediatric dentists need to be familiar with a newborn's features, development, and characteristics since they may be referred infants shortly following their birth for examination.

Newborns also demonstrate reflexes that appear to serve no apparent function. For example, the Palmar grasp involves infants closing their hand around any object placed in the palm. Although parents and other care providers are often delighted when it appears that the infant is "holding" their finger, reflexes such as the Palmar grasp are believed to be vestiges from our evolutionary past. The presence of these reflexes at birth, as well as their disappearance in the first few months (when reflexive behaviors come under the voluntary control of higher brain centers), are early indicators for assessing development of the nervous system.

In terms of sensory readiness to explore the world, the five senses, although not all fully developed, are functional at birth. Newborns even have preferences for certain odors, tastes, sounds, and visual configurations. For example, infants prefer sweet tastes and are able to differentiate between salty, bitter, and sour solutions. They will also turn their head in the direction of a sound, and most show a preference for female voices. Early experiments comparing infants' preferences for their mothers' voices or faces compared to voices or faces of unfamiliar females demonstrated that, within the first few days of life, infants showed a preference for the familiar voice and face (DeCasper and Fifer, 1980; Field et al. 1984). Although vision is the least-developed sense (with acuity being about 20/600), newborns can still see all or almost all of the colors adults see (Brown, 1990; Franklin, et al. 2005). Newborns are also responsive to touch and sensitive to pain (Porter et al. 1988).

Cognitive Development: Learning, Thinking and Memory

Cognitive development starts early and progresses quickly as children are exposed to rich and stimulating learning environments. Interesting environments for young children can include both novel and familiar materials. Novel materials and books allow children an opportunity to expand their experiences, acquire new skills, and map learned skills to new contexts. Familiar materials, especially those that children can use in many ways (such as containers or blocks that can be stacked, be used to build things, or serve other purposes such as being tools, musical instruments, or even transport devices for other toys, etc.), also allow children to experiment and evolve their play just as well-loved books can allow them to demonstrate their increasing comprehension, letter-recognition, and other reading skills. Cognitive development, then, is influenced greatly by children's experiences, the information they are given and the way in which they are encouraged to explore new information and events.

Exactly how does cognitive development take place? Jean Piaget's theory of cognitive development embraced the notion of children as active, engaged learners who try to understand the world and experiences they encounter (Piaget 1971; Piaget and Inhelder, 1969). In his theory, children pass through four invariant stages of intellectual development with each stage reflecting a qualitative shift in reasoning capabilities. Schemas serve as the underlying cognitive structures that are used to

identify and interpret objects, events, and information that infants and children encounter. Infants have very basic schemas that are refined, and replaced with more complex ones as children acquire more skills. Schemas are altered through two complementary processes, called assimilation and accommodation. When we encounter new objects, events, experiences, and information, we first use existing schemas to understand what is going on. If the new experience does not "fit" (i.e., it cannot be assimilated), then the schema must be modified, or a new schema must form to accommodate this new information. For example, when a child encounters a horse for the first time, they might try to understand it in terms of their pet dog and think "this is a very large dog." However, when they become aware that the horse is quite different from a dog, this initial conceptualization will change and they will now think about dogs and horses in a different way. Piaget believed that within each of his stages there were significant cognitive understandings that children acquire. Once these ways of thinking were achieved, the child would progress to the next stage.

Using the tests that Piaget devised, we can still see infants and children respond in the same way that Piaget observed within each stage. For example, Piaget believed that infants experienced the world through their senses and motor activity with objects in the here and now. This first stage, the sensorimotor, begins at birth and extends to eighteen to twenty-four months. Once objects were no longer in view or available, infants perceived them as no longer there–literally "out of sight" meant "out of mind."

A critical achievement, then, would be for the infant to be able to represent objects and people mentally, rather than just tangibly. That is, children must come to understand that things exist even when they are not immediately visible or in hand. This understanding of object permanence, at about two years of age, represents the point where Piaget believed they move to the second, or preoperational stage.

Preoperational children (ages two to seven) experience a language explosion, and with that increasing skill they come to use the arbitrary symbol system of language to represent objects and actions. Now words and images can be used to represent things and events. As the ability to represent things increases, there is also an increase in imaginary or symbolic play, where children pretend to be other people, creatures, and objects, and use objects in creative, playful ways. Concomitant with these gains are several limitations. For example, limitations in children's schemas inhibit their ability to solve some logic problems. That is, children are unable to mentally manipulate all of the "operations" needed to solve some problems (hence the name preoperational).

The inability to solve conservation problems provides a good example. An example of this problem would be to show children a short, fat glass filled with liquid. Then, in full view of the child, an experimenter would pour the liquid from the short, fat glass into a tall, skinny glass and ask the child if the glasses contained more, less, or the same amount of liquid. The answer? Most children report that the tall, skinny glass has more. Children appear to be stymied by the one change–the higher height of the liquid in the tall glass–rather than understanding the constancy of volume across the two glasses. Children make this same mistake with mass and number. When children hone in on one feature, especially a perceptually salient one, to the detriment of taking in all the important variables, they are said to be engaging in centration–a characteristic flaw for this stage–and one that contributes to their failure at conservation. Children also have challenges with reversibility. In the case of the volume problem above, children may not be able to reverse the action and understand that the liquid could be poured back into the short fat glass, which would allow them to see that the volume would remain the same across the two glasses. Centration and irreversibility are two errors that impact children's problem solving.

Children in this stage are also egocentric in their thinking. Often we interpret the word egocentric as something negative, but in this context it refers to how children "see" or represent the world. Think of children as seeing the world through only their own eyes and through only their own experience. For example, a child might show you an interesting picture he has found in a book. When showing it to you, the child might orient the book toward him rather than you, leaving you with an upside-down image. The child may not seem to understand that you will not be able to see the image well from that upside-down perspective. Egocentrism also shows up in children's answers to questions. For example, parents might call out to their young child "Where are you?" and get the reply "Here." The child is not trying to be obstinate or deliberately vague. Instead, the child looks around the environment that he can see and it is obvious to him that "here" is where he is. These cognitive traits for two to seven year old children can have great import when communicating with preoperational children in the dental office.

By Piaget's third stage (concrete operations) children seven to twelve years of age are able to navigate the problems of preoperational thinking. They can decenter their thinking and focus on more than one dimension of a stimulus at a time. They understand the concepts of reversibility and conservation (although conservation comes in slowly with conservation of mass, for example, preceding conservation of volume). They can also

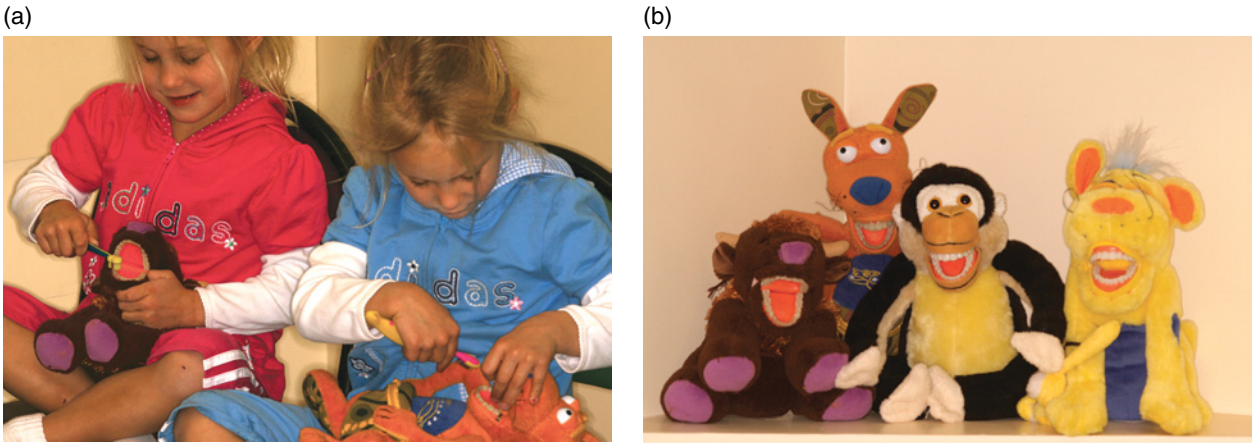

Figure 2-1. Allowing children to 'teach' their favorite stuffed toy or a puppet can make the setting more memorable and more personally relevant for pediatric patients (a). Demonstration dolls are available for this purpose (b). Courtesy of Dr. Ari Kupietzky.

engage in mental seriation (mentally arranging items along some quantifiable dimension such as shortest to tallest) and they are less egocentric. What is the limitation for children in this stage? The label "concrete" describes the most significant limitation. Children can apply logical operations only to concrete problems. Abstract or hypothetical problems are a challenge that is not resolved until children achieve the final stage, formal operations.

The formal operations (ages eleven to twelve and beyond) stage represents the ability to fully engage in multiple forms of logical thinking. Children can think deductively and inductively. They can generate and test hypotheses, and explore concrete and abstract ideas. This level of thinking, however, is not achieved by all children (or adults) (Kuhn 1984; Siegler 2005).

Applying Piagetian Theory Today

Critics of Piagetian theory argue against the notion of broad invariant stages, instead favoring constant, incremental gains with some areas developing well before others (Bjorklund 2005; Siegler 2000). Many traditional Piagetian tasks are considered too challenging, often requiring more than one skill set simultaneously (for example, requiring both advanced verbal and perceptual skills). For that reason, Piaget is thought to have underestimated the abilities of very young children and infants. However, we continue to adopt Piaget's understanding of infants and young children as active, curious, and engaged learners, who construct knowledge by generating, testing, and developing theories to explain their world. Understanding children in this way means that we should present environments that intrigue them and give them opportunities to engage in trial and error. Even small changes to our approach to children can make this possible. For instance, some dentists acclimate young children to their practice by letting them see the equipment, and maybe take a "ride" in the chair. If this acclimation was taken one step further by allowing the child to see and test how the chair functions and how other tools work, then the children would be both familiarized and intrigued. Children may be given a dental mirror and shown how it assists the dentist in seeing the teeth from all aspects.

Encouraging them to think about the process without giving them all the answers can engage a child and begin the kind of rapport that is built upon interest and that can sustain engagement with a child. Knowing that pretend play emerges in the preschool to early grade school years tells us that this is a time to use pretend play as a way to connect with children and to convey important skills and knowledge in a manner that is interesting to them. For example, allowing children to pretend to be the dentist. Having them learn important hygiene skills or routines by letting them "teach" their favorite stuffed toy or puppet can make the setting more memorable and more personally relevant for the child. Demonstration dolls are available for this purpose (Figure 2-1). Regardless of age, effective teaching should involve concrete, observable instructions and demonstrations to maximize learning.

More Recent Views on Cognitive Development

More current views on cognitive development typically borrow from the work of Vygotsky or information processing models. Vygotsky (1978) argues that children's cognitive development is highly tied to sociocultural factors. Children do not learn in a vacuum; instead, their

knowledge is shaped by the beliefs, values and tools that surround them as they develop. This cultural context influences not only what they know but how they think. Where Piaget attributed cognitive gains to mechanisms within the child, Vygotsky argues that many of the discoveries and knowledge that a child attains are facilitated through exchanges with a knowledgeable "other." The other can be a parent, peer, teacher, dentist, or anyone who engages the child and works collaboratively to help bring the child from their current level of knowledge to a higher level. Knowledgeable others can support learning because they can bridge the distance between what the child currently knows and can accomplish on his own, and what the child is capable of acquiring or performing with a little guidance or assistance. The term "zone of proximal development" represents this distance in knowledge. If the distance is too large–that is, too complex–it exceeds the child's zone of proximal development, the child will not be able to internalize or make sense of the information, and the learning opportunity will be lost. Using Vygosky's theory as the framework for facilitating practitioner-client interactions requires several key elements. First, practitioners need to know something about the context and culture of the child they are treating. Having a dialogue with parents can alert the practitioner to pre-existing knowledge that the child might have about dental practices, interventions, protocols, and beliefs. The importance of learning about the child patient is also highlighted in Chapters Three and Six.

The information exchange should also consider "tools" for learning. For example, many children today use technology as a source of information, play, and socialization. Practitioners may want to adapt current interventions to use a familiar tool (for example, perhaps downloading a relevant video tutorial). Using these tools may make learning easier for the child (See Chapter Seventeen). Similarly, practitioners can assume the role of knowledgeable others. To be effective in this role, practitioners must determine the child's current level of understanding and, where applicable, skill mastery. There is one additional step. Once the child has acquired the knowledge or skill, they must be given an opportunity to practice it to ensure mastery.

Only with mastery can a child internalize it for later use. For example, introducing a child to independent tooth brushing involves knowing how to grip the toothbrush, the ideal amount of pressure, the direction of brushing, the number of strokes, rinsing, etc. By breaking down the task to its elements and checking to see what the child can already do, practitioners can then provide instruction and opportunities for practice so the child can acquire the skills and knowledge that is currently missing.

What can be expected when teaching oral hygiene techniques to children? Children usually can brush their teeth by six years of age and efficiently floss their teeth by about nine. If these two tasks, requiring manual and digital skills, are considered developmental milestones, then six and nine years of age represent the average ages that a child can be expected to accomplish these tasks. What also has to be considered is the "normal range." Thus, self-tooth brushing can be anticipated at about six years (± one year) and self-flossing at nine years (± one and a half years). The general principle that developmental tasks tend to occur with wider ranges of normality as age increases can and should be applied when teaching children oral hygiene techniques.

Information processing models have been used to explain how attention, memory, and higher order skills develop and function. In terms of attention, it is well-known that younger children have shorter attention spans than older children. This is why many dentists have advocated shorter appointments for younger children. In part, this is a function of the challenges that younger children face. Specifically, young children are less attentive, more easily distracted by the multitude of other interesting things in their environment, and they are susceptible to intrusive thoughts or actions. Hence, the introduction of distraction with video tapes or television has worked well with younger children (Hinotsume et al. 1993). Overall, children can be easily distracted by interesting, novel stimuli. Distraction can be used as a tool when we do not want children to notice things, but it needs to be addressed when we want children to focus. Children, especially very young children, need to be cued to come back on task and the key task needs to be very salient in relation to other things in the environment.

Although children may have trouble learning new information in general, many children, even very young ones, demonstrate areas of expertise. For example, have you ever had a conversation with a young kindergarten-aged child about the topic of dinosaurs and found that you did not know all the types of dinosaurs or whether they were omnivores, carnivores, or herbivores? This situation is not uncommon. It reminds us of the importance of recognizing that children can have extensive domain knowledge in some areas and that they are not always naïve compared to adults. For example, in a classic experiment ten-year-old chess experts showed much higher recall for the placement of chess board pieces than adults (Chi 1978; 2006).

Knowing that children can have "expertise" provides practitioners with an important tool. First, acknowledging a child's knowledge and engaging them in their area of expertise provides one avenue for building rapport. Second, when a practitioner acknowledges a

lack of expertise in the domain in which the child has expertise, the practitioner can then provide an opportunity for the child to "teach" or inform the practitioner. This sets an important precedent for the child that the practitioner may not be all-knowing. Research on child interviewing techniques suggests that when children are made aware that an adult, especially an authority figure, does not "know everything" they are much more likely to provide answers to questions. Finally, if it is possible to tie information that you want children to remember to their prior knowledge, the new information can be more easily integrated and subsequently recalled Woloshyn, Wood and Willoughby, 1995).

Social/Emotional Development: Knowing Society and Self

Each of us is born into a society with rules, expectations, attitudes, and values. Our task throughout development is to come to understand ourselves, how we feel and function, and what our society deems desirable and appropriate. The process of socialization–learning socially acceptable behaviors, attitudes, and values–is greatly influenced by parents and other care providers, as well as more peripheral people in children's lives and external sources such as the media.

Feelings

Emotional development requires mastery of two sets of emotions: basic and complex. Basic emotions include joy, surprise, anger, sadness, and fear. The term "basic" reflects the apparent biological programming of these emotions because they appear at about the same time in all infants (two to seven months of age), and are interpreted in the same way by observers across different cultures. Complex emotions (pride, embarrassment, shame, guilt, and envy) appear later, at about two years of age and onward, and require both cognitive and social skills. For example, complex emotions require that a child has the cognitive skills to evaluate their own behavior relative to some self-imposed or socially construed expectation. Recall from the previous section on cognitive development that being able to fully comprehend the perspective of others is a challenging task for children. Additionally, children need experiences in a wide array of social contexts to understand the expectations they face. As expected, therefore, development of complex emotions is highly influenced by the information children receive from adults (Alessandri and Lewis 1996). Thus, giving a child a prize for good behavior has importance. It reinforces the positive experience. Early in life (among toddlers and preschoolers), the expression of complex emotions tends to be limited to contexts where an adult or other person is present who might encourage the type of self-evaluation that is needed to achieve these emotions (Stipek et al. 1992). It is not until the mid-to-late elementary school years that children internalize these complex emotions and experience them both when they are on their own and when others are there.

Experiencing feelings is one element of emotional development and displaying them is another. Cultural and social rules are taught to children to help them to display emotions "correctly" (Eisenberg et al. 2003). In order for children to comply with these display rules, they must learn to regulate their emotions. For example, North American children learn that they should look pleased upon the receipt of a gift from a family member. What happens if the gift is a disappointing one? To comply with the social display rule–that the child must be pleased with the gift–the child must inhibit displaying their true emotion of disappointment and then exhibit the features that will indicate a positive emotion. This is a challenging task, even for some adults. By about three years of age, children are already beginning to try to execute display rules. Often, however, it is not until about seven to nine years that children can mask their true emotion and deliver another.

Perhaps one of the most important feelings infants and children experience in life is the emotional attachment that forms between infants and parents or care providers. While parents often experience an intense and immediate bond with their infant, infants' emotional ties to their parents or care providers take time to forge.

If you have interacted with infants regularly, you will probably already be aware that, initially, infants seem to be quite happy interacting with anyone. In fact, parents can pass even a fussy young infant to another person who will be able to calm and entertain them. Somewhere between seven and nine months of age, this pattern changes and infants start to protest, sometimes quite vehemently, when they are separated from one key person (their attachment figure). Hence, during the one-year dental visit it is recommended to examine infants in the knee-to-knee position (see Chapter Five). Infants at this stage can crawl, and often do so to stay in proximity to this key attachment figure. They will wriggle and try to free themselves from the hold of others–even those whom they may know well–in an effort to get to the desired attachment figure. The knee-to-knee examination acknowledges their first attachment as it allows the child to see the parent's face.

The quality of attachment can vary. Approximately two thirds of infants form secure attachments and the

remaining third of children form one of three types of insecure attachment (Ainsworth et al. 1978; Main and Solomon 1990). To determine what type of attachment has formed, children up to two years of age are tested using the Strange Situation (Ainsworth et al. 1978). This technique consists of eight episodes, during which caregiver and child interactions are observed as they have opportunities to explore new and stimulating toys, encounter strangers, separate briefly from one another, and potentially reunite. Children and care providers with different attachment types handle these situations differently. The term "secure" reflects a relationship where the infant will freely explore new toys, often looking back to use the attachment figure as a reference or "safe base" from which to explore. These children are visibly distressed when separated from their attachment figure and greet him or her warmly upon return, often seeking physical contact (a hug, a touch), after which the child may return to play activities. With the attachment figure present, these children are relatively outgoing with strangers. Securely attached infants are typically characterized as the most responsive, obedient, and content children compared to other attachment types.

The most common category of insecure attachments, Avoidant Attachment, impacts about 20% of North American infants. These infants tend to be unresponsive to their attachment figures when they are present, and are untroubled when separated from them. Those infants with Resistant Attachment patterns (10% of North Americans) seek close contact with their attachment figures even before being separated from them and are hesitant to leave them, even to explore the interesting toys.

Finally, about 5% of North American infants display Disorganized/Disoriented Attachment patterns. They display mixed responses after a separation. For example, the infant may sometimes show characteristics of resistant or avoidant attachments, or they may appear confused and waffle between both resistant and avoidant responses at the same time. Overall, these infants appear to be most stressed by the Strange Situation and are considered to be the least secure (NICHD Early Childcare Research Network, 2001).

Although anyone can potentially be an attachment figure, much of the research has been conducted with mothers. Mothers of securely attached infants tend to be sensitive, affectionate, positive, and responsive to their children (Isabella et al. 1989; DeWolff and van Ijzendoorn 1997). They create opportunities for themselves and their infants to interact and they respond quickly both to the children's interest and distress. Mothers of infants with a resistant attachment tend to be inconsistent in their responsiveness to their child and in their emotional responses. For example, they might be engaging, positive and supportive in one interaction and indifferent to the child in the next. Mothers of infants who display avoidant attachment patterns fall into one of two interaction categories. Some demonstrate little affection and generally fail to respond to their infants' needs and cries, while others are overly engaged and overly stimulating, independent of the cues and needs of their infants. The research with mothers is supported in father–child attachment relationships. Fathers can be the primary attachment figure and can provide the same responsive and competent interactions that mothers have been shown to provide (Roberts and Moseley 1996).

The research outcomes on infants exposed to the Strange Situation have also been demonstrated with older children using alternative methodologies. That is, the attachment categories observed in infants are also found in older children, and the impacts of these attachment types on social and cognitive functioning have also been supported.

The long-term correlates for infants with secure attachments are positive in many domains. In early childhood, securely attached children are more socially skilled, they express more positive than negative emotions, and they are typically rated by others as more desirable playmates (Fagot 1997; Kochannska 2001). Positive social outcomes continue to be evident by eleven to twelve and sixteen years of age. Secure children also demonstrate cognitive advantages and academic success.

The previous summary refers to outcomes in North American children. There is some variation in the percentages of children classified into each category as a function of culture. Overall, however, John Bowlby (1951), one of the foremost theorists on attachment, captured the key concern with attachments. He stated that in order to ensure mental and emotional health, infants and young children "should experience a warm, intimate, and continuous relationship" with their attachment figure that is mutually satisfying and enjoyable. Health care providers can support and extend this relationship within their own practice by developing protocols sensitive to the needs of children and their care providers.

You might wonder why children form attachments at all. Initially, it was believed that infants formed attachments because caregivers provided the food necessary for survival, but an intriguing set of studies showed that, although having the necessities of life is critical, close contact-comfort was a basic need for healthy attachment (Harlow 1962). This conclusion became clear when Harlow (1962) conducted experiments with infant monkeys in which the infants could

select the kind of support (nutritional or comfort) they wanted. The experiment involved two cylindrically–shaped artificial monkey "mothers;" one made from wire-mesh, the other similar but covered with soft terry cloth. Each of these "mothers" could be fitted with a baby bottle to provide formula. Through a number of experiments it became apparent that "the infants developed a strong attachment to the cloth mothers and little or none to the wire mothers" (Harlow and Harlow 1962,) independent of which mother provided the food. In other words, it was contact comfort–the comfort supplied by bodily contact that formed the basis of the infant monkeys' attachments. Human infants, too, need contact comfort to develop optimally. Studies examining children raised in orphanages repeatedly show that healthy social development requires more than basic nourishment and medical care (O'Connor and Rutter 2000; Rutter and O'Connor 2004). Children require attention by a warm, close caregiver who provides comfort and attention (Montagu 1962; Van IJzendoorn and Juffer 2006). Practitioners can support parents and infants by providing and modeling responsive, warm, and caring interactions.

Compliance Through Parenting Styles

A key goal in social development is to get children to comply with social expectations. Although compliance is initially controlled externally, the goal is to provide children with enough information, skills, and opportunities for them to internalize the values of society and comply with social expectations independently. The first step on this path is typically provided by parents (Figure 2-2). How parents get their children to comply can be captured by three parenting styles (Baumrind 1971, 1991): authoritative, authoritarian, and permissive. Maccoby and Martin (1983) modified Baumrind's groupings, renaming "Permissive" as "Indulgent" and adding "Neglectful" as a fourth parenting style (see Chapter Four for further discussion and application in the dental setting).

It is important to know about parenting styles because many children expect these general styles of compliance to span contexts, such as in school and at their dentists' office. Many professionals expect and employ a different style of "control" than the one that is used at home, which can confuse the child and potentially lead to challenges both from the child and their parents. Modeling desirable authoritative interactions may be one way of assisting parents in communicating with their child and ensuring that important information and rules are presented in the most effective manner.

Figure 2-2. Courtesy of Chris Madden.

Who am I?

It is important to consider how children come to understand themselves as unique individuals in the world, and how their self-awareness will impact the way that others will likely treat them. One of the first steps in understanding who you are is to first understand that you are. Children only come to recognize that they are a separate and recognizable individual somewhere between eighteen and twenty-four months of age (Lewis and Brooks-Gunn 1979). After children recognize themselves (e.g., in mirrors or photos), they can begin to describe who they are. If you ask a toddler to tell you about himself, he will most likely focus on externally observable attributes such as sex and age. For example, my son described himself as "Mine big boy". They might also use some broad social categories such as "good" or "nice." Three- to five-year-olds expand this description by including possessions they might have ("I got Spiderman") or activities they can perform. Preschoolers are also capable of identifying stable social and psychological characteristics that they believe are true to them, but they often fail to do so unless the information is provided to them. That is, if asked whether they like to play by themselves or with others, preschoolers can accurately identify the characteristic that tends to be stable over time (Eder 1990).

As children move closer to adolescence, they begin to spontaneously generate more abstract understandings of their inner and outer selves. At this point they understand enduring characteristics about themselves, including traits, values and beliefs (Shaffer et al. 2010). Stable identities, or self-concepts, develop during adolescence, and at this point individuals can provide coherent, well-integrated understandings of what it is to be themselves. Self-esteem develops alongside self-concept. Not surprisingly, self-esteem, the evaluation of who you are, has an incredible impact on the well-being of children and adolescents. Maturational, biological, cognitive, and social influences all contribute to self-esteem. The term "looking glass self" has been used to describe how it is that we sometimes come to define ourselves through the eyes of others. If someone says "you're generous" we may be surprised initially, but come to understand that as a true statement. This knowledge is then incorporated into our understanding of self, and because it has a positive evaluation, it assists in supporting our self-worth. Older children's self-esteem is further impacted by how they weigh or value different characteristics. If being generous was considered positive but not deemed an important trait, then it would be less beneficial to hear that generosity is a characteristic relative to some other, more valued trait. Parents, teachers, health care providers, and peers can support positive attributions and foster positive self-esteem by identifying strengths in those under their care.

Significant Changes in Adolescence

Adolescence begins with the onset of puberty. Apart from the visible and physiological changes typically associated with puberty, adolescents begin to demonstrate significant changes in the way they think and behave. One unique developmental change occurs when adolescents experience a different kind of egocentrism from that reported by Piaget in younger children. This adolescent version of egocentrism takes two forms: the imaginary audience and the personal fable (Elkind 1967, 1985).

Egocentrism involving the imaginary audience can be characterized simply: "In the young person's mind, he/she is always on stage" (Buis and Thompson 1989). Adolescents believe that they are literally on view at all times and that everyone is evaluating them. Evaluations can been positive, with others admiring them, or negative, with others critiquing them.

Given the feeling that they are "on view," adolescents may spend time imagining how they will be perceived. For example, they may imagine the reaction of others when they enter their classrooms or dentists' offices and wonder how they will be judged. They may also imagine how they should or would interact, what they should say and how various responses might be received. Coupled with this imaginary audience is an exaggerated sense of personal uniqueness and indestructibility called the personal fable.

Many adolescents feel that they are experiencing the world in a way that no other person has or could. Clearly, holding these beliefs can make even the simplest social setting potentially terrifying or, alternatively, an event that requires great preparation. In either case, these beliefs can place adolescents under great stress. Adolescents require sensitivity from those working with them, as well as support to help minimize stress that can be caused by these forms of egocentrism.

Closing Comments

The preceding developmental summary identifies some key changes that occur physically, cognitively, and emotionally and socially. The goal was to highlight not only the changes themselves, but how those changes might impact the way children and adolescents understand the world around them in general as well as how they might approach the dental environment and practitioners. There are four major points that should be emphasized before closing, as these considerations need to be kept in mind when we meet children and adolescents as individuals.

1. *All children are unique***.** In the same way that adults differ from one another, children, too, are different. They differ in personality, cognitive capacity, social skills, and experience. The summary provided in this chapter outlines global changes that occur, but these are based on populations rather than individuals. Not all children progress through development in the same way or at the same time. Knowing what is typically observed to occur, however, provides a starting point for approaching and interacting with children, and this is a critical first step in building a relationship with a child.
2. *Children do not exist in isolation.* Children come from families, attend schools and daycares, and have friends and experiences that shape and influence them. Understanding the child involves some consideration of the cultural and social context from which the child comes. Interviews with parents are important. Understanding how parents influence their children can have implications for how children expect practitioners to interact. In addition, knowing more about the child's social context is important for

designing and sharing health information and protocol. Finally, knowingly or unknowingly, practitioners provide a social context through their practice. Ensuring that your dental practice provides a positive, supportive environment for children is an important consideration for the healthy development of those children under your care.

3. *Children may not have enough knowledge to understand*. While it is important that practitioners never underestimate or "dumb down" their interactions with children, it is equally important that knowledge not be taken for granted. Ensuring enough time to have a casual conversation with children during each visit can be important in assessing their current level of knowledge, allowing you an opportunity to present information at the right level. Using accessible language, concrete examples, and opportunities for practice can reinforce the conveyed messages.
4. *Taking time to establish rapport is worth the effort and time*. Children are fascinating and eager to learn, and most desire attention and approval from adult authority figures. Providing children with a sensitive, caring introduction to yourself as a practitioner, the dental practice, and dental procedures allows children to develop trust and knowledge and retain some control. Respecting children's strengths and welcoming them as valued individuals is the foundation for sustaining a healthy, long-lasting relationship.

References

Ainsworth, M.D.S. et al. (1978). *Patterns of attachment*. Hillsdale, NJ: Erlbaum.

Alessandri, S.M. and Lewis, M. (1996). Differences in pride and shame in maltreated and nonmaltreated toddlers. *Child Development*, 67, 1857–69.

Baumrind, D. (1971). Current patterns of parental authority. *Developmental Psychology Monographs*, 4 (1, Pt. 2), 1–103.

Baumrind, D. (1991). Effective parenting during the early adolescent transition. In P.A. Cowan and M. Hetherington (Eds.), *Family transitions*. Hillsdale, NJ: Erlbaum.

Bayley, N. (1993). Bayley Scales of Infant Development (2nd edition). New York, Psychological Corporation.

Bjorklund, D.F. (2005). *Children's thinking: Cognitive development and individual differences* (4th ed.). Belmont, CA: Wadsworth.

Bowlby, J. (1951) Maternal care and mental health. Geneva: World Health Organization, 13.

Brown, A.M. (1990). Development of visual sensitivity to light and color vision in human infants: A critical review. *Vision Research*, 30, 1159–88.

Buis, J. and Thompson, D. (1989). Imaginary audience and personal fable: A brief review. *Adolescence*, 24, 773–781.

Chi, M.H.T. (1978). Knowledge structures and memory development. In R.S. Siegler (Ed.), *Children's thinking: What develops?* Hillsdale, NJ: Erlbaum.

Chi, M (2006). Two approaches to the study of experts'characteristics. *The Cambridge Handbook of Expertise and Expert Performance*, Cambridge, Cambridge University Press.

Eder, R.A. (1990). Uncovering young children's psychological selves: Individual and developmental differences. *Child Development*, 61, 849–63.

Eisenberg, N. et al. (2003). The relations of parenting, effortful control, and ego control to children's emotional expressivity. *Child Development*, 74, 875–95.

Elkind, D. (1967). Egocentrism in Adolescence, *Child Development*, 38(4),1025–1034.

Elkind, D. (1985) Egocentrism Redux, *Developmental Review* 5(3), 218–226.

Elkind, D. (2001). Authority of the brain. *Pediatrics*, 107, 964–66.

Fagot, B.I. (1997). Attachment, parenting, and peer interactions of toddler children. *Developmental Psychology*, 33, 489–99.

Field, T. et al. (1984). Mother-stranger face discrimination by the newborn. *Infant Behavior and Development*, 7, 19–25.

Franklin, A., Pilling, M., and Davies, I. (2005). The nature of infant color categorization: Evidence from eye movements on a target detection task. *Journal of Experimental Child Psychology*, 91, 227–248.

Glaser, D. (2000). Child abuse and neglect and the brain: A review. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41, 97–117.

Greenough, W.T., Black, J.E., and Wallace, C.S. (1987). Experience and brain development. *Child Development*, 58, 539–59.

Greenough, W.T., Black, J.E., and Wallace, C.S. (2002). Experience and brain development. In M.[AP1] H. Johnson, Y. Munakata and R. Gilmore (Eds.), *Brain development and cognition: A reader* (2nd ed.). Oxford: Blackwell Press. 186–216.

Harlow, H.F. (1962). Affectional systems of monkeys, involving relations between mothers and young. *International Symposium on Comparative Medicine Proceedings*. New York: Eaton Laboratories, 6–10.

Harlow, H.F. and Harlow, M.K. (1962). Social deprivation in monkeys. *Scientific American*, 207, 137–146.

Hinotsume, S. et al. (1993). The influence of video films on child patient behavior during dental treatment. *The Japanese Journal of Pediatric Dentistry* (in Japanese, English abstract), 31 , 850–858.

Huttenlocher, P.R. (1994). Synaptogenesis, synapse elimination, and neural plasticity in the human cerebral cortex. In C.A. Nelson (Ed.), *Threats to optimal development: Integrating biological, psychological, and social risk factors: Minnesota symposia on child psychology*, 27. Hillsdale, NJ: Erlbaum.

Isabella, R., Belsky, J., and von Eye, A. (1989). Origins of infant-mother attachment : An examination of interactional synchrony during the infants' first year. *Developmental Psychology*, 25, 12–21.

Izard, C.E. et al. (1995). The ontogeny and significance of infants' facial expressions in the first 9 months of life. *Developmental Psychology*, 31, 997–1013.

Janowsky, J.S. and Finlay, B.L. (1986). The outcome of perinatal brain damage: The role of normal neuron loss and axon retraction. *Developmental Medicine and Child Neurology*, 28, 375–89.

Johnson, H., Munakata, Y., and Gilmore, R. (Eds.) (2008). *Brain development and cognition: A reader* (2nd ed.). Oxford: Blackwell Publishing.

Johnson, M.H. (1998). The neural basis of cognitive development. In W. Damon (Series Ed.) and D. Kuhn and R.S. Siegler (Vol Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (5th ed.). New York: Wiley.

Johnson, M. H. (2005). *Developmental Cognitive Neuroscience: An Introduction*. Cambridge, MA: Blackwell.

Kochannska, G. (2001). Emotional development in children with different attachment histories: The first three years. *Child Development*, 72, 474–490.

Kohler, L., and Rigby, M. (2003). Indicators of children's development: Considerations when constructing a set of national Child Health Indicators for the European Union. *Child Care, Health and Development*, 29, 551–58.

Kolb, B. and Fantie, B. (1989). Development of the child's brain and behavior. In C.R. Reynolds and E. Fletcher-Janzen (Eds.), *Handbook of clinical child neuropsychology*. New York: Plenum Press. 17–41.

Kopp, C.B. and Kaler, S.R. (1989). Risk in infancy. *American Psychologist*, 44, 224–30.

Kuhn, D (1984). Cognitive Development. In M.H. Bernsteing and M.E. Lamb (eds.) *Developmental Psychology*. Hillsdale, NJ:Erlbaum.

LaVelli, M. and Fogel, A. (2005). Developmental changes in mother–infant face-to-face communication: Birth to 3 months. *Developmental Psychology*, 38, 288–305.

Lewis, M. and Brooks-Gunn, J. (1979). *Social cognition and the acquisition of self*. New York: Plenum.

Maccoby, E.E. and Martin, J.A. (1983). Socialization in the context of the family: Parent-child interaction. In Mussen, P., Hetheringon, E.M. (Eds). *Handbook of Child Psychology, Volume IV: Socialization, personality, and social development* (4th ed.). New York: Wiley. 1–101.

Main, M. and Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M.T. Greenberg, D. Cicchetti, and E.M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention*. Chicago: University of Chicago Press.

Mattson, S. and Riley, E. (2000). Parent ratings of behavior in children with heavy prenatal alcohol exposure and IQ matched controls. *Alcoholism: Clinical and Experimental Research*, 24, 226–231.

Miller, P.H. (2000). How best to utilize a deficiency. *Child Development*, 71, 1013–17.

Miller, P.H. and Weiss, M.G. (1981). Children's attention allocation, understanding of attention, and performance on the incidental learning task. *Child Development*, 52, 1183–90.

Montagu, A. (1962). *The humanization of man*. Cleveland, OH: World.

NICHD Early Child Care Research Network (2001). Child care and children's peer interaction at 24 and 36 months: The NICHD study of early child care. *Child Development*, 72, 1478–1500.

O'Connor, T.G., Rutter, M. (2000). Attachment disorder behavior following early severe deprivation: extension and longitudinal follow-up. English and Romanian Adoptees Study Team. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 703–712.

Piaget, J. (1971). *Science of education and the psychology of the child*. New York: Viking Press.

Piaget, J. and Inhelder, B. (1969). *The psychology of the child*. New York: Basic Books.

Porter, F.L., Porges, S.W., and Marshall, R.E. (1988). Newborn pain cries and vagal tone: Parallel changes in response to circumcision. *Child Development*, 59, 495–505.

Rakic, P. (1991). Plasticity of cortical development. In S.E. Brauth, W.S. Hall, and R.J. Dooling (Eds.), *Plasticity of development*. Cambridge, MA: Bradford/MIT Press.

Roberts, P. and Moseley, B. (1996). Father's time, *Psychology Today*, 29, 48–55.

Rutter, M. and O'Connor, T.G. (2004), Are there biological programming effects for psychological development? Findings from a study of Romanian adoptees. *Developmental Psychology*, 40, 81–94.

Shaffer, D. et al.(2010). *Developmental Psychology: Childhood and Adolescence*. (3rd Canadian Edition). Toronto, Nelson.

Siegler, R.S. (2000). The rebirth of learning. *Child Development*, 71, 26–35.

Siegler, R.S. and Alibali, M.W. (2005). *Children's Thinking* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Stipek, D.J., Recchia, S., and McClintic, S. (1992). Self-evaluation in young children. *Monographs of the Society for Research in Child Development*, 57, 1.226.

Tanner, J.M. (1990). *Foetus into man: Physical growth from conception to maturity* (2nd ed.). Cambridge, MA: Harvard University Press.

Thompson, R. and Nelson, C. (2001). Developmental science and the media. *American Psychologist*, 56 (1), 5–15.

Van IJzendoorn, M.H. and Juffer, F. (2006). The Emanuel Miller Memorial Lecture 2006: Adoption as intervention. Meta-analytic evidence for massive catch-up and plasticity in physical, socio-emotional, and cognitive development. *Journal of Child Psychology and Psychiatry*, 47, 1228–1245.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

De Wolff, M.S. and van IJzendoorn, M.H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68, 571–91.

WHO Multicentre growth Reference Study Group (2006). WHO motor development study Windows of achievement for six gross motor development milestones. *Acta Paediatrica, Suppl.* 450, 86–95.

Woloshyn, V., Wood, E. and Willoughby, T. (1995). *Cognitive Strategy Instruction for Middle and High Schools*, Cambridge MA: Brookline.

Chapter 3

Children's Behavior in the Dental Office

Jaap S.J. Veerkamp

Gerald Z. Wright

This chapter discusses the reactions of children to dental treatment. It is intended to assist the dental health team in raising its perception of children's behavior. The information will hopefully help dental professionals attain a greater sensitivity to the underlying factors which contribute to children's reactions in the dental office. It is this kind of broad understanding that facilitates decisions concerning the management techniques that are likely to be successful for an individual child patient. Although clinical suggestions are offered on fostering positive reactions and dealing with negative ones, this is not the chapter's main purpose: that information receives more attention in Chapter Six.

Historically, early writing on the subject of children's behavior in the dental office began by following two lines of thought. First, a number of techniques for the "containment" of children in the dental environment were suggested. Second, the need for psychological knowledge and its application to children's treatment was realized.

In the 1930s, the profession began to assess and detail children's reactions to dentistry. There was an immediate interest in these writings which has been maintained and has steadily grown. The writings have taken two forms. The early descriptions were, for the most part, based on clinical observations and personal opinion. Collectively, these writings can be highly informative and useful in supporting theoretical guidelines. In the 1960s, controlled data-seeking investigations began to appear in the dental literature. As a result of differing viewpoints and experimental designs, the information gleaned from these studies can sometimes be confusing or contradictory. Nonetheless, they are helpful.

Guidelines are currently research-based. The focus is on evidence-based clinical trials (Roberts et al. 2010), which implies the use of randomized clinical trials (RCT). Since there has been a deficiency of this type of pediatric dentistry research over the past few decades, evidence often is gathered from other disciplines such as psychology or medicine (Klingberg 2008, Gustafsson et al. 2010).

The writings describing children's behavior in the dental office have centered around three main areas. These areas include: (1) classifying children's behavior, (2) describing various forms of behavior, wherein negative behavior patterns have been labeled and, (3) elaborating on factors which affect behavior in the dental environment. Hence, these main areas have served as natural focal points for the organization of this chapter.

Classifying Children's Behavior

Numerous systems have been developed for classifying children's behavior in the dental environment. The knowledge of these systems holds more than academic interest and can be an asset to clinicians in two ways: it can assist in evaluating the validity of current research, and it can provide a systematic means for recording patients' behaviors. Interestingly, most classification systems that are used in clinical practice nowadays were spawned from research investigations.

When a clinician treats a child patient, the first issue of concern is the child's behavior. The clinician has to classify the behavior (mentally at least) to help guide the management approach. There is wide variation between classification systems. One of the first was described by Wilson (1933), who listed four classes of behavior—normal or bold, bashful or timid, hysterical, and rebellious. During the same year, Sands wrote that children were of five types—hypersensitive or alert, nervous, fearful, physically unfit, and stubborn. These systems identified behaviors during dental procedures that mainly limited success of treatment. Nowadays, classification systems are often based on principles used in psychological questionnaires. Child behaviors during

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

daily, non-dental situations may be placed into categories that summarize the personality of the child (Klaassen 2002). This provides information on the attitude of the child that is unrelated to treatment situations.

One of the most widely used systems was introduced by Frankl et al. in 1962. It is referred to as the Frankl Behavioral Rating Scale. The scale divides observed behavior into four categories, ranging from definitely positive to definitely negative. A detailed description of the scale is provided in Table 3-1.

The Frankl classification method, as seen in Table 3-1, is often considered the gold standard in clinical rating scales, mainly as a result of its wide usage and acceptance in pediatric dentistry research. Its popularity as a research tool has stemmed from three features. First, it is functional, as has been demonstrated through repeated usage. Second, it is quantifiable. Since it has four categorizations, numerical values can be assigned to the observed behavior. Finally, it is reliable. A high level of agreement among observers can be obtained. In fact, many investigations using this tool have shown the level of agreement to be 85% or higher—a very acceptable level in this type of research. These are the criteria for a measurement tool that are necessary for a successful investigation.

Table 3-1. The Frankl Behavior Rating Scale: A four-point scale with two degrees of positive behavior and two degrees of negative behavior.

Categories of Behavior
Rating 1: Definitely negative
Refusal of treatment, crying forcefully, fearfulness, or any other overt evidence of extreme negativism.
Rating 2: Negative
Reluctance to accept treatment, uncooperative behavior, some evidence of a negative attitude but not pronounced (i.e., sullen, withdrawn).
Rating 3: Positive
Acceptance of treatment, at times cautious, willingness to comply with the dentist, at times with reservation but follows the dentist's directions cooperatively.
Rating 4: Definitely positive
Good rapport with the dentist, interested in the dental procedures, laughing and enjoying the situation.

Other classification systems similar to the Frankl scale have been developed. Most notable are Likert-type scales, which have five levels of response (Rud and Kisling 1973). The studies of Venham et al. (1977) used the five-point scales to measure anxiety and behavior (self-report and proxy-report). Repeating their study, it was found that the two scales correlated so highly that the use of a single scale seemed appropriate (Veerkamp 1995). Other scales, such as the Houpt clinical rating scale (Houpt 1993) or the self-reporting Wong and Baker (1988) facial scale, are comparable systems. These are also useful in clinical settings, as well as research.

Self-report is the first method of choice when studying pain and/or anxiety. However, children under eight years of age have limited cognitive capacities: to depend on the accuracy of their reporting (ten Berge 2001) offers a greater risk of incorrect information. To improve the information on self-reporting rating scales for young children, some investigators have used small icons of dentistry-related situations or happy-to-sad faces as clinical endpoints (Venham et al. 1979; Wong and Baker, 1988, Chapman and Kirby-Turner, 2002). An example of such a scale is shown in Figure 3-1. In general, visual analogue scales (VAS) are the most effective with young children, with "very cooperative" and "uncooperative" as the clinical endpoints.

In her literature review, Aartman (1998) stated that the method of choice is to take two measurements, e.g., a self-report and an independent observer, and base conclusions on a combination of both reports. However, this approach may be impractical for some researchers and clinicians.

Classification procedures have important clinical application. Many general dentists have two thousand patients in their practices. If a fifth of these are children, the practice would contain four hundred child patients. It is impossible to recall how each child reacted during former visits. For pediatric dentists, having two thousand children in a practice and remembering their behaviors is even more

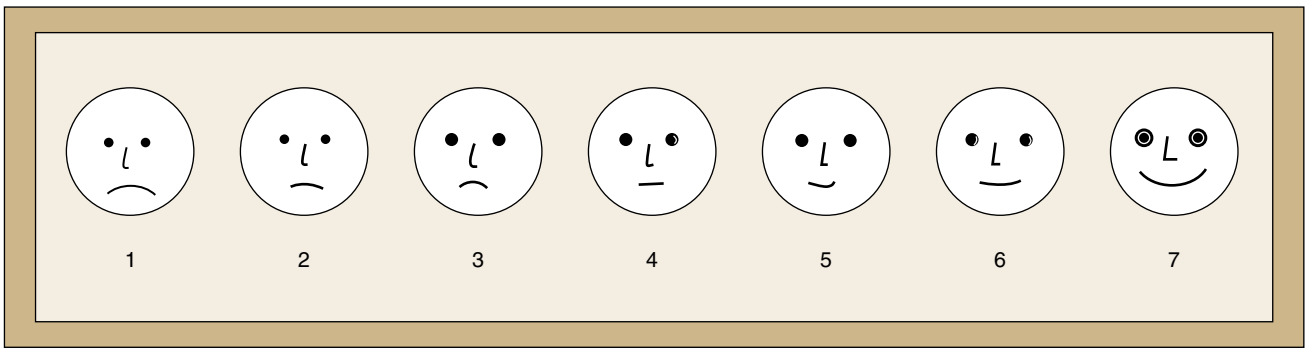

Figure 3-1. A visual analogue scale using happy and sad faces as its endpoints. Chapman, H.R., Kirby-Turner, N. (2002). Visual/verbal analogue scales: examples of brief assessment methods to aid management of child and adult patients in clinical practice. *British Dental Journal* 193, 447–450.

(a)

PROCEDURE	ANES.	BEH.
X rays	—	T.S.D — → +
d.o Ag	1.8 Lido 2%	T.S.D +
d.o. Ag	1.8 Lido 2%	+ +

(b)

Initial exam, PA + 2BW, BEH — ---> TSD ---> +
1.8 2% LIDO, 1:100,000 EPI BEH — ---> VC ---> +
1.8 2% LIDO, 1:100,000 EPI BEH + +

Figure 3-2. A section of a patient's chart showing a child's behavior recorded over a series of appointments (a). A separate column on the chart is reserved for this purpose. Notation of behavior should also be made in computerized patient charts (b). Courtesy of Elaine Schroit.

daunting. Since the behavior of a child is an integral factor in the treatment planning, noting reactions can be of major assistance. Developing the habit of systematically recording patients' behaviors on their clinical records takes little effort and can result in a big payoff.

Knowledge of the progression of a child's behavior during a series of appointments, or over a period of years, can assist in behavior management. It provides a base for planning. To gather this information, a separate column on the patient chart should be reserved for recording behavior. Figure 3-2 records a child's behavior over several appointments using the Frankl Rating Scale. Note that the scale lends itself to a shorthand form. A child displaying positive cooperative behavior can be identified by jotting down (+) or (++). Conversely, uncooperative behavior can be noted by (−) or (=). This enables a child's performance to be discerned at a glance. Similar notation of behavior can be made in computerized patient charts using appropriate software.

Rating scales, such as the Frankl Scale, have two clear shortcomings. First, they do not communicate sufficient clinical information for uncooperative children. If a child is judged to be (−), the scale does not identify the type of negative behavior. Thus, the dentist using this classification system has to qualify as well as categorize the reaction. An example might be: (−) timid. If behavior ranges from negative to positive during a visit, a simple notation could be (−>+). The management technique can also be recorded. TSD shows that behavioral change was accomplished by the T (Tell), S (Show), D (Do) technique (Addelston 1959). Personal abbreviations can be developed for the various situations such as (−) INJ, which reminds the dental team that behavior was negative at the time of injection or VC indicating the use of voice control. Second, a behavioral scale represents a child's performance during the actual treatment. It has no prognostic value. Nonetheless, it helps clinicians to prepare for the child's future behavior, based on past performances, and to guide the behavior during treatment instead of simply reacting.

Simple, direct rating scales show a high inter- and intra-observer reliability (Rud and Kisling 1973). Studies have shown substantial correlations between observations of child behaviors during sequential treatment sessions as well as within parts of each treatment appointment (Veerkamp 1995b). Thus, it would be extremely beneficial for dentists to learn and make use of one of the classification systems on child behavior. A few digits are read more easily than a long, detailed report on a child's behavior.

Before leaving this subject, it is important to note that all clinicians do not perceive behavior in precisely the same way. It follows, therefore, that some dentists feel compelled to develop their own classification consistent with their views of children's reactions to dentistry. Furthermore, not only do clinicians perceive children's behavior in different ways, but they also tolerate children's behavior differently (Alwin et al. 1995).

The interesting concept of the clinician's "tolerance level" was introduced by Wright (1975) in his original behavior management book. Consider children who present with borderline cooperative-uncooperative reactions to dentistry. What is acceptable to Dr. Jones may be totally unacceptable to Dr. Smith. Certain behavior may be highly irritating to one dentist but only slightly bothersome to another. The dentists have different tolerance levels. They withstand stress differently, and this influences their classifications of children's behaviors as well their selection of management techniques. Tolerance level is an important but seldom-discussed concept. It helps to explain differences in the numerous descriptive classifications. Moreover, an appreciation of this concept points out the necessity for educators to train dentists in a variety of management techniques.

Descriptions of Behavior

In describing child behavior, the interest or emphasis in the literature has been on behaviors that dentists find difficult to deal with or are inappropriate in some way.

However, there are other aspects of behavior that sometimes can be important, and dentists may need to consider these as well. Questionnaires appear in Chapter Six that can be used to investigate children's environments, how children react to different situations, and how they express fears prior to and during aversive situations. Children's methods of play and oral habits are forms of behavior. Astute receptionists can observe children playing in the waiting room and often provide important information to the clinician.

When a dentist examines a child patient, one type of behavior—the cooperative behavior—is always assessed because a key to the rendering of treatment is cooperative ability. Most clinicians, consciously or not, characterize children in one of three definable ways (Wright 1975):

1. cooperative,
2. lacking in cooperative ability, or
3. potentially cooperative.

Knowing the clinical aspects of these distinctive child behaviors is important to behavior management and treatment planning.

Cooperative Behavior

Most children seen in dental offices cooperate. This is substantiated by dental office experiences, as well as indirect data from behavioral science studies (ten Berge 2001). Cooperative children are reasonably relaxed. They have minimal apprehensions. They may be enthusiastic. Further description of their reactions appears in Frankl's positive groupings (Table 3-1).

Children judged to be cooperative can be treated by a straightforward, behavior-shaping or tell-show-do approach (see Chapter Six). When guidelines for their behavior have been established, they perform within the provided framework. These children present a "reasonable level" of cooperation, which allows the dentist to function effectively and efficiently. They seldom require pharmacologic adjuncts to help accomplish their treatments.

Lacking Cooperative Ability

In contrast to the cooperative child is the child lacking cooperative ability. This could include very young children (less than three years of age) with whom communication cannot be established. Comprehension cannot be expected. If their treatment needs are urgent, they can pose major behavioral problems. Pharmacologic adjuncts may be required for their treatment. MacDonald (1969) referred to these children as being in the pre-cooperative stage. For these children, time usually solves the behavior problems. As they grow older, they develop into cooperative dental patients and treatment is provided with behavior shaping.

Another group of children who lack cooperative ability are those with specific debilitating or handicapping conditions. The severity of their conditions often prohibits cooperation in the usual manner. Obtaining information on their intellectual development can give the dentist valuable information about the expected level of cooperation. At times, special behavior management techniques, such as body restraints or sedation, are employed to control body movements. While the treatment is accomplished, major positive behavioral changes cannot be expected.

In most western societies, thrust in intellectual impairment services is community-oriented, and as large institutions for the mentally challenged are phased out, more children with special needs are being treated in dental offices today. More and more, these children and adults are living in group and private homes within residential communities. Many dental faculties have recognized this societal change, and programs have been established to prepare undergraduate and postgraduate students to meet the foreseeable demand. Chapter Seven provides a more complete description of the disabled patient.

Potentially Cooperative Behavior

Until recently, the nomenclature applied to a potentially cooperative child was "behavior problem." The child may be healthy or disabled. However, there is a difference between the potentially cooperative child and the child lacking cooperative ability. The potentially cooperative child has the capability to behave well. It is an important distinction. When characterized as potentially cooperative, the judgment is that the child's behavior can be modified: the child has the age-related cognitive capacities to learn to deal with dentistry and can become cooperative.

Perhaps one of the most challenging issues for the clinician is to determine what behavior can be expected from the new patient. There are those children who may approach the dental office crying or screaming. Their behavior is apparent. Conversely, there are children who are quiet, shy, or withdrawn. These children can be hard to read. They may or may not be difficult to treat. Behavioral science researchers in dentistry and allied professions have made efforts to predict children's behaviors before their arrival at a dental clinic. Since the 1990s the Children's Fear Survey Scale-Dental Subscale (CFSS-DS) has received considerable attention. Initially presented by Cuthbert and Melamed (1982), the CFSS-DS has been used worldwide. Indeed, it has been translated and tested in various cultures and nations such as

I. How afraid is your child of	Not afraid at all	A little afraid	A fair amount afraid	Pretty much afraid	Very afraid
	1	2	3	4	5
1. Dentists	O	O	O	O	O
2. Doctors	O	O	O	O	O
3. Injection (shots)	O	O	O	O	O
4. Having somebody examine your mouth	O	O	O	O	O
5. Having to open your mouth	O	O	O	O	O
6. Having a stranger touch you	O	O	O	O	O
7. Having somebody look at you	O	O	O	O	O
8. The dentist drilling	O	O	O	O	O
9. The sight of the dentist drilling	O	O	O	O	O
10. The noise of the dentist drilling	O	O	O	O	O
11. Having somebody put instruments in your mouth	O	O	O	O	O
12. Choking	O	O	O	O	O
13. Having to go to the hospital	O	O	O	O	O
14. People in white uniforms	O	O	O	O	O
15. Having the nurse clean your teeth	O	O	O	O	O

Figure 3-3. Items on The Child Fear Survey Schedule—Dental Subscale (CFSS-DS). Krikken et al., 2012, and Milgrom et al., 1995.

Finland, the Netherlands, Bosnia, India, and Japan (ten Berge et al. 1998, Bajric, 2011; Singh, 2010). All venues had similar positive findings when rating fear/anxiety.

The CFSS-DS scale has been used in large patient samples between four and fourteen years of age, it is considered to work well on a group basis, and it has been evaluated as a diagnostic tool on an individual level. In a report comparing properties of different self-report measures, it was concluded that CFSS-DS was preferred, as it has better psychometric properties measuring dental fear more precisely.(Aartman 1998). The psychometric properties were further analyzed and found appropriate for children from four to fourteen years (ten Berge 2001). The test consists of fifteen items that are shown in Figure 3-3. Each item has five different scores, ranging from one (not afraid at all) to five (very afraid). Thus, there is a possible total score range from fifteen to seventy-five. Scores below thirty-one suggest an absence of dental anxiety, or low anxiety, whereas those between thirty-one and thirty-nine are at risk for developing dental anxiety. Above thirty-nine the dental anxiety definitely needs to be taken into account. Children in this group have extremely high anxiety that is undoubtedly due to more than a single bad experience or some age-related apprehension. In general, this group needs special attention, treatment time, and a protocol, likely involving pharmacotherapeutic approaches. Today the test is mainly used in two versions, one to be answered by the child who reads (about eight years or older), and a proxy (parental) version.

The proxy version of CFSS-DS is used most frequently. It is especially applicable when children cannot read. How accurate are the parental reports? In an attempt to answer the question, Krikken and colleagues (2013) recently assessed the accuracy of parents reporting their children's dental fears. The study was conducted with 326 children, seven to eleven years old. The children completed the child version of the dental subscale and their parents filled out a questionnaire about their children's dental fears. The two groups' responses were compared and the results suggested that a great majority of parents are able to rate the dental fear of their children. If there were discrepancies, parents generally tended to estimate the dental fears of their children slightly higher than their children.

In the Dutch population, an estimated 14% of children suffer from dental fear (ten Berge et al. 2002). Hence, there has been considerable interest and research on the subject of dental fear and anxiety at the Academic Center for Dentistry Amsterdam, and it is recognized that the CFSS-DS is a one-dimensional measure of dental fear. It could help clinicians predict the behavior of children. In the Netherlands, children whose dental anxiety scores are between thirty-one and thirty-nine are considered to be in the potentially cooperative category. Knowing that they are anxious—and not simply withdrawn or shy—the important issue is to develop strategies to prevent potentially cooperative children from developing serious behavior problems.

The dental literature is saturated with anecdotal descriptions of potentially cooperative patients. Moreover, their adverse reactions have been given specific tags or labels that conveniently convey to dentists, in as few words as possible, the essence of the clinical problem. The following are some of the more common labels that have been attached to potentially cooperative behaviors. While it is recognized that almost all negative behaviors are caused by a form of anxiety or rejection of dental treatment, the descriptions only relate to the observed behaviors.

Uncontrolled Behavior

When an uncontrolled behavior reaction is observed in a potentially cooperative patient, it usually occurs in a child three to six years of age on the first dental visit. The reaction, a form of tantrum, may start in the reception area or even before the child enters the outer office. It is characterized by externalized behavior—tears, loud crying, physical lashing out, and flailing of the hands and legs. All are suggestive of anxiety and an extroverted personality type. This heightened state is usually seen in preschoolers, but acute stress can cause a five- or six-year-old to regress to an earlier form of behavior and act in this way.

Because of the furnishings in most dental clinics, the child must be dealt with expeditiously to prevent personal physical harm. If any success is anticipated, a line of communication must be established with the patient. In most cases, a time-out will help. If there is no behavior control, it is impossible to explain procedures. Some form of restraint or sedation may be needed to begin any form of treatment. However, most children can comprehend the situation, and their behavior can be controlled. Thus, the potentially cooperative child can become a cooperative patient.

Case 3.1

Identical twin girls, eight years of age, were referred to a pediatric dentist. One girl was described as a "behavior problem." Jane had the first appointment. Her behavior during the examination was acceptable. Judy, her twin sister, demonstrated out-of-control behavior in the reception area. Once separated from her parent, her cooperation improved. Later, the parent was questioned about these two vastly different reactions. It seemed that Jane had always been the leader- better in school, better in sports, helpful at home. She was used as a model for Judy. As a consequence of the discussion, at the first scheduled operative dentistry appointment, their appointment sequence was reversed. Judy was the model and she responded admirably.

***Case 3.1, Discussion*:** School-age children tend to model their behavior after that of adults or older siblings. Out-of-control, immature behavior, which usually occurs with younger children, would not be consistent with their self-concept. If out-of-control behavior does occur in the older child, there are likely deep-rooted reasons for it. An attempt to understand the reasons for this behavior often reveals unusual situations and can lead to a solution.

In this case, where the lack of control occurred in an eight-year-old girl, the pediatric dentist realized that it was unusual and took the time to try and understand the situation. Why was Judy acting in this way? Was she really afraid? Was she rebelling? One reason might be that she was tired of always being second. Another reason might be that she was fulfilling her family's expectations. Whatever the reason, the dentist solved the problem by reversing the expected protocol in the family. This solution would not have come about without a post-clinic interview by the dentist.

Challenging or Defiant Behavior

Although challenging behavior can be recognized in children of all ages, it is more typical of those in the public school age group. It is one way that some children deal with aversive situations. To some extent, defiant behavior is controlled behavior. It is distinguishable by shouts of "I don't want to" or "I won't." This is not the constructive coping style that facilitates dental care.

Children who react this way often perform similarly in their home environments. Their parents may not provide sufficiently strict guidelines for their behavior. When brought to the dental office against their will, they protest as they would at home. Children exhibiting this type of behavior have been referred to as "stubborn" (Lampshire 1970). While it is generally acknowledged that there is a relationship between the home environment and behavior in the dental environment, it could be fallacious to make this connection. Using the Eyberg Child Behavior Inventory (ECBI), Dunegan and colleagues (1994) found that a child's disruptive or non-disruptive behavior at home was not a reliable predictor of behavior within the dental setting. The study used a small sample, so the relationship still is debatable.

Challenging or defiant children often have a robust self-esteem. They tend to be strong-willed children who are sufficiently extroverted to express their disagreement. Asking parents how they do at home with things like cutting nails, washing hair, or their first visit to school can often create an image of a child without fears. However, it is possible that the child may have been frightened by a single intrusive

treatment creating a solid state (situational) anxiety (Spielberger 1973). A straightforward, firm approach often changes their behavior dramatically. After their cooperation has been obtained, their behavior should be goal-directed. Definitive guidelines for their behavior have to be established. By challenging the dentist, an adult authority, defiant children show some courage. With the proper techniques, this courage can be used to affect reciprocal behavior. Once won over, these children have the potential to be highly cooperative and can become some of the dentist's best patients.

Timid Behavior

If timid children are managed incorrectly, their behavior can deteriorate to uncontrolled behavior. This can occur if the dentist is unable to detect the child's timidity. These children are likely highly anxious and can be difficult to treat. The dentist must proceed slowly and gain the child's confidence. If the dentist hurries to start treatment, it might jeopardize the complete treatment alliance that is needed for consecutive sessions. Compared to those behavioral forms already described, timidity is a more introverted type of behavior. Some children may shield themselves behind a parent, but they often fail to offer great physical resistance to the separation procedure. Some may stall when given directions. These children do not always hear or comprehend instructions. Therefore, the dental health team should understand that guidelines presented to them often must be repeated because of their emotional state.

Many reasons may exist for timid reactions. Currently, it is mainly seen as an aspect of the child's personality. Another assumption is that the child's behavior reflects that of the parent. One child may come from an overprotective home environment. Another may have little contact with strangers. Other children may be awed by strange surroundings. Information obtained from office questionnaires may help to guide these children through their early dental experiences (see Chapter Six).

Tense-Cooperative Behavior

The behavior of some tense-cooperative children could be judged as borderline positive-negative. Typically, these children accept treatment. They do not exhibit violent physical misbehavior, nor can they be suitably classed as timid. They are, however, extremely tense. The dentist should realize that these patients are probably quite afraid of the dental treatment. In most cases a friendly word or a positive remark from the dentist, and encouragement by the dental staff, can reduce the stress considerably.

The term "tense-cooperative" was coined by Lampshire (1970) specifically for this type of behavior. It should be considered as a positive sign when children are tense-cooperative. They are probably not the most excellent communicators who express their anxiety in eloquent sentences but, without words, they try to control their emotions. Their tension is often revealed by body language. Some patient's eyes may follow the movements of both dentist and dental assistant. These children can be considered in an introverted anxiety group.

When considering the latter portion of the behavior management definition proposed in the introductory chapter referring to the importance of a positive dental attitude, one can recognize that these children are easily mismanaged. Because they accept treatment, the busy or unobservant practitioner fails to see a problem. There are two possible results: (1) the child will either suddenly burst out in distress behavior or (2) the child will develop an attitude detrimental to future dental health. Younger children, toddlers, and preschoolers frequently accept their first restorative treatment in this way, and at a second session the clinician suddenly finds that there is a major behavior problem. Older children may grow up accepting dentistry, but voicing dislike out of proportion to their personal experiences.

Crying and Whining

Crying can be considered a manifestation of stress in the dental environment. Some children cry with tears and some without tears. Consider this case.

Case 3.2

During local anesthesia eight-year-old Michelle cried loudly, without any tears, and squeezed the hands of the assistant. She had no other signs of stress, before or during the treatment. But, when local anesthesia was administered she cried. The dentist learned from the intake questionnaire that she developed the crying habit when she was about four years of age, and the crying had continued ever since that time.

After the injection, the dentist asked if it was possible for her not to cry. He explained that the loud crying hurt his ears. He also inferred that it disturbed others in the waiting room, Worse yet, he said, it makes some children nervous. Michele pondered this. Finally, she confessed, "You know, I just like to scream, it makes me feel good. But OK, I've grown up now, so next time I'll help you and try not to cry."

***Case 3.2, Discussion*:** Some view crying as coping—a positive sign. When asked to stop crying, some children may remark that "they can't." Fortunately, that was not the situation in Case 3.2, which is almost laughable. But it happened. Maybe the child cried for attention, or to release her tension. We don't know the reason. The important thing is that once the dentist presented the problem to Michelle, she replied in a mature manner and wanted to help the dentist. In many cases, children will alter their behaviors if they are given a forthright, logical explanation.

Few studies have dealt with crying in pediatric dentistry. One interesting investigation, however, by Zadik and Peretz (2000), inquired about parents' attitudes toward their children's crying in the dental environment. Zadik and Peretz asked 104 parents accompanying their children to dental treatment to complete a questionnaire assessing the tendency of their children to cry and how they, the parents, perceived their own role in such a case. The investigators learned that 53% of the parents assessed their children as having a tendency to cry and 73% preferred that the operator cease the treatment and calm the crying child before resuming. They opined that the successful completion of dental treatment of a crying child is a partnership of the dentist and the parent. If parents hold this opinion, it is important that the dentist inform the parent about the method to be used and have their consent.

In the past, some children have been called whiners. When children whine, it could be regarded as an acceptance of the treatment situation, but an expression of serious discomfort at the same time. Since whining plays a prominent part in their performance, their behavior is described as a distinct entity.

It is difficult to describe a child's behavior by aural perception alone. The whining child is, nevertheless, identifiable. The child's emoting is not particularly loud—it is controlled and the sounds are constant. Great patience is required when dealing with whining children. They allow the dentist to proceed, but whine throughout a major part of the procedure, despite encouragements. Local anesthesia administration may have been repeated because they frequently complain of pain. It can be hypothesized that their apprehensions lower their pain thresholds. Their continuing reactions are a source of frustration and irritation to those involved with the treatment. It is part of the professional attitude of the dentist to accept the whining child's behavior. Although this may be difficult, it will ultimately lead to the best results. With a firm approach, there is a risk of being too directive, overruling the child, and losing the fragile contact that always exists in these situations.

Passive Resistance

A totally different style, often seen in adolescents, is known as passive resistance. Picture the youngster who solemnly slumps in the dental chair. The patient does not respond verbally. When the dentist attempts to involve the child in the procedure, communication fails. When an intraoral examination is attempted, the patient may reject the situation by clenching his teeth. Body language can cue this behavior. The tight grip on the dental chair may turn knuckles white. Eye contact is frequently avoided.

This coping style is a symptom of problem behavior caused by a bundle of reasons. It may be anxiety, a general feeling of dislike, or lack of interest in the situation. These children may act in a similar manner at home if they are not allowed to choose their own clothing or go to movies with their friends. When brought to the dental office unwillingly, they are forced into a situation which has violated their freedom. When treated as juveniles, their self-images are affected. They rebel. Modifying their behavior is a challenge not only for the dentist but for every adult involved (see Chapters Two and Four). In time, behavior will modify for the better when the adolescent becomes interested in oral health. If pharmacological support helps them to relax and it is accepted by the patient, it can be an asset with these children. Every attempt should be made to motivate the child to accept the support of the dental team.

Lists of potentially cooperative behaviors exhibited in dental environments could go on ad infinitum. Generalized descriptions lack specificity, and children are individuals. Their behavior is too highly variable to allow accurate pinpointing. However, the foregoing labeled descriptions of negative behaviors are those most commonly observed. They should be adequate for an understanding of clinical situations when they are referred to in later chapters.

Factors Underlying Children's Cooperation

During the child's first dental visit, the dentist needs to assess behavior in the dental environment. Behavior is the key to treatment. Some children are robust and tolerant in stressful situations and are unlikely to present uncooperative behavior. Other children are vulnerable and may need more attention and time in order to feel at ease and to cooperate with dental treatment. The question is, who are these vulnerable children and what might be the underlying factors which contribute to their behavior in the dental office?

It is axiomatic that an anxious child who anticipates an unpleasant experience is more likely to have such an experience, whereas a child who has a low level of fear

or anxiety is likely to have a pleasant dental visit. But what is anxiety? And what is fear? The various psychological schools agree that anxiety is a personality trait that can be assessed based on the child's behavior (Achenbach and Rescorla 2001). Anxiety describes an emotional state of human personality. It is referred to as a construct; that is, it is an abstraction composed of ideas and concepts. One of the difficulties is that anxiety takes on various meanings depending on the operational criteria employed by different researchers or clinicians (Ruebush 1963). Hence, there are many varied definitions of anxiety that have been used by social scientists.

The crux of the problem in defining anxiety is its similarity to fear. There are theoretical differences, but for practical purposes, they can be indistinguishable (Levitt 1967). Both are constructs of social scientists with no clear physical existence themselves. Anxiety and fear are defined in words. For a definition to be operational and clinically applicable, it should be defined in terms of acts. Nonetheless, these terms are frequently used in behavioral science research in dentistry and other areas without operational definitions. If this is the case, any measurement of the construct is open to question.

The distinction between fear and anxiety is difficult to ascertain in dental situations, except for extreme circumstances. If a child has had several extractions without profound anesthesia, then any uncontrollable future behavior could legitimately be attributed to fear. This is one extreme. The opposite is the mildly concerned but cooperative child, about to have a first dental appointment. The concern could be attributed to anxiety. The two are vastly different situations, but it is the "gray zone," the zone between the extremes where fear and anxiety become indistinguishable.

Another way of looking at fear and anxiety is by examining the source or stimulus. Think about the four-year-old who has uncontrollable behavior at the first dental visit. Is the uncontrolled behavior fear or anxiety? Since the child has not seen a dentist previously, by some definitions, the behavior is attributable to anxiety. On the other hand, someone at school or at home may have frightened the child with stories about dentistry. Did this cause the fearful negativism? We don't know. Again, the fact remains that fear and anxiety can be difficult to tell apart.

Now, returning to the child who is vulnerable, the behavior may be due to internal factors stemming from chronic fear and anxiety. Psychologists refer to those aspects of the individual's personality that are innate, rather than learned, as the temperament. Since the 1950s, many scientific studies have shown that temperament influences children's health and development. The realization that many behavioral tendencies are inborn—and not the result of poor parenting—is one of the most important insights parents (and dentists) gain from learning about temperament. Internal factors like fear and anxiety can be difficult to clarify at times, but some of the resultant child characteristics that may be in need of special attention include somatic complaints, such as gagging or nausea when the child becomes anxious; overactive or impulsive behaviors (Anrup et al. 2002); or aggressive behaviors such as non-compliance with dental procedures.

On the other hand, some of the behavior may be due to factors relating to the child's perception of the dental office, or perhaps to a prior medical experience. These can be termed external factors. At the time of the first appointment or patient intake, if appropriate questions are asked, the child's history may reveal important external factors (see Chapter Six for questions).

From 1970 to 1985, there was great interest in behavioral science research in pediatric dentistry. The focus for much of this research was to assess external factors to determine which ones influenced children's behaviors. Unfortunately, this type of research is less popular today and much information is gleaned from older studies. However, a wide variety of variables were identified that still can be useful. Some of these include the following.

Medical History

The quality of past medical visits were found to be important. If they were unpleasant, this could have a bearing on a child's attitude toward future dental visits. Pain from previous procedures is often reported by a parent and, although it may be inaccurate, this aspect of the medical history ranks high on possible sources of misbehavior. Other aspects of the medical history, such as frequency of medical visits or even hospitalization, have not been found to be consistently related (Wright 1975; Bailey et al. 1973).

Maternal Anxiety

Historically, using an anxiety scale to assess maternal anxiety, it was found that an anxious mother has a greater likelihood of having a child that will be uncooperative in the dental environment. This variable was studied in depth in the 1970s and repeatedly found to be significant (Wright et al. 1973). However, family environments have changed with increased single parenthood, blended families, and same sex marriages. Mothers do not always accompany their children to dentists. Sometimes fathers, both parents, or caregivers bring children to the dentist. Further study of this variable is a fertile area for future research.

Need for Treatment

If a child is aware that a dental problem exists, there is a greater likelihood that anxiety will be heightened (Wright and Alpern 1971). This variable has received current attention from Yang and colleagues (2011). Examining 195 children three to seven years of age, they found a significant correlation between children with dental caries and uncooperative behavior. One advantage of The Dental Home concept (see Chapter Five) is that children usually do not arrive at the dental office in need of treatment.

Attempts have been made to relate other external factors that clinicians have suggested may have a bearing on children's behavior. While some of these factors have not been significantly related or withstood repeated testing, they cannot be completely discounted. It has to be remembered that research establishes relationships with large population samples, and dentists treat individuals.

When interpreting responses to questionnaires, the clinician should exercise caution. Evaluating external factors in relation to a child's behavior as a cause-and-effect relationship can be misleading. While there is undoubtedly some interaction between factors, no clear agreement exists on the relative importance of factors in relation to one another. Few studies have offered information concerning these relationships.

Once there is an understanding of the underlying factors that can influence a child's behavior, a treatment plan can be developed. Some child patients might need extra time in preparing them for what is to come, especially those with chronic fears and anxieties. Patients with aggressive behaviors may need expectations clearly explained and a highly structured approach throughout their dental visits. Understanding the child's needs in treatment planning should enhance the possibility of a successful outcome.

Summary

Advances in clinical practice are developed by building small portions of information on existing knowledge. Nowhere is this more evident than in this chapter, for it illustrates how clinical observations can lead to objective investigations, which ultimately have implications for dental practice. The chapter highlighted three topics related to children's behavior in dentistry: (l) classification procedures, (2) forms of behavior, and (3) the importance of learning about underlying factors influencing children's cooperative behavior.

Some dentists are intuitive and "get along" with children. All dentists can recall fellow students who coped extremely well with their patients without any theoretical study of children's behavior. Others are less fortunate. They require information to a greater degree. Regardless of individual successes with children, all clinicians should strive to maximize a positive effect on child patients. There are many ways of achieving this effect. Learning about the dynamics of child behavior is one of these ways.

References

AAPD (American Academy of Paediatric Dentistry). (2008). Clinical Affairs Committee, Guideline on behavior Guidance for the paediatric dental patient. *Pediatric Dentistry*, 29, 115–124.

Aartman, I.H.A. va et al. (1998). Self-report measurements of dental anxiety and fear in children: a critical assessment. *ASDC Journal of Dentistry for Children*, 65, 252–258.

Achenbach, T.M. and Rescorla, L. A. (2001). Manual for the ASEBA School-Age Forms and Profiles. Burlington, VT: University of Vermont, Research Center for Children, Youth, and Families.

Addelston, H.K. (1959). Child patient training. *Fortnight Review. Chicago Dental Society*, 38, 7–9, 27–29.

Alwin, N., Murray, J.J., and Niven, N. (1994) The effect of children's dental anxiety on the behaviour of a dentist. *International Journal of Paediatric Dentistry*, 4, 19–24.

Arnrup, K. et al. (2002). Lack of cooperation in pediatric dentistry—the role of child personality characteristics. *Pediatric Dentistry*, 24, 119–128.

Bailey, P.M., Talbot, M., and Taylor, P.P. (1973). A comparison of maternal anxiety with anxiety levels manifested in the child patient. *ASDC Journal of Dentistry for Children*, 40, 253–258.

Bajric, E., Sedin, K., and Juric, H. (2011). Reliability and validity of the Dental Subscale of the Children's Fear Survey Schedule (CFSS-DS) in children in Bosnia and Herzegovina. *Bosnian Journal of Basic Medical Science*, 11, 214–218.

Chapman H.R and Kirby-Turner, N. (2002). Visual/verbal analogue scales: examples of brief assessment methods to aid management of child and adult patients in clinical practice. *British Dental Journal*, 193, 447–450.

Cuthbert, M.I. and Melamed, B.G. (1982). A screening device: children at risk for dental fears and management problems. *ASDC Journal of Dentistry for Children*, 49, 432–436.

Dunegan, K.M. et al. (1994). Evaluation of the Eyberg Child Behavior Inventory as a predictor of disruptive behaviour during an initial pediatric dental examination. *Journal of Clinical Pediatric Dentistry*, 18, 173–179.

Frankl, S.N., Shiere, F.R., and Fogels, H.R. (1962). Should the parent remain with the child in the dental operatory? *ASDC Journal of Dentistry for Children*, 29, 150–155.

Gustafsson, A. et al. (2010). Dental behaviour management problems: the role of child personal characteristics. *International Journal of Paediatric Dentistry*, 20, 242–253.

Houpt, M. Project USAP the use of sedative agents in pediatric dentistry (1993). 1991 update. *Pediatric Dentistry*, 15, 36–40.

Klaassen, M.A. et al. (2002). Stressful situations for toddlers: indications for dental anxiety? *ASDC Journal of Dentistry for Children*, 69, 297–305.

Klingberg, G. (2008). Dental anxiety and behaviour management problems in paediatric dentistry: a review of background factors and diagnostics. *European Archives of Paediatric Dentistry*, 9, 11–15.

Krikken, J.B. et al. (2013). Measuring dental fear using the CFSS-DS. Do parents and children agree? *International Journal of Paediatric Dentistry*, 23, 94–99.

Lampshire, E.L. (1970). Control of pain and discomfort. In: Goldman, H. et al. (eds.): *Current Therapy in Dentistry*. Vol. IV, 489–525. C.V. Mosby Co., St. Louis.

Levitt, E.E. (1967). *The Psychology of Anxiety*. Bobbs-Merrill Co. Inc., Indianapolis.

McDonald, R.E. (1969). *Dentistry for the Child and Adolescent*. C. V. Mosby Co, St. Louis.

Milgrom, P. et al. (1995). Origins of childhood dental fear. *Behaviour Research and Therapy*, 33,313-319.

Nakai, Y. et al. (2005). The Children's Fear Survey Schedule—Dental Subscale in Japan. *Community Dentistry and Oral Epidemiology*, 33, 196–204.

Roberts, J.F. et al. (2010). Review: Behaviour Management Techniques in Paediatric Dentistry. *European Archives of Paediatric Dentistry*, 11, 166–174.

Rud, B. and Kisling, E. (1973) The influence of mental development on children's acceptance of dental treatment. *Scandinavian Journal of Dental Research*, 81, 343–352.

Ruebush, B.K. (1963) Anxiety. In: Stevenson, H.W., Kagan, J., and Spikes, C. (eds.). *Child Psychology*. The 62nd Year Book of the National Society for the Study of Education. University of Chicago Press, Chicago.

Sands, R.A. (1933). The mental aspect of pedodontics. *Dental Items of Interest*, 5, 927–929.

Singh, P. et al. (2010). Reliability and factor analysis of children's fear survey schedule—dental subscale in Indian subjects. *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 28, 151–155.

Spielberger, C.D. (1973). Manual for the State–Trait Anxiety Inventory for Children. *Consulting Psychologists Press*. Palo Alto, CA.

ten Berge, M. (2001). Dental fear in children: prevalence, aetiology and risk factors. PhD Thesis, *University of Amsterdam, The Netherlands*.

ten Berge, M., Veerkamp, J.S., Hoogstraten, J. et al. (2002). Childhood dental fear in the Netherlands: prevalence and normative data. *Community Dentistry and Oral Epidemiology*, 30, 101–107.

Veerkamp, J.S.J. et al. (1995). Dentists rating of child patient dental anxiety. *Community Dentistry and Oral Epidemiology*, 23, 356–359.

Veerkamp, J.S.J. et al. (1995b). Anxiety reduction using nitrous oxide: a permanent solution? *ASDC Journal of Dentistry for Children*, 62, 44–48.

Venham, L., Bengston, D., and Cipes, M. (1977). Children's response to sequential dental visits. *Journal of Dental Research*, 56, 454–459.

Venham, L.L. and Gaulin-Kremer, E. (1979) A self-report measure of situational anxiety for young children. *Pediatric Dentistry*, 1, 91–96.

Wong, D.L. and Baker, C.M. (1988). Pain in children: comparison of assessment scales. Pediatric Nursing, 14, 9–17.

Wilson, C.W. (1933). Child Management. *Journal of the American Dental Association*, 20, 890–892.

Wright, G.Z. and Alpern, G.D. (1971). Variables influencing children's cooperative behavior at the first dental visit. *ASDC Journal of Dentistry for Children*, 38, 126–131.

Wright, G.Z., Alpern, G.D. and Leake, J.L. (1973). A cross-validation of the variables affecting children's cooperative behavior. Journal of the Canadian Dental Association, 39, 268–273.

Wright, G.Z. (1975). *Behavior Management in Dentistry for Children*, Chapter Three, W.B. Saunders Co., Philadelphia.

Yang, C., Zou, H., and Zou, J. (2011). Analysis of dental cooperative behaviors of the first-visit in children's clinic. *Hua Xi Kon Qiang Xue Za Zhi*, 5, 501–504.

Zadik, D. and Peretz, B. (2000). Management of the crying child during dental treatment. *ASDC Journal of Dentistry for Children*, 67, 55–58.

Chapter 4

Influence of the Family

Barbara Sheller

Introduction

The family is critical to a child's nurturing and development. A child's sense of self-worth develops from being cared for, loved, and valued. Along with meeting basic physical needs, families provide children with emotional support, socialization, coping methods, and other life skills. The purpose of this chapter is to review aspects of the relationship between children and their families, which may influence their ability to cooperate for dental treatment. Some parent and family factors which may be manipulated by the dental team are identified, and sample strategies are outlined to identify and shape key family factors to enhance child coping and cooperation. To provide the greatest value for the clinician, there is a summary of important learning concepts at the end of each section, translating theory and research into the clinical dental practice with children. Dentistry does not stand alone in its interest in promoting child coping and cooperation skills, or in its recognition that parents and family can affect a child's responses during a dental appointment. Thus, this chapter includes selected research from pediatric medicine, developmental psychology, and neuroscience to supplement the dental evidence base.

Families influence children's oral health of in daily life through eating behaviors and oral hygiene practices. Parents decide when their children should see a dentist, choose the office or clinic and dentist, arrange the visit, and often accompany their children to the appointments. Before stepping into the dental office, parents are invested in the quality of their child's dental experience.

Family Structure

A family is a network of interconnected relationships. Over the last several decades, social and cultural changes have expanded the concept of what comprises a family. Dental practices worldwide serve a multicultural population with a wide range of family structures. Family diversity includes, but is not limited to, parental status (married, divorced, separated, single, step, biological, adoptive, foster), along with differing racial, ethnic, linguistic, spiritual, religious, sexual, social, and inter-generational aspects. Parent age can vary widely—maternal age may extend from pre-teen into late middle age due to the availability of advanced fertility treatments and surrogacy, and there is no clear upper limit for paternal age. Family size and composition may range from a small and straightforward family of one parent and one child to a large and complex multi-generational, multi-parent, multi-child family with varying relationships among the children and to the parents. Important variations within these diverse family structures are parenting style, parenting behaviors and practices, communication style, roles of family members, use of time within the family, commitment to individual family members, type and quality of childcare, connection to the community, economic and social resources, and methods of responding to challenges of life (American Academy of Pediatrics Task Force on the Family 2003).

A child's well-being is closely linked to physical, emotional, and social health; social circumstances; and behavior of their parents. Children do best when raised by two caring, cooperative parents with adequate social and financial resources providing a secure, supportive, and nurturing environment. The family stress model proposed by Conger et al. (2000) recognizes that parents become emotionally depleted by financial hardships, health problems, marital discord, fatigue, employment difficulties, lack of social support, and other traumatic life events. Parental emotional distress can lead to family conflict, instability, and disrupted, poor-quality parenting.

In general, stressful events which occur early and/or result in long-lasting disruptions in a child's care and

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

nurturing lead to worse outcomes for children. However, no particular family structure makes poor outcomes for children inevitable (American Academy of Pediatrics 2003). Family risk factors such as a single parent household, a parent's ill health, or financial hardship adversely impact parents' attitudes and behaviors and reduce their ability to positively socialize, support, and guide their children during dental treatment. Family characteristics of 230 children and adolescents ages eight to nineteen years of age who were referred to pediatric dentistry specialists for behavior management problems were compared to 248 controls without behavior management issues. Striking differences in life and family situations were found between the groups. The uncooperative children more often lived in families with low socioeconomic status, had parents who were not living together, reported fewer leisure-time activities, performed poorly in social interactions, had personal professional support, and had received interventions by social agencies. The "burdensome life and family situation" was suggested as a factor explaining some of the patients' non-cooperation (Gustafsson et al. 2007).

Application in Dental Practice

The dentist has no control over a child's family situation, but knowledge of family circumstances contributes to optimal clinical decision-making. A constructive partnership between the dentist and the parent and/or key caregiver lays the foundation for a positive and satisfying child–dentist relationship over the child's lifetime.

The dentist should know who is most involved in the care and nourishment of the child, as well as the primary caretaker's oral health perspective and preferred style of interaction. Other information to consider includes: identity of family members living in the home, custody arrangements, child care setting and primary caregivers, family disruptions such as marital strain or divorce, severe illness of a family member, moving, refugee status, military deployment, social support, parent employment status, and financial security.

Understanding this information will guide the dentist's communication with parents and/or other key family members whose understanding and "buy in" is essential for promoting a child's positive attitude about healthy diet, oral hygiene behaviors, and cooperation for dental treatment. For families experiencing difficult circumstances (e.g., divorce, unemployment, moving to a new city, or death of a family member), the dentist can express appreciation for the effort that has been made to bring the child to the appointment, and should understand that recommendations for changes in diet or oral hygiene may not be actualized until the family situation improves.

Attachment

The bonding of an infant with a parent or other caregiver is one of the key developmental tasks of infancy (see attachment theory in Chapter Two). Infants become bonded, or attached, to caregivers with whom they have significant amounts of interaction. They develop a hierarchy of preferred attachment figures, having a most-preferred caregiver, a next most-preferred, etc. Infants have limitations in their capacity for attachments, and serious attachment disturbances have been reported among children raised in settings with large numbers of caregivers. Children who are institutionalized or maltreated may have no definite attachments to anyone (Zeanah and Fox 2004). Preferred attachments can develop at any time after infants reach a cognitive age of seven to nine months if the new caregivers have substantial involvement with the child. Young children adopted out of foster care or institutions form attachments to their new caregivers, but in some cases the quality of the attachment is compromised (O'Connor et al. 2000).

Researchers observing securely attached and insecurely attached children have found that those with secure attachments are more likely to engage with their environment in an active manner. Theoretically, successfully attached infants have learned to trust the outside world as a welcoming place and to trust adults. A secure parent-child attachment appears to prepare a child to be receptive to and cooperative with parental socialization influences (Kochanska 1995). Conversely, infants whose emotional needs have not been consistently or adequately met come to view the world as unpredictable and learn that adults are not to be relied upon. For poorly attached children, discipline is experienced as rejection and disapproval, and they overreact to the negative feelings caused by routine childhood rules and restraints. They are at risk for chronic anxiety or distrust, less able to cope with challenging or adverse life experiences, and are more likely to exhibit behaviors that result in adverse experiences (Bowlby 1982). Understandably, children with insecure attachments are more likely than securely attached children to feel threatened by new or stressful situations (McKernon et al. 2001).

Most research on attachment has focused on the child's bond to the mother. Recent investigations indicate the importance of the father-to-child bond. "Double-insecure" (insecure attachment to both parents) six to eight year old children had high levels of

behavior problems at school as rated by teachers and by the children themselves. A secure attachment with one parent offsets risk for poor behavior, but having a secure attachment with two parents did not confer additional benefit to the child (Kochanska and Kim 2013).

Application in clinical dental practice

The dentist should assess the child patient's social history regarding risk factors for disrupted attachment, such as: extended hospitalization during infancy or toddlerhood, early life in an orphanage with multiple caregivers, history of foster care—particularly with multiple foster home placements, adoption after infancy, history of physical abuse or neglect, or a parent with substance addiction or mental health issues. In the dental setting, a child disadvantaged by an insecure attachment may show extreme fear and reluctance (retreat from an unsafe and unpredictable world) or be defiant and uncooperative (battle against an unsafe and unpredictable world). Either response should elicit the compassion, patience, and understanding of the dentist and dental team. Time, consistency, and patience must be invested when working with an insecurely attached child, using positive and incremental efforts to form a relationship and earn the child's trust. A long-term perspective should be paramount when the dentist meets a child with a severe attachment disorder. An insecure attachment does not make poor psychosocial outcomes inevitable for a given child or adolescent; it is more useful to think of attachment quality as a risk factor or protective factor in a child's life experience. The advantage and psychological protection resulting from a secure attachment enhances a child's ability to listen, relate, and respond to the dentist, and then to cooperate during dental treatment. The young child will do best if introduced to the dental environment and dental team in the presence of their preferred attachment figure.

Genetic Contribution to Child and Parent Interactions

The answer to the question "Does behavior result from nature or nurture?" is now understood to be "both." Genes and interactions between genetic potentials and the environment (epigenetics) are both determinants of behavior. The structure and function of the developing brain is strongly influenced by social interactions in infancy and early childhood. While most existing research on socialization was completed with observational and behavioral methods, the discipline of social and cognitive neuroscience now has tools to study neural pathways within the brain. As this chapter is written in 2013, a working hypothesis is that recurrent, active, and long-term engagement in behavioral sequences (cultural tasks) shape and modify brain pathways. Connectivity and functions of different areas of the brain change as a result of experience in general, and particularly by repeated participation in specific cultural practices (Kitayma and Park 2010).

Mapping of the human genome has made it possible to study mechanisms of gene and environment interactions. These techniques are now being applied to the study of parenting and child behavior. For example, it has been found that children with certain serotonin transporter gene haplotypes show greater reactivity to both supportive and unsupportive parenting styles and practices (Sulik et al. 2012). The serotonin transporter gene variation could offer the child either an advantage in socialization if the parent messages are clear and constructive (high quality), or a disadvantage in socialization if the parent's socialization messages are unclear (low quality).

Further clarification of the contributions of genetics and epigenetics to understanding child development and human behavior is expected as refined scientific tools become more available and opportunities for this type of research explode. It is expected that mechanisms of interaction between all aspects of a child's family life and the developing brain will be clarified. For example, children genetically at risk for behavioral problems due to their serotonin transporter gene haplotype demonstrated low levels of self-control when they also formed insecure attachments to their mothers during infancy. This finding suggests that secure attachment in infancy may protect children who are genetically vulnerable to behavioral problems with self-control (Kochanksa et al. 2009).

Application in Clinical Dental Practice

Scientific knowledge of genetics, behavior, and the bi-directional influence of genetics on human behavior and human behavior on genetic expression is increasing rapidly. Today's partial picture of genetic influence on parent and child behavior will become clearer through research. In the near future, patient genetics may be more relevant to dental practice than is currently appreciated, and increased knowledge in this area is likely to influence some diagnostic and treatment decisions.

Family Influences on Child Behavior

The family serves as the child's connection to the world and has a critical role in preparing a child for life outside of the home. Socialization, the process by which an

individual learns and accepts the established ways of a particular social group or society, may be viewed as the "nurture of nature," whereby the family transmits cultural values, expectations, and behavioral standards to the child. The family is considered the major arena for social growth. Although socialization and re-socialization can occur throughout life, childhood is viewed as a uniquely malleable period when social skills, personality attributes, and values are established. Examples of socialization include learning to share toys, obey adult requests, and behave politely (Maccoby 1991). Socialization also can determine a child's response to dental treatment. It can influence behavior standards, attitude toward adult authority, how much discomfort justifies complaint, and how to express distress.

Parenting Styles

A viewpoint or philosophy toward the child is reflected by the parenting style. It creates the emotional climate and context in which parents' socialization behaviors occur. Parenting style classifications consider the balance between 1) parental warmth and affection, and 2) parental behavioral controls. The first version of a widely used parenting style typology was proposed by Baumrind in 1973. The degree of parent responsiveness (affection and attentive responsiveness to the child's needs) was considered with the level of parental control (demandingness for developmentally appropriate, pro-social, responsible behaviors) to classify an individual's parenting style as Authoritative, Authoritarian, or Permissive. Maccoby and Martin (1983) modified Baumrind's groupings, renaming "Permissive" as "Indulgent" and adding "Neglectful." Most research examining parenting styles and child behavior cited in this chapter employs the typology of Baumrind, as well as Maccoby and Martin. The four parenting styles and a brief description of their characteristics are: Authoritative (high responsiveness + high behavior control), Authoritarian (low responsiveness + high behavior control), Permissive (high responsiveness + low behavior control), and Neglectful (low responsiveness + low behavior control).

Parents with an Authoritative parenting style set up a collaborative home environment that is democratic, flexible, and supportive of the child, with guidelines aimed at enabling the child to become self-regulating. These parents may be warm and involved, yet still firm and consistent in establishing limits. Rules are not simply set in place, but are supported through age-appropriate rationales.

Authoritarian parents clearly take charge, may be more autocratic, rigid, and use punishment as needed to enforce a high degree of structure, expecting obedience from the child. Parents shape and control their children in accordance with a set of standards and rules. The rules are not to be discussed or arrived at by argument and interaction. On the contrary, rules are imposed upon the child as mandatory, and the child or adolescent is not consulted. Authoritarian parents discourage verbal give-and-take between parent and child.

Authoritarian and Authoritative parents share their high expectations for the child's self-control.

Parents with a Permissive parenting style indulge the child's wishes and agenda, placing the child in the power position with an appeasing, nondirective, lenient approach without clear rules or guidelines. They are considered more responsive than demanding. The Permissive parenting style has more negative than positive effects on the social outcome and is associated with aggressive, impulsive children lacking independence and a sense of responsibility.

Neglectful parents are less involved in their child's lives than parents within any of the other three categories. The passive, emotionally removed, lax, or indifferent attitude exhibited by neglectful parents leaves the child to negotiate the world without structure, assistance, rules, or guidelines. Indifferent parents tend to be cold and uninterested in the needs of their children and adolescents, reflecting a desire to keep them at a distance. They try to minimize time and interaction with their children. This type of parent is characterized as uninvolved, meaning that they have a low degree of commitment to their role as a parent. There is a risk of a child or adolescent being neglected by this type of parent. Both Permissive and Neglectful parents have low expectations for the child's self-control.

Parenting Practices

Parenting style is expressed through behaviors or "parenting practices." Parenting practices are mechanisms through which parents directly help their child attain socially valued outcomes such as development of a conscience, cooperation, compliance with societal rules, and academic success. Parenting practices include both specific goal-directed behaviors (time-out, physical punishments, shaming) and non-goal-directed behaviors (gestures, tone of voice, emotional expression) (Darling and Steinberg 1993). Children become accustomed to their own parent's practices and behaviors and develop the ability to read their parent's internal state. A typically developing child can accurately and rapidly perceive if her parent is pleased or displeased, comfortable or anxious, or calm or distressed by interpreting the parent's tone of voice and body language.

Cultural Influence on Parenting Style

Culture has a pervasive influence on family life, including the way in which parents socialize their children. Parenting styles and practices hold psychological and cultural meanings and vary between cultures. For example, parental harshness (hostile behavior and/or physical punishment) carries a message of care and concern within a culture valuing strict behavior controls and high expectations for children's behavior. However, in a less strict culture holding lower expectations for children's behavior, it carries a message of unsympathetic criticism (Ho et al. 2008). It was initially suggested that Authoritative parenting likely would result in good psychosocial outcomes for children from all ethnic and cultural groups. Some studies, however, have found better outcomes associated with the Authoritarian parenting style, depending on family context and culture (Deater-Deckard et al. 1996; Ho et al. 2008). No investigation in any culture has reported consistent positive social outcomes for children of any age with the Permissive or Neglectful parenting styles; this may be due to lack of rules and limits upon the child's conduct, which communicate which child behaviors are desired and expected and which actions are unacceptable.

The prevalence of parenting style types varies by culture. Sociologists and educators have noted an increase in the Permissive parenting type in many countries, including the United States (Long 2004). In traditional parenting models (Authoritarian, Authoritative), the adult determines, communicates, clarifies, and enforces rules for the child. In families with the Permissive parenting style, children question adult authority and a "the child should feel good" ethos permeates family life and parent decisions. Permissive parents are generally well-intentioned, want to be nice, and would like their children to be happy doing what they want to do. In some cases, the Permissive parent attempts to become a friend to their child, abrogating the traditional parental role of socialization.

The term "helicopter parent" is employed in the popular lexicon to describe a parent who is attentive, hovering, and available to rescue their child from the consequences of any poor decisions or actions (Cline and Fay 1990). Today's ever-present cell phones have made it inexpensive and simple for parents to stay connected to their child, even when physically separated. It is theorized that the extension of the usual time period of parent-child close connection may prolong the child and young adult's dependence upon parent and family resources.

The disparate cultural views of proper parenting style and practice between Western-European and Eastern-Asian cultures was illustrated for the public consciousness by Chua in the book *Battle Hymn of the Tiger Mother* (2011), which recounts the strict methods she used to promote the academic success of and mastery of musical instruments by her daughters. Chua's behavioral controls over her children, such as limiting access to the bathroom, requiring many daily hours of homework and musical instrument practice, forbidding television viewing, and emotional tactics of ridicule and shame, engendered extensive commentary supporting and criticizing this parenting style. Those embracing the predominantly Western philosophy that children are fragile and require protection and nourishment of their self-esteem called Chua's strict methods cruel and abusive. In contrast, those with a predominantly Eastern viewpoint assume that the child has inner strength and the parent's job is to override the child's preferences because "to enjoy anything you have to be good at it, to be good at it you have to work, and children on their own never wish to work" (Chua 2011).

Interactions between culture, parenting and child behavior are complex and challenging to thoroughly describe and study. Existing research is primarily cross-sectional with varying methodologies, focuses nearly exclusively on mothers, and heavily relies on subjective data such as parent reports on behavior practices, rather than on observation of parents' behavior (Paulussen-Hoogeboom et al. 2007). Parenting behaviors appropriate at a developmental stage and in a specific social context will predictably differ depending on a child's developmental stage. A simple example is crossing a street with traffic: parents carry or hold the hand of a young child (high behavioral control) but do not need to hold the hand of a school-age child who has mastered the social task of safely crossing the street (low behavioral control).

There is no single "best" parenting style universal to all children. It is believed that a child's internal state of fear, arousal, and anxiety is integral to their receptiveness to social learning; the best child outcomes appear to result when a parent's style is in harmony with the child's temperament. For example, gentle, low-power discipline has been found to create the optimal anxiety arousal for social learning for temperamentally fearful children. Negative, punitive, and other types of power-assertive parenting have been found to be detrimental for temperamentally fearful children with a low anxiety threshold. In contrast, for relatively fearless children, gentle parental discipline does not capture the child's attention. For low-fear children, high parental pressure results in child anger and disregard for parent messages. Preliminary evidence suggests that

reciprocal positive parent–child interactions are more effective in achieving social learning for children with low-fear temperaments (Kochanska et al. 2007).

Application in Dental Practice

Dentists should be aware of the parent's style of interacting with their child. To an experienced clinician, the parenting style may be obvious after a short observation of the parent and child. The less seasoned dentist may wish to include questions in the social history to indicate the parent's philosophy and style. Sample questions are presented in Table 4-1.

Children raised by Authoritative or Authoritarian parents who expect and demand appropriate, responsible behavior will understand that the dentist and staff members establish the rules and will guide them through a dental visit. These children have been socialized to follow the lead of adults. The dentist can expect that most Authoritative or Authoritarian parents will endorse and support the rules, structure, and behavior guidance that the dentist presents to the child.

Children raised by Permissive parents have been conditioned to view adults in a more egalitarian manner. They may expect the dentist and staff to offer them the same degree of choices and control that they are accustomed to in their home environment. Since a dental appointment is not a situation where the child should or can lead, the he may become unsettled, disappointed, or frustrated with a role of diminished power, and react negatively. Permissive parents may take offense at firm, clear structure provided for their child by the dentist and dental staff and advocate for their child's preferences to be accommodated. Recent research illustrating implications of parenting style on child cooperation during dental treatment is presented later in this chapter in the section "Parent influence on child cooperation in dental settings."

Coping Socialization

The term "coping socialization" is defined as the parental and familial factors that may affect children's coping. (Kliewer et al. 1996). Attaining maturity and acquiring social competence occurs as a child grows from toddlerhood through childhood, adolescence, and into adulthood. A typically developing toddler is easily frustrated, emotionally labile, and lacks the ability to shift her attention away from sources of stress and toward positive stimuli or thoughts; a socially competent adolescent has developed internal resources and strategies to meet the demands of life outside the home. In the child development, psychology, and medical literature, the term "coping" is used to describe the thoughts and behaviors that an individual uses to manage and respond to environmental or internal stresses and demands. An individual who is cooperative with dental treatment is exhibiting "coping behaviors." Coping behaviors allow a child to handle the demands of dental treatment and accept care.

Emotional Expression Within the Family

The family is most commonly the initial place for children to experience and learn to cope with negative emotions. The emotional climate of the family results, in part, from the way that parents express their own emotional feelings. Emotional expression is both verbal and nonverbal, and has been classified by Valiente et al. (2004) as positive (e.g. praising and demonstrating admiration), negative dominant (e.g., expressing anger and displaying threatening emotions) or negative submissive (e.g., sulking and/or crying). Multiple investigations have found that children of emotionally positive parents are happier, more socially competent, and have lower rates of behavior problems than those of parents with low expressions of positive emotions and/or high

Table 4-1. Parenting Style Questions.

1. Which best describes your family's style of making decisions?		
Parent in charge	Democracy–shared control	Child in charge
2. It is best to give children choices instead of telling them just what to do.		
Disagree	Neutral	Agree
3. When acting with love, you can never do too much for a child.		
Disagree	Neutral	Agree
4. My child interrupts my conversations often.		
Disagree	Neutral	Agree
5. I generally need to ask more than once to get my child to do something.		
Disagree	Neutral	Agree

A majority of answers in the left column indicates a parenting style with high behavioral controls. A majority of answers in the right column indicates a parenting style with low behavioral controls.

levels of negative emotional expression. Parental expression of anger, whether or not it is directed toward the child, is associated with: decreased amounts and quality of child play and exploration; child avoidance of the parent; increased periods of the child's negative emotions (e.g., sadness, fear, anger); and deterioration of child behavior (Teti and Cole 2011).

Children are strongly influenced by their parents' methods of emotional expression (Thompson 1994). The type and intensity of parent emotional expression provides a model for a child to imitate. Constructive, upbeat expressivity and support from the parents have been found to relate positively to children's constructive coping with daily stress. Mothers with negative dominant expressions have children with lower levels of constructive coping. Witnessing or being the target of hostile negative emotions is stressful at any age, and children have limited life experience and capacity to withstand, process, and cope with such stress. Evidence that children's constructive coping is positively related to parental supportive strategies is mounting. It is possible that parents who express emotion in positive ways are more likely to insist that children manage and control their emotions in socially appropriate ways in stressful situations and/or teach them constructive ways of coping (Valiente et al. 2004).

Parental responses to their children's emotions influence and teach children strategies for self-regulation. Effective parent responses have been found to be problem- and emotion-focused and express encouragement. Unhelpful parent behaviors include minimizing, punitive, and distressed responses to their children's emotions. High levels of family chaos have been found to be associated with lower levels of effective parent responses (Valiente et al. 2007).

The terms "emotional contagion" and "emotional attunement" describe the observation that a person's emotions are highly influenced by the emotions expressed by those around them, and there is a tendency for individuals in proximity to emotionally converge. Emotions are shared in multiple ways, subtly and overtly, verbally and non-verbally. Research using functional magnetic resonance imaging has found that observing another individual's emotions and facial expressions activates regions of the brain which 1) experience similar emotions and 2) produce facial muscle activation and mimicry (Morrison et al. 2004). A simple example is that when someone smiles at us, we reflexively smile back. Due to the negative bias of the human brain to detect potential threats, it is easier to become upset and distressed by someone else's negative emotional expression than it is to become happy and relaxed by someone else's joy and contentment. Emotional contagion theory explains how ambient mood states of both parties influence parent-child interactions. A child in a positive mood is more likely to comply with a mother's requests (Lay et al. 1989). A mother who is angry, even for reasons unrelated to her child, is more likely to believe that interactions with her child will be unpleasant and require a stern approach (Dix 1991).

Child Influence on the Parent

Children are not passive recipients of adult influence. The parent-child relationship is reciprocal, with each influencing the other's thoughts, feelings, and behavior. Parents and children develop a long history of interaction; each acquires a set of expectations concerning the other's behavior and establishes a method of interpreting the other's reactions. The relationship is unique in the asymmetry of knowledge, power, control, and physical strength, and the balance of power in the relationship changes as the child develops. Disruptive behavior in a toddler holds less consequence, risk to the child, and threat to the parent than disruptive behavior in a teenager. Parenting affects children's behavior most strongly during early childhood (Slagt et al. 2012) while problematic adolescent behavior strongly affects parenting (Reitz et al. 2006). Parental sense of competence is defined as a parent's opinion of her ability to positively influence the behavior and development of her child (Coleman and Karraker 1998).

Social relations theory views children as active agents in their interactions with parents and assumes that disagreements, conflicts and changes occur frequently. It is developmentally normal for children to resist some of the socialization demands of their parents (Goh and Kuczynski 2009). A parent's philosophy of parenting (style) and behaviors (parenting practices) will determine the degree of parent accommodation and submission to the natural resistance of the child. It has been observed that a child's status and power is higher in single-child homes. China introduced its One-Child Policy in 1979, resulting in a generation of children and young adults without siblings or cousins. Most of these solitary children are the focus of interest for six adults: two parents and four grandparents (Goh and Kuczynski 2009). Chinese parents and teachers have used the term *xiao huangdi*, meaning "little emperor," to describe pampered and entitled children who have inflated views of their own status and importance. Both teachers and employers have observed that many One-Child-Policy babies never learned how to cope with disappointment and frustration in ways that would best prepare them for life outside the home (Cameron et al. 2013).

Application in Clinical Dental Practice

The dentist and staff should continually monitor the ambient emotional tone in the office and quickly intervene in cases of negative emotional expression by parents. A parent who verbally or nonverbally expresses the stress of a bad day is not emotionally available to help his child and may unintentionally sabotage that child's dental appointment. If the dentist or staff member's sincere and respectful attempt to redirect the parent to the intended positive purpose of the dental appointment is unsuccessful, the parent should be offered the opportunity to reschedule at a time when they are more in control.

Sibling Influences

Throughout life, the sibling relationship may be cooperative, ambivalent, or antagonistic. The child grows and develops within a dynamic and variable family context across time. Multiple studies have confirmed that families differentially distribute such resources as parental time, attention, money, nurturance, and love among the children in a family. Parents tend to concentrate resources on some children and not on others. Parent resource inequity between siblings has been examined based on birth order, child gender, sibling gender, birth spacing, and birth intention (wanted versus unwanted pregnancy). Unintended children have been found to receive fewer parent resources than intended siblings (Barber and East 2009). Unwanted children are more likely to receive critical, punitive, abusive, and/or neglectful parenting (Barber et al. 1999). Inequitable treatment by parents has been found to have significant long-term negative effects on the adjustment and self-esteem of the slighted child. (McGuire et al. 1995; Volling and Elins, 1998).

The sibling relationship is known to be a key part of the developmental context of a child's socialization, yet the complex interactions between siblings are only partially understood. The birth or adoption of a brother or sister is a normal life event for many children. Freud and others have proposed that the changes in home environment, family composition, family function, and parental attention resulting from a new baby (or newly adopted child) cause a developmental crisis for many children. Some are extremely jealous, have behavioral regressions, or display tantrums or disruptive behaviors; other children display minimal behavioral changes. A review of studies considering firstborn children's reactions to the birth of a sibling found that the child's developmental level contributes to psychological adjustment during the transition to siblinghood. Skills newly acquired in the weeks and months immediately preceding a sibling's birth (e.g., toilet training, weaning from bottle) appear more vulnerable to regression than behaviors that are better established and part of the child's routine (Volling 2012).

Children in the same family do not experience identical environments. Common variations are the state of the parent relationship, parent-child temperament fit or misfit, family social and economic circumstances, and parent-child interactions. Sibling rivalry begins early. Twelve-month-old infants and young children are sensitive to maternal attention directed toward a newborn infant, sibling, or unfamiliar peer (Volling et al. 2002). Arrival of an infant has been found to adversely affect mother-to-older-sibling interactions with decreased maternal attention, positive affection, and attachment security, and often results in confrontations with the older child. It is theorized that increased behavior problems of the older child are mediated through changes in the mother-child relationship, particularly through increases in the mother's use of physical discipline (Volling 2005).

Application in Dental Practice

It is important for the dentist to recognize the disruption and stress caused by new sibling(s) in the home and to realize that the transition of a child to the role of "big brother or big sister" comes at the cost of diminished parental attention. The child patient may show signs of stress in their new role and behave in a negative way to capture their parent's attention. The goal should be to keep the focus and nurturing of the dental team directed toward the child patient, rather than on the newest family member and parent. The child patient can be invited to introduce his new sibling to the dentist or staff member. Examples of child-focused responses are: "It is nice to meet your new sister, but today, you are the special one!" and "This is a very lucky baby to have you for their own big brother!"

When the dentist is caring for children from a family with inequitable distribution of parent resources, the dental team can advocate for the less-favored child. The attention and nurturing of the team should be directed entirely toward the child patient. Comments such as "Parents with more than one child continually need to shift attention between them. Right now I'd like both of us to focus on (name of child), and decide together how we can (give compliment), (describe concern), (request resource allocation)" will nudge the parent's attention toward the more overlooked child. When the dentist is successful in proactively directing the parent's attention towards the habitually slighted child, the child patient will not need to escalate behavior during the appointment to capture and sustain their parent's interest.

Family Functioning Models

When treating a child, it is important to understand the family environment. Family systems researchers readily acknowledge the many limitations inherent in describing, quantifying, evaluating the network of relationships within any family. Family functioning models are the work of many and have evolved over time. One frequently used model of family functioning includes three common family profiles to classify the emotional and relational qualities of the family. This family functioning typology and child security outcomes as summarized by Davies et al. (2004) follows:

- *Cohesive family.* Warm, close, and harmonious family relationships. Discrete but flexible boundaries separate relationships and family members. Autonomy of family members is respected.
- *Enmeshed or chaotic family.* High levels of conflict and hostility. Discordant and/or weak boundaries within and across family relationships. Enmeshed family processes emotionally pull children into adult family problems.
- *Disengaged or separate family.* Emotionally cold relationships with high levels of adversity and low levels of support. Rigid boundaries between and within parent-co-parent and parent-child relationships.

Child security and psychological functioning have been examined in the context of family functioning by many investigators. Children in cohesive families exhibit high levels of attachment security, constructive coping, and psychological adjustment, and are thought to be at lower risk for psychological adjustment problems. In a one-year study of kindergarten-age children and their families, children from both enmeshed and disengaged families had decreased security and were at increased risk for psychological difficulties and maladjustment when compared to children from cohesive families (Davies et al. 2004).

Application in Clinical Dental Practice

The dentist should realize that children from dysfunctional families are unlikely to have experienced positive behavior models in the home, and are thus less likely to have developed and practiced methods of constructive coping. These children have increased risk for dental anxiety and poor cooperation with dental treatment. Positive, warm, and supportive habituation to the dental environment is a good practice for any child, but is disproportionately expected to benefit children from dysfunctional families.

Parent Influence on Child Coping and Cooperation in Medical Settings

Dentists have much to learn from parent-child research from colleagues in pediatric medicine. In pediatric medicine, patient- and family-centered care is based on the understanding that the family is the child's primary source of support and that their perspectives and information are important in clinical decision-making. Family inclusion has become the standard for pediatric medical practice for procedures ranging from venipuncture to anesthesia induction and cardiopulmonary resuscitation (American Academy of Pediatrics Policy Statement 2012). In recent decades, areas of research which have explored the influences exerted by the social environment on children undergoing painful medical treatment include: impact of parental presence versus absence, interviews with children regarding their preferences for help during stressful medical procedures, and efforts to assess the impact of adult behaviors on children's coping or distress reactions. Some of these findings can be applied to the dental situation. Separation of the child from the parent during a painful medical procedure is unacceptable to most parents, and most children indicate a preference for parents to be present (Gonzalez et al. 1989). Family presence during medical procedures decreases anxiety for both the child and the parents. When parents are prepared, they do not prolong the procedure or make the provider more anxious (Blesch and Fisher 1996; Wolfram and Turner, 1996; Powers and Rubenstein, 1999; Dingeman et al. 2007). In a systematic review by Piira et al. (2005), multiple studies confirmed that parents were more positive about treatment when they were with their child during invasive procedures. Blount and various coauthors have developed, revised, and created a shortened form of a Child-Adult Medical Procedure Interaction Scale (Blount et al. 1989, Blount et al. 1991, Blount et al. 2001). The CAMPIS scales include categories for both child and adult behaviors, and each participant is scored separately. The child's procedural distress and coping, and the various adults' behaviors that significantly influence the distress of children, are included in the CAMPIS measures. Adult actions or comments which improve child coping and cooperation are termed "Coping-Promoting" and adult actions or comments which worsen the child's coping and cooperation are termed "Distress-Promoting."

Research using the CAMPIS, CAMPIS-R(Revised), and CAMPIS-SF(Short Form) leads to the conclusion that the number of adult Distress Promoting behaviors exceeds the number of Coping Promoting behaviors, and that many of the most common parent behaviors are counterproductive

in helping the child to accept and cope with an uncomfortable medical procedure. Examples of Distress Promoting behaviors are:

- *Uninformative reassuring comments*: "I won't let them hurt you." "Don't worry."
- *Informative reassuring comments*: "You're almost done." "Just two more minutes."
- *Giving control to child*: "Do you want to put this mask on?" "Can we start now?"
- *Criticism*: "You are in a bad mood today." "Why can't you be like your sister?"
- *Apology*: "I'm sorry this is taking so long." "I wish they didn't have to hurt you."
- *Empathy*: "I know it hurts." "You must be getting tired."
- *Suggestions or demands to the healthcare provider*: "He does better when he knows what is going to happen." "When she gets upset, if you'll stop for a moment, she'll calm down."
- *Intimidation*: "I'm going to slap you." "You are seriously going to harm yourself."
- *Inappropriate or confusing comments*: "You can do anything but move." "He's going to try to not hurt you."

Investigations have repeatedly found that parents who displayed a high proportion of Distress Promoting behaviors had children who were more distressed, fearful, experienced more pain, and were less approaching, less cooperative, and harder to help (Blount et al. 2007, Chorney et al. 2009, Mahoney et al. 2010, Pedro et al. 2010).

Reassurance is a particularly common but unhelpful parental behavior during painful procedures, yet parents likely provide reassurance believing it will comfort their child. Children may perceive that their parents are fearful when they reassure. The facial expression, vocal tone, and verbal content of adult-to-child messages are influential but incompletely understood for children during these procedures. Reassurance may tell the child that the situation is concerning and may direct attention to unpleasant aspects of the procedure (Chorney et al. 2009, McMurtry et al. 2010). Four independent, randomized, controlled trials with differing methodologies have confirmed increased amounts of child distress associated with adult emotion-focused behaviors including reassurance, empathy, and empathic touch during painful stimuli ranging from injections, to cold-pressor, to abdominal pain (Chambers et al. 2002; Walker et al. 2006).

Children displaying a high proportion of coping behaviors have been found to be less distressed, less fearful, experience less pain, and be more approaching, cooperative, and easily helped. Child coping and cooperation is positively related with the proportion of parent Coping Promoting behaviors, although the association is much weaker than the relationship of parent Distress Promoting behaviors to a child's lack of coping. Examples of parent actions and comments found to be Coping Promoting are:

- *Non-procedural conversation with the child which redirects their attention to something pleasant*: Conversation about pets, toys, food, movies, television, friends. Conversation about the child's plans or desires. Familiar and well-loved stories.
- *Prompt or command for child to use a coping strategy*: "Use your deep breathing now." "Squeeze my hand as hard as you can."
- *Humor directed to engage the child and improve their mood*: Silly jokes, such as "What is gray, weighs two tons, and puts people to sleep? A Hypnopotamus!" Any statement that suggests outrageous ideas or emphasizes humorous aspects of a situation—although not at the child's expense. (See Chapter Six for further use of humor in the dental setting.)
- *Reframing and reinterpreting the situation, equipment and procedures*: Presenting procedures and equipment as something fun, positive, manageable and understandable. "Let's play the astronaut game" is an example of reframing presentation of an oxygen mask.

Parents' happy facial expressions and rising vocal tones were interpreted positively by children in one study (McMurtry et al. 2010). Giving parents training improves their effectiveness in helping their child to cope (Blount et al. 1994). Parent coaching is a component of the cognitive behavior therapy (CBT) package currently considered a "well-established treatment" to manage procedure-related pain in children and adolescents.

In summary, both parent's and healthcare provider's behaviors have been linked to children's levels of distress and coping during painful medical procedures. Providers may be able to directly affect parent's behavior by modeling desirable Coping Promoting interactions with the child. Adult behaviors which direct the child's attention to their emotions promote distress and poor coping; adult behaviors which distract the child have the opposite result. Distress of the child is more strongly correlated with parent's behavior than with the behavior of the healthcare provider. Coping by the child is more strongly influenced by the healthcare provider's behavior than by their parent's behavior. (Cohen et al. 2002; Chorney et al. 2009; Mahoney et al. 2010). Children are best supported during a painful procedure when both parents and providers use Coping Promoting strategies.

Box 4.1 How Can I Best Help My Child?

Tips for Parents of Dental Patients

Feelings shape our actions. Your child looks to you when deciding how to feel about a dental appointment. The advice included here is the result of more than 25 years of research on how parents can best help children cooperate for medical and dental treatments. Some of these ideas may surprise you. Thank you for your help in creating a great dental experience for your child.

Parent Actions and Comments that Help Children Cooperate:

1. Calm, relaxed, and upbeat parent attitude and body language. Happy facial expressions.
2. Positive stories or comments about your own dental experiences.
3. Showing no doubt that your child will enjoy the dental visit and make your proud.
4. Parent stays silent when dentist and staff is talking to the child and allows their child to answer questions from the dentist and staff.
5. Bringing something small that your child likes to the appointment (stuffed toy to hold, music and headphones).
6. Before- and after-appointment talk which directs the child's attention to something pleasant. (Talk about pets, toys, stories, food, movies, television, friends, child's plans or desires.)
7. Bring a joke or silly riddle to tell the dentist. (Laughing will relax everyone.)
8. Planning a small reward for your child after a successful appointment.
9. Take a picture of the smiling child after the appointment and send to the grandparents.

Parent Actions and Comments that Upset Children and Interfere with Cooperation:

1. Stressed, hurried, or anxious parent attitude or body language.
2. Negative or scary stories and comments about dental treatment or appointments.
3. Uninformative reassuring comments. ("Don't worry.")
4. Informative reassuring comments. ("You're almost done.")
5. Criticism. ("Why can't you be like your sister?")
6. Apology. ("I'm sorry this is taking so long.")
7. Empathy. ("You must be getting tired.")
8. Suggestions to the dentist. ("He does better when he knows what is going to happen.")
9. Intimidation. ("You are seriously going to harm yourself.")
10. Inappropriate or confusing comments. ("He's going to try to not hurt you.")

Application in Dental Practice

Not all strategies are readily transferred from a medical context into a dental context. For example, a child receiving dental restorations isolated with a rubber dam is not able to freely participate in a conversation with either their parent or the dentist. Box 4.1 summarizes information for parents about how to promote the coping and cooperation of their child during a dental appointment.

Parent Influence on Child Cooperation in Dental Settings

Dental research focusing on correlations between parent and family factors and child cooperation has included the topics of: parent dental anxiety, parent presence or absence in the operatory during appointments, influence of parenting styles on child dental anxiety and cooperation, parent behavior during the appointment, and parent satisfaction. There are few studies of parent and/or family characteristics and cooperation of children that meet the highest standards of scientific evidence, with randomized subject allocation, presence of a control group, inclusion of both mothers and fathers, use of standardized and validated measurement tools, and outcomes measured at multiple time points by blinded observers.

Parent Dental Anxiety

Fear of dentistry is common—an estimated 11 to 20% of the general adult population experiences severe dental anxiety. In contrast to reported increases in general anxiety, the prevalence of dental fear in adults remained stable in studies conducted in the United States between 1954 and 2000 (Smith and Heaton 2003). Child dental

anxiety is associated with the parent's own anxiety. Social learning theory predicts that siblings and other family members may create or feed dental anxiety via overt or subtle means. Negative attitudes toward dental care in the family are reportedly common reasons for developing dental fear. Some fearful adults report that their anxiety started in childhood, and in some instances the anxiety preceded their first dental visit (Berggren and Meynert 1984, Locker et al. 1991).

In theory, a parent with dental anxiety could avoid instilling dental fear in their child. The parent could be prepared with education about the safety and comfort of modern dentistry, and coached to consciously, continuously, and carefully monitor their emotional expressions and comments about dentistry. Methods for parental education are provided in the pre-appointment behavior modification section in Chapter Six. Ideally, actions of the dentally anxious parent would be ameliorated by the influences of another parent or family member without dental fear.

Parent Presence or Absence in the Dental Operatory

Family inclusion has become the standard in pediatric medicine, and dental surveys examining parent presence and absence during treatment reflect a similar cultural change in pediatric dentistry (Adair et al. 2004). A clear majority of parents, 66 to 97%, prefer to stay with their child during dental treatment, as reported by investigators in the United States, India, Ireland, Israel, and Saudi Arabia (Kamp 1992; Peretz and Zadik, 1998; Arathi and Ashwani, 1999; Crowely et al. 2005). A large study of fathers and mothers in Saudi Arabia found that parents most strongly wanted to be present in situations where their child expressed fear prior to the dental visit (Abushal and Adenubi 2009).

Advantages associated with parent presence in the operatory have been reported for the child, parent, and dentist. The proximity of a parent apparently offers the child increased emotional security and support. Parents report higher satisfaction and peace of mind that they are protecting and supporting their child, and are presumed to benefit from hearing the dental health messages given to their children by caring dental providers. The dentist may benefit from improved cooperation from the emotionally supported child and ability to build a trusting relationship with the parent as they provide care to the child (Venham et al. 1978; Wright et al. 1983; Pinkham, 1991; Marcum et al. 1995; Feigal, 2001; American Academy of Pediatric Dentistry, 2012).

Disadvantages of parental presence in the operatory have also been reported. Most problems are created due to division of attention. The child's attention is split between parent and dentist and they may not know which adult to listen to. No investigator has found that a parent's repetition of a dentist's instructions improves child cooperation. When the parent contradicts the dentist, the child will become confused. Wright observed that parents who take an active and verbal role in the operatory disrupt the interaction between the child and the dentist, increasing potential for more child noncooperation (1983). The dentist may become distracted or annoyed by a talkative parent, feeling compelled to simultaneously attend to child behaviors and parent concerns and behaviors while performing a procedure. If the parent has high dental anxiety, being in the dental operatory can amplify their negative emotions, which are then transmitted to the child. Fearful parents may directly interfere with dental treatment of their child by interrupting treatment, questioning the dentist's techniques, or relating their own negative experiences. Klingberg et al. (2009) observed that an anxious parent serves as a live and powerful negative model of dental anxiety to their child. Some dentists may be reluctant to use accepted behavior management techniques in the presence of a parent (Wright et al. 1983; Marcum et al. 1995; American Academy of Pediatric Dentistry, 2012).

A randomized, controlled trial examining the effect of parent presence in the operatory, patient age, and patient dental anxiety was conducted in a pediatric dentistry clinic in The Netherlands. Ninety patients, ages four to eight years, had a habituation dental appointment followed by a treatment session on another day. Dentists found that the child's behavior was significantly better during habituation appointments when parents were not present in the operatory. Parents and dentists agreed that dentally anxious children cooperated better during treatment when the parent was not present. Dentists in the study reported disadvantages when parents of anxious children were present in the operatory. Parental presence or absence did not significantly affect the child's perception of the treatment (Cox et al. 2011).

If a parent is to be in the operatory, it is important that she does not disrupt the relationship between the child and dentist or distract the dentist. An investigation in the United States evaluated parents' compliance with instructions to remain silent in the operatory while their four- to nine- year-old-children received restorative dentistry. Thirty-nine parents were randomized into two groups: written instruction only or written and verbal instruction. Most parents (82%) remained silent, and there were no significant associations found between the modality of the request to be silent and parent compliance. A few parents (10%) interrupted the appointment multiple times; in all of these cases the child had a history of previous dental restorations (Jain et al. 2013).

The American Academy of Pediatric Dentistry's Clinical Guideline: Behavior Guidance for the Pediatric Patient includes parent presence or absence in the operatory among the methods for establishing effective dentist–child communication. 239 parents of children ages one to fifteen completed surveys at the beginning and end of their children's appointments for preventive, restorative, oral surgery or orthodontic care. Parents who showed consistency in their desires to be either present or absent and their actual experience during the appointment were more satisfied and positive about their child's appointment than parents who showed inconsistency. As patients were younger, the desire of parents to remain with their children increased (Kim et al. 2012).

Kupietzky et al. (2013) introduced and validated a Parent Cooperation Scale (PCS) to categorize parent behaviors and assess a parent's ability to be a constructive, supportive influence on their child during dental treatment. The PCS is analogous to the Frankl scale for rating child behaviors, with four groups of parent behaviors:

- *PCS 1.* Definitely negative (refusal of treatment plan, suspicious of dentist, overprotective of child);
- *PCS 2.* Negative (some evidence of negative attitude, needs to see caries on radiographs, acts as liaison between patient and dentist);
- *PCS 3.* Positive (accepting of treatment plan, cautious behavior at times, reluctantly allows child to be alone with dentist);
- *PCS 4.* Definitely positive (trustful, expresses confidence in dentist, allows patient to be alone with dental staff).

A study of 244 children and parents found a significant association between parent PCS scores and the Frankl scores of their children. Parents with negative behavior were more likely to present with children who had negative dental behavior, and positive parents were more likely to have cooperative children.

In summary, a negative, distrustful, or intrusive parent is a disruptive influence in the dental operatory, even when the parent is well-intentioned. The child's awareness of and attunement to their parent's negative emotional state undermines their ability to listen, relate, and respond to the dentist positively. For each child-parent pair, the risk and benefit of parent presence during treatment should be considered, and a proactive decision should be made and respectfully explained to the parent.

Influence of Parenting Style

Pediatric dentists surveyed in 2001 perceived a change in American parenting styles during the last decades of the 20th century. Families shifted away from traditional family hierarchies with the parent in charge, moving toward a more permissive and democratic family style. In families with permissive parenting styles, child misbehavior does not necessarily result in negative consequences for the child. The dentists also reported increases in single-parent families, family mobility, and dual-income families. The vast majority of dentists believed that these family changes had resulted in somewhat or much worse child patient cooperation during dental treatment. Simultaneously with declining patient cooperation, parent expectations (e.g., no crying) for their child's dental appointments were often inflated and not achievable (Casamasimo and Wilson 2002).

An investigation of many variables relating to child cooperation for dental treatment found that parent-reported frequency of difficult child behaviors by three to twelve-year-olds outside the dental setting did not predict the child's disruptiveness during treatment. Young patient age was the best predictor of uncooperative behavior. Uncooperative behavior during the dental appointment also correlated with parents who set few limits and were relaxed and supportive of their child (Allen et al. 2003).

A study of the relationships between parenting style, parent behavior during the appointment, child cooperation with dental treatment, and behavior management techniques used by the dentist was reported by Aminabadi and Farahani (2007). Seventy-two children ages four to six and their parents were videotaped while the child received an inferior alveolar block and amalgam restoration of a mandibular molar. Parent style was classified by using typology of Baumrind, as well as Maccoby and Martin, which was described earlier in this chapter.

Parents with an Authoritative style (high warmth and firm behavior controls) primarily observed the treatment (69%) and also rewarded, verbally encouraged, and explained. Most of their children (81%) expressed no discomfort during treatment, while others (19%) showed mild discomfort.

Parents with a Permissive style (high warmth and low behavior controls) exhibited vastly different behaviors: 74% had physical contact with their child, 70% stopped treatment at least once, 50% questioned the efficacy of the local anesthesia, and only 7% observed without participating further. All children were uncomfortable during treatment, with 44% expressing moderate discomfort and 56% expressing severe discomfort.

Fewer parents had an Authoritarian style (low warmth and high behavior control), and 100% of these took physical control of their child "with firmness and displeasure." All children of Authoritarian parents were uncomfortable; 38% showed moderate discomfort and 62% showed severe discomfort.

There were no parents with the Neglectful style (low warmth and low behavior control) in the study.

This study provides support for the view that parent behaviors which distract the child from the dentist or undermine the authority of the dentist are destructive to the dentist-child relationship. It provides additional support for the concept of the parent's role as a "silent observer" when in the dental operatory with their child.

One hundred children ages four to twelve who were referred to a specialized pediatric dentistry clinic in the Netherlands due to uncooperative behavior were analyzed with their parents for the relationship between child dental anxiety, level of cooperation for treatment, and their parents' style of parenting. Pre-treatment parent expectations of the dentist's effectiveness in managing their child's behavior significantly differed by parenting style. Authoritarian parents more strongly expected that their child's behavior could be managed by the dentist; Permissive and Neglectful parents had less confidence in the dentist. In this study, parents were not present in the dental operatory during treatment. Parenting style was not found to be related to the child's pre-treatment dental anxiety or to the child's cooperation during the treatment. Highly anxious children were more disruptive than less anxious children. Parents showed more confidence in the child-dentist relationship after the completion of their child's dental treatment and expressed a lower need to accompany their child into the dental operatory (Krikken and Verrkamp 2008).

A survey of parents of four- to twelve- year-old children examined association between child dental anxiety and parenting style. Parenting style was categorized for 331 parents of children referred to specialty pediatric dentistry clinics due to non-cooperation and for 120 parents whose children had not been referred. Child age and child dental anxiety were also examined. Parenting style did not correlate to a child's referred versus non-referred status. No correlation was found between children's dental anxiety and their parents' styles of parenting. Referred children were significantly younger than non-referred children, and had significantly more dental anxiety (Krikken et al. 2012).

Parent Prediction of Child Cooperation

A parent's ability to predict her child's cooperation for dental treatment is of interest. A study of 273 three-year-old children found that parents were accurate in predicting a negative reaction from their child to introductory dental procedures such as sitting in the dental chair and allowing the explorer against the fingernail and a tooth. The child's anxiety when meeting new people also predicted cooperation (Holst et al. 1993).

Application in Dental Practice

Most dentists learn about the child from the parent, but less frequently do they ask parents to predict how well the child will cooperate for treatment. Parents will readily share information about their personal dental attitudes, parenting styles, and desires to be present or absent during their children's treatment if they are asked about these factors in a private, thoughtful, and respectful conversation with the dentist.

Dentist and Parent Communication

Over the past several decades, the nature of health care delivery has shifted from a paternalistic, "doctor is the authority" model to a more egalitarian model where patients and families expect to participate in treatment decisions and health care delivery. The health and welfare of the child should be the primary focus for both parent and dentist. The role of the dentist is to provide parents with the risk and benefit information needed to make an informed decision and to correct any misinformation the parent may have. The role of the parent is to receive and process this information and make a choice for the child. Dentists may need to accept decisions they disagree with if those decisions are not likely to be harmful to the child (Diekema 2005).

The dentist should listen attentively and respectfully to the parent's concerns, recognizing that parents may not use the same decision criteria as the dentist. One dentist will not be an ideal match for every child and family. When distrust develops or significant differences in philosophy of care exist, the child and family should be directed to another dentist and/or clinic.

Wright and Stigers (2011) suggest incorporating a "functional inquiry" about child behaviors into the initial patient health history. Brief questions about the child's past cooperation in the medical setting, the child's perception of his dental health or dental problem, the parent's own dental anxiety, and the parent's prediction of child cooperation for dental care will guide the dentist toward understanding both the child and her parent. Knowledge of the child and parental concerns allows the dentist to more accurately predict a child's ability to cooperate. The functional inquiry is discussed in greater detail in Chapter Six.

It is natural for dentists and parents to take their cues from each other as they interact with the child during a dental appointment. Therefore, even brief interventions which prepare the parent to support their child without disrupting the child–dentist relationship may be beneficial. Educational materials for parents and families explaining the different types of coping strategies with

brief examples can be posted on the office website and made available in the office. Box 4.1 offers helpful hints for parents.

Summary

Families establish styles of interacting between family members and with the world outside the family long before reaching a dental office. Social circumstances and family patterns of behavior may prepare a child to be more or less accepting of dental treatment. The dentist should mindfully assess the dynamics between new patients and their parents or caregivers before deciding how best to guide them through the dental appointment. Early attention to a family's situation, style, and preferences will allow the dentist to gain the trust of the parent and earn the opportunity to form a positive, long-term relationship with the child.

Acknowledgment

The author thanks Dr. Bryan J. Williams, whose advice helped translate research and theory into clinical dental practice.

References

Abushal, M. and Adenubi, J.O. (2009). Attitudes of Saudi parents toward separation from their children during dental treatment. *Saudi Dental Journal*, 21, 63–67.

Adair, S.M. et al. (2004). A survey of members of the American Academy of Pediatric Dentistry on their use of behavior management techniques. *Pediatric Dentistry*, 26, 159–166.

Allen, K.D., Hutfless, S., Larzelere, R. (2003). Evaluation of two predictors of child disruptive behavior during restorative dental treatment. *Journal of Dentistry for Children*, 70, 221–225.

American Academy of Pediatric Dentistry. (2012). Clinical Guidelines. Guideline on behavior guidance for the pediatric dental patient. *Pediatric Dentistry*, 34, 170–182.

American Academy of Pediatrics. (2003) Family Pediatrics: Report of the Task Force on the Family. *Pediatrics*, 111, 1541–1571.

American Academy of Pediatrics. (2012) Policy Statement. Patient- and Family-Centered Care and the Pediatrician's Role. *Pediatrics*, 129, 394–404.

Aminabadi, N.A., Farahani, R.M. (2008). Correlation of parenting style and pediatric behavior guidance strategies in the dental setting: preliminary findings. *Acta Odontologica Scandinavica*, 66, 99–104.

Arathi, R., Ashwani, R. (1999) Parental presence in the dental operatory—Parent's point of view. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 17, 150–155.

Barber, J.S., Axinn, W.G., Thornton, A. (1999). Unwanted childbearing, health, and mother-child relationships. *Journal of Health and Social Behavior*, 40, 231–257.

Barber, J.S., East, P.L. (2009). Home and parenting resources available to siblings depending on their birth intention status. *Child Development*, 80, 921–939.

Baumrind, D. (1973). The development of instrumental competence through socialization. In A.D. Pick (Ed) *Minnesota Symposium on Child Psychology* (Vol. 7, 3–46). Minneapolis: University of Minnesota Press.

Berggren, U., Meynert, G. (1984). Dental fear and avoidance: causes, symptoms, and consequences. *Journal of the American Dental Association*, 109, 247–251.

Blesch, P., Fisher, M.L. (1996) The impact of parental presence on parental anxiety and satisfaction. *Association of Operating Room Nurses. AORN Journal*, 63, 761–768.

Blount, R.L. et al. (2001) The Child-adult medical procedure interaction scale-short form (CAMPIS-SF): Validation of a rating scale for children's and adults' behaviors during painful medical procedures. *Journal of Pain and Symptom Management*, 22, 591–599.

Blount, R.L. et al. (1989). The relationship between adults' behavior and child coping and distress during BMA/LP procedures: A sequential analysis. *Behavior Therapy*, 20, 585–601.

Blount, R.L. et al. (1991). Differences between high and low coping children and between parent and staff behaviors during painful medical procedures. *Journal of Pediatric Psychology*, 16, 795–809.

Blount, R.L. et al. (2007). Evidence-based assessment of coping and stress in pediatric psychology. *Journal of Pediatric Psychology*, 33, 1021–1045.

Bowlby, J. (1982). Attachment and loss: retrospect and prospect. *American Journal of Orthopsychiatry.* 52, 664–678.

Cameron, L. (2013). Little emperors: behavioral impacts of China's One-Child Policy. *Science*, 339, 953–957.

Casamasimo, P.S. and Wilson, S. (2002). Effects of changing US parenting styles on dental practice: perception of diplomates of the American Board of Pediatric Dentistry. *Pediatric Dentistry*, 24, 18–22.

Chambers, C.T., Craig, K.D., Bennett, S.M. (2002). The impact of maternal behavior on children's pain experiences: an experimental analysis. *Journal of Pediatric Psychology*, 27, 293–301.

Chorney, J.M. et al. (2009). Healthcare provider and parent behavior and children's coping and distress at anesthesia induction. *Anesthesiology*, 111, 1290–1296.

Chua, A. (2011). Battle Hymn of the Tiger Mother. Penguin.

Cline, F.W. and Fay, J. (1990). Parenting with Love and Logic: Teaching Children Responsibility. Pinon Press. 23–25.

Cohen, L.L. et al. (2002). A child-focused intervention for coping with procedural pain: Are parent and nurse coaches necessary? *Journal of Pediatric Psychology*, 27, 747–757.

Coleman, P.K. and Karraker, K.H. (1998). Self-efficacy and parenting quality: findings and future applications. *Developmental Review*, 18, 47–85.

Conger, K.J., Rueter, M.A., Conger, R.D. (2000). The role of economic pressure in the lives of parents and their adolescents: the family stress model. In: Crockett L.,J., Silberesisen, R.J., eds. *Negotiating Adolescence in Times of Social Change*. Cambridge, England: Cambridge University Press, 201–233.

Cox, I.C.J., Krikken, J.B., Veerkamp, J.S.J. (2011). Influence of parental presence on the child's perception of, and behaviour, during dental treatment. *European Archives of Paediatric Dentistry.* 12, 200–204.

Crowley, E. et al. (2005). Parents' preference as to whether they would like to accompany their child when receiving dental treatment—results from a national survey. *Journal of the Irish Dental Association*, 51, 23–24.

Darling, N. and Steinberg, L. (1993). Parenting style as context: An integrative model. *Psychological Bulletin*, 113, 487–496.

Davies, P.T., Cummings, E.M., Winter, M.A. (2004). Pathways between profiles of family functioning, child security in the interparental subsystem, and child psychological problems. *Development and Psychopathology*, 16, 525–550.

Deater-Deckard et al. (1996). Physical discipline among African American and European American mothers: Links to children's externalizing behaviors. *Developmental Psychology*, 32, 1065–1072.

Diekema, D.S. (2005). Responding to parental refusals of immunization of children. *Pediatrics*, 115, 1428–1431.

Dingeman, R.S. et al. (2007). Parent presence during complex invasive procedures and cardiopulmonary resuscitation: a systematic review of the literature. *Pediatrics*, 120, 842–854.

Dix, T. (1991). The affective organization of parenting: Adaptive and maladaptive processes. *Psychological Bulletin*, 110, 3–25.

Feigal, R.J. (2001). Guiding and managing the child dental patient: a fresh look at old pedagogy. *Journal of Dental Education*, 65, 1369–1376.

Gilliom, M. et al. (2002). Anger regulation and in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. *Developmental Psychology*, 38, 222–235.

Goh, E.C.L. and Kuczynski, L. (2009). Agency and power of single children in multi-generational families in urban Xiamen, China. *Culture & Psychology*, 15, 506–534.

Gonzalez, J.C., Routh, D.K., Armstrong, F.D. (1993). Effects of maternal distraction versus reassurance on children's reactions to injection. *Journal of Pediatric Psychology*, 18, 593–604.

Gustafsson, A. et al. (2007). Psychosocial concomitants to dental fear and behavioural management problems. *International Journal of Paediatric Dentistry.* 17, 449–459.

Ho, D., Bluestein, D.N., Jenkins, J.M. (2008). Cultural differences in the relationship between parenting and children's behavior. *Developmental Psychology*, 44, 507–522.

Holst, A. et al. (1993). Prediction of behavior-management problems in 3 year old children. *Scandinavian Journal of Dental Research*, 101, 110–114.

Jain, D. et al. (2013). Parental compliance with instructions to remain silent in the dental operatory. *Pediatric Dentistry*, 35, 47–51.

Kamp, A.A. (1992). Parent child separation during dental care: a survey of parent's preference. *Pediatric Dentistry*, 14, 231–235.

Kim, J.S., Boynton, J.R., Inglehart, M.R. (2012). Parents' presence in the operatory during their child's dental visit: a person-environmental fit analysis of parents' responses. *Pediatric Dentistry*, 34, 407–413.

Kitayama, S., Park, J. (2010). Cultural neuroscience of the self: understanding the social grounding of the brain. *Social Cognitive and Affective Neuroscience*, 5, 111–129.

Kliewer, W., Fearnow, M.D., Miller, P.A. (1996). Coping socialization in middle childhood: Tests of maternal and paternal influences. *Child Development*, 67, 233–2357.

Klingberg, G. and Berggren, R. (1992). Dental problem behaviors in children of parents with severe dental fear. *Swedish Dental Journal*, 16, 27–32, 39.

Klingberg, G., Raadal, M., Arnup, K. (2009). Dental fear and behavior management problems. In: *Pediatric Dentistry: A Clinical Approach*, 2nd *Ed*. Koch, G., Poulsen, S. Eds. Blackwell Publishing Ltd. 32–43.

Kochanska, G. (1995). Children's temperament, mothers' discipline, and security of attachment: Multiple pathways to emerging internalization. *Child Development*, 66, 597–615.

Kochanska, G., Aksan, N., Joy, M.E. (2007). Children's fearfulness as a moderator of parenting in early socialization: two longitudinal studies. *Developmental Psychology*, 43, 222–237.

Kochanska, G., Kim, S. (2013). Early attachment organization with both parents and future behavior problems: from infancy to middle childhood. *Child Development*, 84, 283–296.

Kochanska, G., Philibert, R.A., Barry, R.A. (2009). Interplay of genes and early mother-child relationship in the development of self-regulation from toddler to preschool age. *Journal of Child Psychology and Psychiatry*, 5, 1331–1338.

Krikken, J.B. et al. (2012). Child dental anxiety, parental rearing style and referral status of children. *Community Dental Health.* 29, 89–92.

Krikken, J.B., Veerkamp, J.S.J. (2008). Child rearing styles, dental anxiety, and disruptive behavior; an exploratory study. *European Archives of Paediatric Dentistry*. 9 supplement 1, 23–28.

Kupietzky, A., Tal, E., Vargas, K.G. (2013). Parental cooperation scale in the pediatric dentistry setting: reliability and criteria. *Journal of Clinical Pediatric Dentistry*, 37, 157–161.

Lay, K., Waters, E., Park, K.A. (1989). Maternal responsiveness and child compliance: The role of mood as a mediator. *Child Development*, 60, 1405–1411.

Locker D., Liddell, A.M. (1991). Correlates of dental anxiety among older adults. *Journal of Dental Research*, 70, 198–203.

Long, N. (2004). The changing nature of parenting in America. Pediatric Dentistry, 26, 121–124.

Maccoby E.E. (1991). The role of parents in the socialization of children: An historical overview. *Developmental Psychology*, 28, 1006–1017.

Maccoby, E.E., Martin, J.A. (1983). Socialization in the context of the family: Parent-child interaction. In Mussen, P., Hetheringon, E.M. (Eds). *Handbook of Child Psychology, Volume IV: Socialization, personality, and social development*. 1–101. New York: Wiley, 4th Ed.

Mahoney, L., Ayers, S., Seddon, P. (2010). The association between parent's and healthcare professional's behavior and children's coping and distress during venipuncture. *Journal of Pediatric Psychology*, 35, 989–995.

Marcum, B.K., Turner, C., Courts, F.J. (1995). Pediatric dentists' attitudes regarding parental presence during dental procedures. *Pediatric Dentistry*, 17, 432–436.

Martin, S.R. et al. (2011). Changing healthcare provider's behavior during pediatric inductions with an empirically based intervention. *Anesthesiology*, 115, 18–27.

McGuire, S., Dunn, J., Polmin, R. (1995). Maternal differential treatment of siblings and children's behavioral problems: a longitudinal study. *Development and Psychopathology*, 7, 515–528.

McKernon, W.L. et al. (2001). Longitudinal study of observed and perceived family influences on problem-focused coping behaviors of preadolescents with spina bifida. *Journal of Pediatric Psychology*, 26, 41–54.

McMurtry, C.M. et al. (2010). When "don't worry" communicates fear: children's perceptions of parental reassurance and distraction during a painful medical procedure. *Pain*, 150, 52–58.

Morrison, I. et al. (2004). Vicarious responses to pain in anterior cingulate cortex: is empathy a multisensory issue? *Cognitive & Affective Behavioral Neuroscience*, 4, 270–278.

O'Connor, T.G., Rutter, M., and the English and Romanian Adoptees Study Team. (2000). Attachment disorder behavior following early severe deprivation: Extension and longitudinal follow-up. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 703–712.

Paulussen-Hoogeboom, M.C. et al. (2007). Child negative emotionality and parenting from infancy to preschool: A meta-analytic review. *Developmental Psychology*, 43, 438–453.

Pedro, H., Barros, L., Moleiro, C. (2010). Brief report: Parents and nurses' behaviors associated with child distress during routine immunization in a Portuguese population. *Journal of Pediatric Psychology*, 35, 602–610.

Peretz, B. and Zadik, D. (1998). Attitudes of parents toward their presence in the operatory during dental treatments to their children. *Journal of Clinical Pediatric Dentistry.* 23, 27–30.

Piira, T. et al. (2005). The role of parental presence in the context of children's medical procedures: A systematic review. *Child: Care, Health, and Development*, 31, 233–243.

Pinkham, J. (1991). An analysis of the phenomenon of increased parental participation during the child's dental experience. *Journal of Dentistry for Children*, 58, 458–63.

Powers, K.S. and Rubenstein, J.S. (1999). Family presence during invasive procedures in the pediatric intensive care unit. *Archives of Pediatrics and Adolescent Medicine*, 153, 955–958.

Powers, S.W. (1999). Empirically supported treatments in pediatric psychology: procedure-related pain. *Journal of Pediatric Psychology*, 24, 131–145

Reitz, E. et al. (2006). Longitudinal relations among parenting, best friends, and early adolescents problem behavior. *Journal of Early Adolescence*, 26, 272–295.

Repetti, R. L., Taylor, S. E., Saxbe, D. (2007). The influence of early socialization experiences on the development of biological systems. In: Grusec, J. and Hastings, P., editors. *Handbook of Socialization*. New York, NY: Guilford. 124–152.

Rodriguez, D.M. et al. (2012). Multimethod assessment of children's distress during noninvasive outpatient medical procedures: Child and parent attitudes and factors. *Journal of Pediatric Psychology*, 37, 557–566.

Roustit, C., Chaix, B., Chauvin, P. (2007). Family breakup and adolescents' psychosocial maladjustment: Public health implications of family disruptions. *Pediatrics*, 120, e984-e991.

Slagt, M. et al. (2012). Longitudinal associations between mothers' and fathers' sense of competence and children's externalizing problem: the mediating role of parenting. *Developmental Psychology*, 48, 1554–1562.

Smith, T.A. and Heaton, L.J. (2003). Fear of dental care. Are we making any progress? *Journal of the American Dental Association*, 134, 1101–1108.

Sulik, M.J. et al. (2012). Interactions between serotonin transport gene haplotypes and quality of mothers' parenting predict the development of children's noncompliance. *Developmental Psychology*, 48, 740–754.

Teti, D.M. and Cole, P.M. (2011). Parenting at risk: new perspectives, new approaches. *Journal of Family Psychology*, 25, 625–634.

Thompson, R.A. (1994). Emotion regulation: a theme in search of definition. *Monographs of the Society for Research in Child Development*, 59, 25–52.

Uman, L.S. et al. (2008). A systematic review of randomized controlled trials examining psychological interventions for needle-related procedural pain and distress in children and adolescents: An abbreviated Cochrane Review. *Journal of Pediatric Psychology*, 33, 842–854.

Valiente C. et al. (2004). The relations of parental expressivity and support to children's coping with daily stress. *Journal of Family Psychology*, 18, 97–106.

Valiente, C., Lemery-Chalfant, K., Reiser, M. (2007). Pathways to problem behaviors: Chaotic homes, parent and child effortful control, and parenting. *Social Development*, 16, 249–267.

van der Gaad, C., Minderaa, R.B., Keysers, C. (2007). Facial expressions: What the mirror neuron system can and cannot tell us. *Social Neuroscience*, 2, 179–222.

Venham, L., Bengstron, D., Cipes, M. (1978). Parent's presence and the child's response to dental stress. *Journal of Dentistry for Children*, 45, 213–217.

Versloot, J. and Craig, K.D. (2009). The communication of pain in paediatric dentistry. *European Archives of Paediatric Dentistry*, 10, 61–66.

Volling, B.L. (2005). The transition to siblinghood: a developmental ecological systems perspective and directions for future research. *Journal of Family Psychology*, 19, 542–549.

Volling, B.L. (2012). Family transitions following the birth of a sibling: An empirical review of changes in the firstborn's adjustment. *Psychological Bulletin* 138, 497–528.

Volling, B.L. and Elins, J.L. (1998). Family relationships and children's emotional adjustment as correlates of maternal and paternal differential treatment: a replication with toddler and preschool siblings. *Child Development*, 69, 1640–1656.

Volling, B.L., McElwain, N.L., Miller, A.L. (2002). Emotion regulation in context: the jealousy complex between young siblings and its relations with child and family characteristics. *Child Development*, 73, 581–600.

Walker, L. et al. (2006). Parent attention versus distraction: impact on symptom complaints by children with and without chronic functional abdominal pain. *Pain*, 122, 43–52.

Wolfram, R.W., Turner, E.D. (1996). Effects of parental presence during children's venipuncture. *Academic Emergency Medicine*, 3, 58–64.

Wright, G.Z. (1983). Parent-child separation. In: *Managing Children's Behavior in the Dental Office*. Wright, G.Z., Starkey, P.E., Gardner, D.E. Eds. CV Mosby Co. 57–74.

Wright, G.Z. and Stigers, J.I. (2011). Nonpharmacologic management of children's behaviors. In: *Dentistry for the Child and Adolescent*, 9th *Ed*. Dean, J.A., Avery, D.R., McDonald, R.E. Eds. Mosby. 27–40.

Zeanah, C.H., Fox, N.A. (2004). Temperament and attachment disorders. *Journal of Clinical Child and Adolescent Psychology*, 33, 32–41.

Additional Reading

Arnup, K. et al. (2002). Attitudes to dental care among parents of uncooperative vs. cooperative child dental patients. *European Journal of Oral Science*, 110, 75–82.

Bowlby, J. (1969). Attachment and loss. Volume 1: Attachment. Basic books.

Bowlby, J. (1972). Attachment and loss. Volume 2: Separation. Basic books.

Eisenberg, N., Smith, C.L., Spinrad, T.L. (2011). Effortful control. Relations with emotion regulation, adjustment, and socialization in childhood. In: *Handbook of self-regulation: research, theory, and applications*. 2nd *Ed*. Vohs, K.D., Baumeister, R.F. Eds. The Guildford Press. 263–283.

Ganiban, J.M. et al. (2011). Understanding child-based effects on parenting: Temperament as a moderator of genetic and environmental contributions to parenting. *Developmental Psychology*, 47, 676–692.

Rothbart, M.K. and Bates, J.E. (2006). Temperament. In: *Handbook of child psychology: Vol. 3. Social, emotional, and personality development 6th Ed*. Eisenberg, N., Damon, W. Eds. Wiley. 99–166.

Chapter 5

Establishing a Dental Home

Anna B. Fuks

Ari Kupietzky

The recognition of and treatment for Early Childhood Caries (ECC) has been a major concern for the dental profession. Indeed, concerns about the dental treatment directed toward infants were reported at the beginning of the twentieth century (Cunha et al. 2000), and surveys have shown that caries in primary teeth have increased for two- to five-year-olds (Dye 2007). To combat this form of early dental caries, pediatric dentists in the 1980s began recommending that dental examinations for children should commence at one year of age or earlier.

Education, a less costly alternative, also has been a focus in solving the ECC problem. One of the earliest centers for delivering an educational program was the Baby Clinic, established in 1986 at the Londrina State University in Brazil. The aim of the Baby Clinic was to provide education to parents and to maintain or re-establish a good oral health status, creating a positive attitude in parents and children toward dentistry (Cunha et al. 2000). Education for improving oral health starts very early, and lectures on prevention of oral diseases are included in prenatal delivery preparation courses for parents (Soderling et al. 2000; Casamassimo 2001). A similar model was introduced in the United States and termed the Dental Home. This relatively new concept, with its prevention potential, has been included in the Guidelines of the American Academy of Pediatric Dentistry (2010). Reports describing new programs indicate the profession's acceptance of this approach, and indeed, an entire book has been published recently on infant dentistry (Berg and Slayton 2009).

This chapter approaches the dental home from a different viewpoint—the patient management perspective. How can the dental home have an impact on future child dental behavior and the relationship between the pediatric dentist and parent? The chapter also presents the technical aspects of examining and managing a one-year-old child, the recommended age to establish a dental home. The management of a one-year-old presents the clinician with entirely different circumstances as compared to older children. Although there is only a year separating a one-year-old from a two-year-old child, there are great cognitive, physical, and dental differences (see Chapter Two).

All of the patient management techniques discussed in the preceding and following chapters have in common the need for effective communicative management. This leads to the conclusion that there is a need for a congenial relationship. Proper patient management and treatment can be achieved in a friendly, familiar environment. This concept has been labeled the "medical home" by our pediatric medical colleagues. The medical home concept was introduced by the American Academy of Pediatrics in 1967. At the time it was envisioned as a central source for all the medical information about a child. It focused primarily on those with special needs and in low socioeconomic groups, as underprivileged children were seeking basic medical treatment in hospital emergency rooms. In 1992 the concept was expanded and the medical home was defined as a strategy for delivering the family-centered, comprehensive, continuous, and coordinated care for all infants and children. In 2002, the organization further extended and operationalized the definition, including the requirement that each patient have an ongoing relationship with a personal physician trained to provide first contact and continuous, comprehensive care. The medical home is now applied to all children and suggests that a strategy be developed that ensures a familiar health care provider for each family. This concept argues for a place that does not change each year with the vagaries of the third-party payment system, governmental support, or practitioner market. The strategy worked: studies show that the medical home public health model allows appropriate care to be initiated more often in the primary care center than in the emergency room. Furthermore, it is associated with better preventive health, higher levels of disease management, and lower resource utilization and costs (Devries et al. 2012, Hearld and Alexander 2012).

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

The guideline on infant oral care was adopted by the American Academy of Pediatric Dentistry (AAPD) in 2001. In 2010, the AAPD reaffirmed its "Policy on the Dental Home," describing it as inclusive of all aspects of oral health that result from the interaction of the patient, parents, non-dental, and dental professionals. Also in 2010, the AAPD reaffirmed its definition of the term, calling it "the ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family-centered way. Establishment of a dental home begins by twelve months of age and includes referral to dental specialists when appropriate" (AAPD reference manual 2012). This concept supports a place where all families feel they will be welcomed for regular, comprehensive care and where they are understood and valued. Empirical evidence suggests great value to a long relationship with child patients as it allows additional learning and reframing of experiences after difficult procedures. This can only occur if the family has a comfortable relationship with the dental home. The present alternative is a system that leads to episodic and emergency care (Feigal 2001).

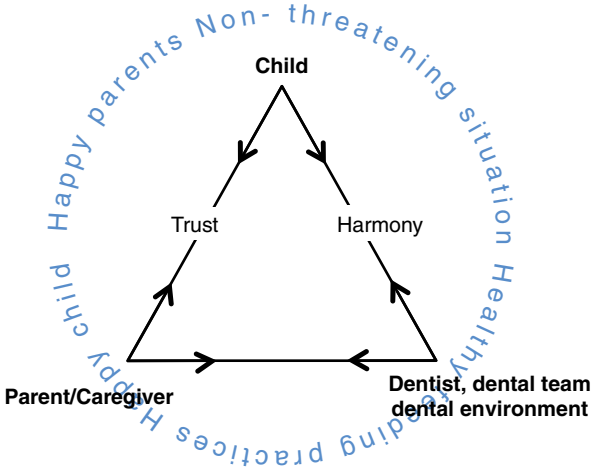

Figure 5-1. The pediatric dental triangle founded under ideal circumstances: during the establishment of a dental home at age one. Courtesy of Dr. Ari Kupietzky.

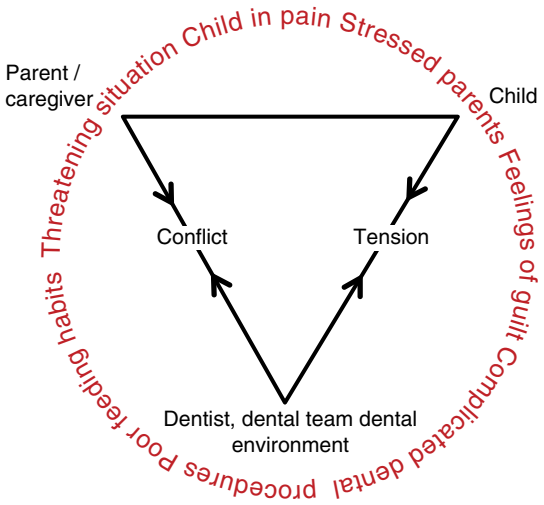

Figure 5-2. The pediatric dental triangle established under less-than-ideal circumstances: an emergency first-time dental visit. Courtesy of Dr. Ari Kupietzky.

In a familiar and welcoming environment, relationships can be made that ease the stress of health care for children. A dental home enhances the likelihood of establishing parental compliance with early and regular care. It is a cornerstone of prevention in dentistry, and it is much more likely to lead to better child acceptance of dental procedures.

A major goal of the dental home concept is the prevention of ECC. Although not yet substantiated by research, researchers and clinicians state that the benefits of the dental home are substantial and intuitive with an increasing emphasis on disease prevention and management, advancements in tailoring care to meet individual needs, and better health outcomes (Nowak and Casamassimo 2008). The benefits of the dental home include early dental attendance and preventive services, resulting in lower future treatment costs, and a decrease in more invasive, complex dental treatments (Doykos 1997, Savage et al. 2004). Untreated dental problems may lead to hospitalization and expose children to additional health risks associated with conscious sedation and general anesthesia (Newacheck et al. 2000). However, among the non-tangible advantages of this approach to dental care is the fact that a dental home established early in life may also reduce children's anxiety or fear of dental care. This is the reason for including this chapter in a book devoted to patient management. Again, the emphasis is on the prevention of disease.

With introspect one may conclude that establishing a dental home is simply the early foundation of a healthy, balanced, stable, and harmonious pediatric dental triangle (see Figure 5-1). The first year visit provides ideal conditions for development of the dentist-parent-child relationship. The child is free of pain and the accompanying parent is free of stress and anxiety. The healthy triangle has at its base the dentist and parent acting as a foundation for the apex of the triangle: the child. The dental team and parent are team members, on the same side of the triangle supporting the child through the dental experience. Conversely, when a two-year-old child appears at the dentist for the first time with ECC and possibly pain, the pediatric dental triangle is far from ideal (see Figure 5-2). Many parents are filled with

feelings of guilt when their child is diagnosed with ECC, often with anxiety and stress. As the dentist explains the cause of the disease and discusses the treatment options many parents take on the role of child protector. The dental team is then situated on one side of the triangle opposite the child and parent. The dental team, bearing the weight and balancing force of the unstable and fragile triangle is at a disadvantage. The early establishment of the dental home allows the avoidance of such an unfavorable start.

Case 5.1

Mrs. G. telephoned a pediatric dentist's office to make a first-time appointment for her thirteen-month-old daughter. The receptionist sensed much hesitation in the mother's voice. "My friend told me that I should bring Kayla in for an appointment. But when I asked my dentist at what age to start with my daughter's dental appointments, he told me not before four or five years old! I was wondering how the dentist would get Kayla to open her mouth. She gives us trouble when taking a bath and even I, as her mom, can't brush her teeth."

The receptionist reassured her that Dr. Ann and the entire staff have much experience dealing with young children, even younger than Kayla. She told Mrs. G. that a pediatric dentist is similar to a pediatrician and will be able to help Mrs. G and Kayla through the visit. Mrs. G made the appointment.

***Case 5.1, Discussion*:** The receptionist is the first contact with the dental office, and in this case needed to reassure the mother that bringing in her child for the one-year visit was the right thing to do. It is clear how important it is for Kayla to establish a dental home. Her mother mentioned on the phone that Kayla is not getting proper preventive dental care at home. She will need to be instructed on proper feeding habits, fluoride usage, and how to brush a young child's teeth. Her predicament and uncertainty about this visit is typical, especially if Kayla is her first child. Contradicting information regarding the proper timing for the first dental visit is widespread in the dental profession. Referral from a pediatrician or family doctor lends more credibility to the concept. Many general dentists give parents misinformation either out of ignorance or perhaps because they themselves cannot manage a very young child and therefore do not comprehend the validity of such an early dental visit. Having a website explaining much of the above helps alleviate parents' initial anxieties.

Although the dental home concept was introduced more than ten years ago, a 2011 survey of parent leaders confirmed that the majority of parents are not aware of it (Kagihara et al. 2011). The majority of respondents (84.8%) said parents do not know about the recommendation to establish a dental home for their child by twelve months of age. They elaborated on their answers with comments including the following:

- "I just learned this (age-1 dental visit concept) myself within the last week—and I'm supposedly in the loop."
- "Some families need to be informed. Other families tell us that they have attempted to get that oral health screening from their dentist at age one and have been turned away because the dentist did not follow this as the standard of care."
- "Many believe they can wait until either the child starts school or they lose their baby teeth."
- "No way! Age three is what we always heard!"
- "Yes, but if the child is chronically ill, other health issues often come first and many children who do not feed by mouth are often taken to the dentist later because of other health complications."
- "Not at all, as oral health care is not considered a priority in light of other medical diagnoses a child might have, and because most families don't think baby teeth are important."

Despite the AAPD's recommendation that all children have a dental visit following the eruption of the first tooth or no later than twelve months of age, changes within the dental profession have been slow. In 1997, approximately 73% of AAPD members surveyed agreed with the policy, but only 47% reported performing evaluations on children twelve months old or younger (Erickson and Thomas 1997). Many pediatric dentists had not accepted the AAPD Policy on the Dental Home, nor did they perform infant oral evaluations a decade after the initial policy statement.

Over the last decade, AAPD members' attitudes and practices have improved significantly. A recent survey of the AAPD membership on infant oral health care beliefs revealed that 91% agreed with the policy, and 90% performed infant oral evaluations in their practice (Bubna et al. 2012). But there still seems to be a lingering doubt about the value of the dental home and early care. When the question was posed to Academy members in a different way, a large dis-

crepancy was revealed in practitioners' beliefs in the AAPD policy. When asked at what age asymptomatic children should have their first oral health evaluation, only 47% of respondents said by twelve months. When practitioners were asked why they did not perform infant oral evaluations in their office, several reasons were noted. Surprisingly, the most common reason was that practitioners felt the "parents do not see the value of the infant oral evaluations." The second most commonly cited answer was that "existing conditions should dictate evaluation time."

Thus, it seems that one of the major difficulties in establishing early prevention is getting support within the profession. Most caregivers have not been counseled on proper infant oral health care and the various factors that contribute to dental disease. Many parents are unaware that the inappropriate use of a baby bottle could result in harm to their child's developing dentition. How, then, is early education to be dispensed to parents? One suggestion made by AAPD members is to educate pediatricians and primary care physicians about the value of early dental evaluations. The American Academy of Pediatrics (AAP) has a policy which recommends that pediatric health care professionals perform oral health risk assessments on all patients beginning at six months, and that patients who are at risk for developing dental caries enter an "aggressive anticipatory guidance and intervention program provided by a dentist between six and twelve months of age" (Hale 2003).

Another equally important suggestion made by AAPD members was to educate and train general dentists, as well as dental students and residents, about infant oral health care and the establishment of a dental home. Surveys in Iowa and Ohio have revealed that fewer than 15% of dentists believe in or perform infant oral examinations (Wolfe et al. 2006; Siegal and Marx 2002) and few general dentists examine children younger than three years old (Seale and Casamassimo 2003). Currently, undergraduate education in infant dentistry is lacking. The report of McWorter et al. (2001) on infant oral health education in U.S. dental school curricula found that the average didactic curricular time devoted to the topic of infant oral health is two hours and twenty minutes, and over half of the pre-doctoral programs provided no hands-on experience in infant oral health examinations. Since general dentists far outnumber pediatric dentists and ultimately examine the majority of our nation's children, the recommendation has great importance.

Case 5.2

Dr. Sue brought eighteen-month-old Joey and his mother into the operatory for the child's first dental examination. She seated the mother in the dental chair with the child lying backward on her. Dr. Sue was handed a mirror to examine the child's mouth and teeth and the assistant adjusted the dental light. Joey refused to open his mouth. When the dentist forcibly opened his mouth, Joey started crying. The mother became very upset and interrupted the procedure. She accused Dr. Sue of not being patient and not knowing how to deal with her child. "If you would have just explained to Joey why he needs to get his teeth checked he would not have cried. Joey understands everything. We never do anything to him without an explanation and his consent."

***Case 5.2, Discussion*:** The child was placed in "mommy wrap" position (in which the guardian lies on the chair and wraps her arms around the infant or toddler). While this position is commonly used with children by general practitioners, it is not the recommended position for examining toddlers. The mother lying back in the "mommy wrap" position may feel vulnerable and not in control. She cannot observe what is being done on her very young child and may assume the worst. In contrast, in the "knee to knee" position, the child is able to see the mother's face while she controls the child's movement. This is reassuring for both child and parent. In the former position, the child only sees the dentist and assistant and, of course, the overhead bright light.

The dentist did not start with initial counseling, anticipatory guidance, and preparation of the mother for realistic expectations for an eighteen-month-old child (see Table 5-1 for development milestones of a toddler). Comprehending the importance of a dental examination is usually beyond an eighteen-month-old's capacity. A first-time modern parent may have false expectations.

Toddlers should ideally be scheduled early in the day, avoiding nap time. A favorite toy or blanket may accompany the child. If possible, either through a written letter or on a website, parents should be advised not to communicate any of their fears to the child. They also could be informed on the procedure that generally takes place.

There are various positions to facilitate the toddler's examination. For example, the dental chair is raised

Table 5-1. A Child's Developmental Milestones—Twelve to Eighteen months.*

Cognitive Milestones	Language Milestones	Social/Emotional Milestones	Physical Milestones
• Identifies family members in photographs • Enjoys cause-and-effect relationship • Is able to make choices between clear alternatives • Begins to solve problems • Remembers more	• Has expressive vocabulary of four to ten words (by thirteen to fifteen months) • Has expressive vocabulary of ten to twenty words (by eighteen months) • Can listen and respond to simple directions	• Prefers to keep caregiver in sight while exploring environment • Demands personal attention • May reveal stubbornness • Unable to share • Responds to simple requests	• Picks up small objects with pointer finger and thumb • Can build a tower of cubes • Can throw a ball • Walks well • Turns pages in a book • Can walk while holding an object

*Based on ACT: Quality Professional Development for Childhood Care and Education Professionals, Department of Human Resources, http://www.acetonline.org/child_dev_milestone.pdf.

and adjusted to simulate a physician's examination table. The infant lies at the foot of the dental chair that is covered with a fresh towel or sheet. This position allows the dentist to peer directly into the child's mouth.

The most effective and comfortable position for the patient, parent, and dentist is the "knee to knee" position. Position the child in the seated adult caregiver's lap (Figures 5-3 to 5-6). Interact warmly with both the child and the caregiver. The dentist and parent sit opposite one another with knees touching. With the child facing the dentist, touch the child's hand. Tickle the arm. Speak gently and smile. During this "warming up" time, brief counseling may occur. Ask the parent to turn the child 180 degrees so that the toddler is now facing them. The infant is placed on the parent's lap, facing the parent, with the child's legs wrapping around the parent's waist. While the parent is holding the patient's hands, the child is laid back, resting the head in the dentist's lap. This position enables the child to see and feel the parent while the dentist performs the examination with minimal restraint. The position allows for excellent visualization of the oral cavity by both the parent and dentist.

Another option for the knee-to-knee exam is using a cushion device (Figure 5-7). A lap cushion device flexes with the baby, allowing the tilt-back to feel more secure. Some parents may prefer it over the infant lying directly on the dentist's lap. On the other hand, it might startle the child, introducing a new device which may make the exam more formal and threatening.

When approaching the very young patient (or any other patient, for that matter), begin with a digital examination. Because the young child often does not comprehend the procedures, the clinician starts slowly with an extraoral examination, gently rubbing the child's face and talking calmly. Vocal quality is important with all

Figure 5-3. Infant exam: Initial counseling and anticipatory guidance. Even if the child does not comprehend the language, a soothing voice helps to relax the patient.

Figure 5-4. Infant exam: In the knee to knee position, the child is able to see the mother's face while she controls the child's movement. The mother is able to observe and communicate with the child and dentist.

(a)

(b)

Figure 5-5. Infant exam: Begin with a digital examination and without instruments (a). Crying may facilitate the exam. As the child cries the mouth remains open (b).

Figure 5-6. Infant exam: Most children will regain composure immediately, as they sit up and receive a hug from the parent.

(a)

(b)

Figure 5-7. A lap cushion device flexes with the baby, allowing the tilt-back to feel more secure (a). Some parents may prefer it over the infant lying directly on the dentist's lap (b). On the other hand, introducing a new device which may make the exam more formal and threatening might startle the child. Courtesy of Specialized Care Co, Inc. Hampton, NH.

youngsters and may be one of the dentist's greatest assets in managing behavior, especially when dealing with very young children. Even if the child does not comprehend the language, a soothing voice helps relax the patient. Before performing an intraoral examination, the dentist explains to the parent that the procedure does not hurt the child and that even though the young patient appears cooperative, many children begin to cry

during an oral examination. Most parents appreciate the forewarning. It may also be necessary to explain this to other children in the office to avoid upsetting them. Since the child is in the parent's arms, the dentist has to attempt to communicate with the child and parent simultaneously. It is not unusual for a young patient's mouth to remain closed since the child does not understand what is expected. The mouth is easily opened by sliding an index finger between the teeth or gum pads and cheek, and pressing lightly against the ramus of the mandible. However, a gentler approach, which often achieves the same end, is to have the dental assistant rub the child's tummy. This relaxes many infants and toddlers, and their mouths often open spontaneously. Once access to the oral cavity is gained, every attempt is made to complete the oral examination before withdrawing from the child's mouth.

In summary, several points are important when examining infants and very young children:

1. Begin with a digital examination and without instruments, and perform as much of the examination as possible. Instruments can be cumbersome in a small mouth and potentially harmful if the child makes sudden, unexpected movements.
2. Avoid using the operatory light if possible. If it is used, care should be taken to keep the light out of the infant's eyes.
3. Place a finger near the tine of the explorer when entering or leaving the mouth or moving the instrument from tooth to tooth. The finger in this position helps to prevent harm in the event of a quick turn of the child's head.
4. Use a mouth prop for young children who do not keep their mouths open. A small Molt mouth prop can be of great advantage when a child fails to keep the mouth open. A less threatening type of prop, which can be prepared beforehand, consists of four or five tongue blades wrapped in adhesive tape, or can be purchased ready-made (see Figure 5-8).

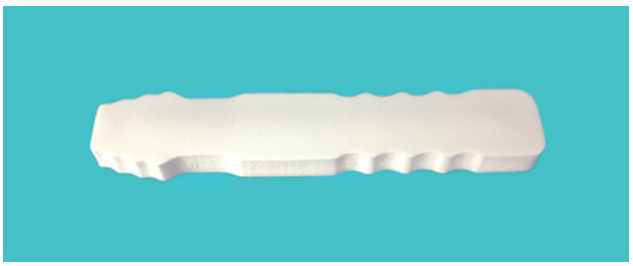

Figure 5-8. Mouth prop. Courtesy of Specialized Care Co, Inc. Hampton, NH.

Case 5.3

Two four-year-olds arrived at the pediatric dentist's office following a collision of heads at nursery school. Both children had bleeding from the mouth and were accompanied by their parents. Sue had been at the dentist initially at age two and had since returned for a checkup the previous year. Jack had never been to any dentist and this emergency visit was the first for both himself and his mother. Jack was crying and very frightened and his mom was visibly upset and tense. Conversely, Sue was a little nervous but was familiar with the office, staff, and dentist. She was looking forward to receiving the prize to be given later. Her mom remembered being told by the dentist that such incidents might occur and are indeed expected. "Kids will be kids. Maybe that is why they grow up with baby teeth." On the other hand, Jack's mom reacted aggressively toward the dentist when she was told that her son's lip was indeed lacerated but that his teeth were not fractured due to the fall; rather they were severely decayed and only appeared broken. The mother had given Jack a baby bottle of apple juice to calm him. She was shocked when told that Jack needed extensive dental work not only on his front teeth but also his molars, as they showed advance signs of ECC.

Sue was discharged after an X-ray. Jack refused to take an X-ray and was to return for restorative treatment under general anesthesia, his parent's preference.

***Case 5.3, Discussion*:** Obviously Jack's mother was at a disadvantage. Her first encounter with her child's dentist was emergent and under duress. This could have been avoided if she had the opportunity to establish her child's dental home earlier. The dental home should not only be analyzed on its effects on the child's oral health and anxiety but also on how it might change the dental anxiety of parents. This is not a trivial point.

Chapter One described the cycle of dental fear. Maternal anxiety and its impact on a child's dental health, anxiety, and behavior has been extensively studied (see Figure 5-9). This anxiety can affect the child's oral health and have long-term rippling effects on the child's future adult dental health (Shearer et al. 2011). As parents bear the responsibility for their preschool children's oral health, anxiety may influence parental attitudes and habits regarding the child's oral health care. Mothers with severe dental anxiety may be reluctant to expose their young child to the expected "terrifying" dental experience. Although there are clear, common ECC etiological pathways

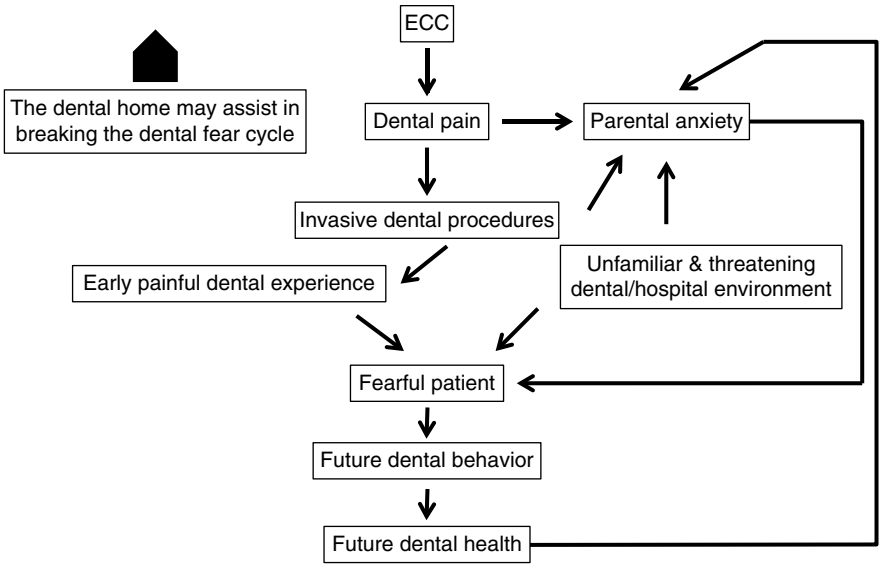

Figure 5-9. The dental fear cycle may be broken or avoided by establishing a dental home early. Courtesy of Dr. Ari Kupietzky.

involving bacteria and diet, these can be modulated by the relative contribution of other factors, including socioeconomic, cultural, and ethnic backgrounds and paternal dental anxiety (Seow et al. 2009). Thus, research suggests that preventive strategies for children's oral health should pay closer attention not only to the child's characteristics and those of his family, but also to maternal dental anxiety-related behaviors (Goettems et al. 2012).

The dentist had alerted Sue's mother to the possibility that trauma might occur, especially during the growing period of two to four years of age, when toddlers seek independence and learn to walk. She was told what to expect and how to act in the event of a traumatic episode involving her child's teeth. Anticipatory guidance should not be limited to explanations about caries, but also include emergency situations. Other topics include: oral development (pattern of eruption, teething facts), fluoride, oral hygiene at home, breastfeeding's effects on the mouth, pacifier use versus thumb-sucking effects, and nutrition and diet.

Summary

This chapter has provided some of the background for the dental home, a relatively new concept. It was included in this book because children who are indoctrinated into a dental home generally have fewer major dental problems and, importantly, they and their parents have better attitudes toward oral health care. Cases were provided to elucidate these points. For those inexperienced with examination procedures for the infant patient, a detailed description was provided.

References

American Academy of Pediatric Dentistry Policy on the Dental Home. (2012). *Pediatric Dentistry*, 34, 24–25.

Berg, J. and Slayton, R. (2009). *Early Childhood Oral Health*, Wiley-Blackwell, Ames, Iowa.

Bubna, S. et al. (2012). Infant oral health care: beliefs and practices of American Academy of Pediatric Dentistry members. *Pediatric Dentistry*, 34, 203–209.

Casamassimo, P. (2001). Maternal oral health. *Dental Clinics of North America*, 45, 469–478.

Cunha, R.F. et al. (2000). "Dentistry for babies: A preventive protocol". *ASDC Journal of Dentistry for Children*, 67, 89–92.

Cunha, R.F., Matos, J.X., Marfinati, S.M. (2004). "Dentistry for babies: Why do parents seek dental care?" *Journal of Clinical Pediatric Dentistry*, 28, 19–34.

Devries, A. et al. (2012). Impact of medical homes on quality, healthcare utilization, and costs. *The American Journal of Managed Care*, 18, 534–544.

Doykos J.D. III. (1997). Comparative cost and time analysis over a two-year period for children whose initial dental experience occurred between ages 4 and 8 years. *Pediatric Dentistry*, 19, 61–62.

Dye, B.A. et al. (2007). Trends in oral health status: United States, 1988–1994 and 1999–2004. National Center for Health Statistics. *Vital and Health Statistics*, 11, 1–92.

Erickson, P.R, and Thomas, H.F. (1997). A survey of the American Academy of Pediatric Dentistry membership: Infant oral healthcare. *Pediatric Dentistry*, 19, 17–21.

Feigal, R.J. (2001). Guiding and managing the child dental patient: a fresh look at old pedagogy. *Journal of Dental Education*, 65, 1369–1377.

Goettems, M.L. et al. (2012). Influence of maternal dental anxiety on the child's dental caries experience. *Caries Research*, 46, 3–8.

Hale, K.J. (2003). Oral health risk assessment timing and establishment of the dental home. American Academy of Pediatrics Section on Pediatric Dentistry. *Pediatrics*, 111, 1113–1116.

Hearld, L.R. and Alexander, J.A. (2012). Patient-centered care and emergency department utilization: a path analysis of the mediating effects of care coordination and delays in care. *Medical Care Research and Review*, 69, 560–580.

Kagihara, L.E. et al. (2011). Parents' perspectives on a dental home for children with special health care needs. *Special Care Dentistry*, 31, 170–177.

McWhorter, A.G., Seale, N.S., King, S.A. (2001). Infant oral health education in U.S. dental school curricula. *Pediatric Dentistry*, 23, 407–409.

Newacheck, P.W. et al. (2000). Access to health care for children with special health care needs. *Pediatrics*,105, 760–766.

Nowak, A.J. and Casamassimo, P.S. (2009). *The Dental Home in Early Childhood Oral Health* (eds J. Berg and R. Slayton), 154–169. Wiley-Blackwell, Ames, Iowa.

Savage, M.F. et al. (2004). Early preventive dental visits: effects on subsequent utilization and costs. *Pediatrics* 114, 418–23.

Seow, W.K. et al. (2009). Case-control study of early childhood caries in Australia. *Caries Research*, 43, 25–35.

Seale, N.S. and Casamassimo, P.S. (2003). Access to dental care for children in the United States: A survey of general practitioners. *Journal of the American Dental Association*, 134, 1630–1640.

Shearer, D.M. et al. (2011). Does maternal oral health predict child oral health-related quality of life in adulthood? *Health and Quality of Life Outcomes*. Jul 7;9:50.

Siegal, M. and Marx, M. (2002). Ohio dental care providers' treatment of young children. *Journal of the American Dental Association*, 136, 1583–1591.

Wolfe, J.D. et al. (2006). Survey of Iowa general dentists regarding the age 1 dental visit. *Pediatric Dentistry*, 28, 325–331.

Chapter 6

Non-Pharmacologic Approaches in Behavior Management

Gerald Z. Wright

Ari Kupietzky

The previous chapters of this volume have focused on the child patient and the family. The remaining chapters deal specifically with techniques or strategies of behavior management which are used in the practice of dentistry for children.

The present chapter is devoted to non-pharmacologic approaches that are commonly used by dentists today. Most of these methods have evolved from generations of dental practitioners. Consequently, some of the references may seem historic, but they are still valid today. The methods in this chapter are extremely important because they are the basis for behavior management. If a child's behavior cannot be managed, then it is difficult, if not impossible, to carry out any dental treatment. Behavior management is therefore one of the cornerstones of pediatric dentistry (Roberts et al 2010).

Many of the psychological terms used in this chapter are derived from learning theory. Learning theory is an all-embracing term for a body of psychological research that describes how people modify their behavior patterns as a result of personal experience or the experiences of a role model. In the language of learning theory, learning is the establishment of a connection or association between a stimulus and a response. It is often referred to as S-R theory.

In the original edition of this book, this chapter contained a section on learning theory. However, little has changed in this area in the past forty years and that section is omitted in the present edition. Instead, to be more relevant and practical, the chapter will interweave dentistry and psychology.

The importance of behavior management and its relationship to psychology has resulted in considerable coverage of the topic in the literature. Some are anecdotal writings. Some are based on psychological principles. Some are controlled studies. Some survey professional practices. Together, they provide a wealth of information. To organize and present the chapter in a meaningful way, and include the pertinent non-pharmacologic literature, it is divided into five parts: getting to know your patient, pre-appointment behavior modification, effective communication, non-pharmacologic clinical strategies, and retraining.

1. Getting To Know Your Patient

This section deals with getting to know new child patients. With all of these procedures, the primary goals are to: (1) learn about patient and parent concerns, and (2) gather information which enables a reasonably reliable estimate of the child's cooperative ability.

Knowing as much as possible about the new patient prepares the dentist to deal with new patient situations in a meaningful way. Information collection begins at the first contact. Assuming that a parent telephones the dental office for a child's appointment, the receptionist begins to create a record. The important demographic information is usually recorded on a card or computer. However, an astute receptionist will determine who referred the child patient, why the child has been referred to the office, and whether or not this is the child's first dental visit. The responses to these questions can be very enlightening.

Once a new patient arrives in an office, dental teams conduct inquiries in two ways: (1) using a paper and pencil questionnaire completed by a parent or caregiver, and (2) by directly interviewing the child and parent. In some offices, one method may predominate, while in others, a combination of techniques is used.

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

Paper-and-pencil questionnaires.

Written questionnaires can be important tools for gaining information because probing questions can uncover critical facts about a family's child-rearing practices, a child's school experiences, or a child's developmental status. Rather than including lengthy lists of questions that can be found in other sources, those items that have been found to be most helpful in clinical situations are shown in Table 6-1. Questions such as these provide some clue or insight into a child's background.

The first question pertains to the intellectual capacity of the child. If "slow learner" is checked, then it is necessary to explore the matter further with the parent. The other four questions have direct clinical relevance (Wright and Stigers 2011). The question related to the child's medical experience is from the investigation of Martin et al. (1977) and it relates to the child's history with physicians. Much has been written about the relationship between past medical history and a child's cooperative behavior in the dental environment. It seems the influential feature is the *quality* of medical contacts. That is, if a child relates positively to a physician and is well-behaved, there is a relatively good chance for cooperation at the dentist.

With respect to the response to the medical question, there is another factor worthy of consideration. To the very young child, the term "doctor" means a physician, and an appointment at the doctor's office, whether physician or dentist, is all the same. The child generalizes the past experience. When the basis for generalization involves a language label, it is called "mediated generalization." To the child approaching school age, language labels form the basis for many generalizations; hence the importance of word selection.

The next question asks parents to rate their own anxiety. At least five studies in the 1970s documented a significant relationship between mothers' anxieties and their children's cooperative behaviors in the dental office. While at that time mothers primarily accompanied their children to the dental office, many fathers or both parents now bring children for dental appointments. Since the paternal role has yet to be explored, the clinician can only speculate at this time that fathers' responses, like mothers' responses, will be similarly correlated.

The fourth question asks whether the child believes that there is anything wrong with their dentition. An affirmative response indicates that something has been identified to the child and, consequently, apprehension is likely to be greater (Wright and Alpern 1971).

The final question emphasizes the role of parents as legitimate members of the Pediatric Dental Treatment Triangle in that they can predict their children's cooperativeness with a high degree of accuracy. This question was found to be highly significant in studies by Martin et al. (1977) and Johnson and Baldwin (1968).

After reviewing the questionnaire responses, it is possible that the clinician may be concerned that the child will be uncooperative. Forehand and Long (1999) have referred to some uncooperative children as strong-willed. They are often described as being independent, persistent, and confident. While qualities such as these are quite positive, most strong-willed children can also be stubborn, argumentative, and defiant, leading to non-compliance. In an effort to learn more about these children, the questionnaire in Table 6-2 was developed

Table 6-1. These are clinically relevant questions that can be copied into the health history form.

How do you consider your child is learning?	☐ advanced in learning ☐ progressing normally ☐ a slow learner
How do you think your child has reacted to past medical experiences?	☐ very well ☐ moderately well ☐ moderately poorly ☐ very poorly
How would you rate your own anxiety (nervousness, fear) at this moment?	☐ high ☐ moderately high ☐ moderately low
Does your child think there is anything wrong with his/her teeth such as a chipped or decayed tooth, gumboil?	☐ yes ☐ no
How do you expect your child to react in the dental chair?	☐ very well ☐ moderately well ☐ moderately poorly ☐ very poorly

Table 6-2. Situations in which uncooperative children may display problems. Adapted from Forehand, R. and Long, N. Pediatr Dent 1999:21, 463–468.

Situations in which strong-willed children often display problems

Situations:

- Going to bed
- Getting up in the morning
- Mealtime
- Bathtime
- When you are on the phone
- When you have visitors at home
- When you visit others
- Riding in the car
- Grocery shopping
- Eating in restaurants

In the above situations:

- Is there a problem?
- How often?
- What do you do?
- What does your child do?

based on the work of Forehand and Long. This questionnaire can be provided as a supplementary set of questions after examining the initial responses.

Many of the foregoing questions came from behavioral science research that is now more than forty years old. Little research of this type is conducted in pediatric dentistry these days, so there is little new material to call upon. Nonetheless, the clinician should give serious consideration to incorporating such questions into a behavioral or health questionnaire. The list of questions is potentially endless, but that would be impractical. These questions have proven to be worthwhile. Careful scrutiny of the responses can tip off the astute clinician to a potential behavior problem.

The Functional Inquiry

In medical practice, a functional inquiry is a series of symptom-related questions posed in a personal interview that elicit new information and obtain further details about a presenting problem. In pediatric dentistry, it is used to learn about dental problems, explore the behavior of the new child patient, understand the parent's attitude, and assess the potential for patient and parent compliance. The paper-and-pencil questionnaire offers a starting point. It provides general information and clues, and it guides the functional inquiry. To begin, consider the first question related to learning efficiency. If a parent has indicated that the child is a "slow learner," more factual information is necessary. A leading question might be, "Is your child in a special class or special school?" Knowing that the child attends a special education class or school can offer a clue about the functioning level of the patient. If the child is behind in school or in a special program, then slow learning is an important part of the patient's profile. The child may have to be guided through dental experiences more slowly, with clear, concrete, repeated explanations and visual aids. Conversely, a parent may indicate that a child is "advanced in learning." The child may attend a school for the gifted. An important part of managing bright children often involves giving detailed explanations, catering to their curious natures.

For very young patients, two interesting questions are "What time does your child go to bed?" and "Is your child toilet trained?" If a child goes to bed at a regular hour, such as 7:00 p.m. or 8:00 p.m. and is toilet trained by the age of twenty-four to thirty-six months, the implication is that child-rearing practices in the home are structured. On the other hand, a three- to four-year-old child who does not go to bed as scheduled or who is not toilet trained arouses the experienced clinician's suspicion about the home environment. Is the parent overly permissive? Is the child's behavior generally non-compliant? More information can be obtained through the questionnaire in Table 6-2.

There is no limit to the depth of the functional inquiry, but if it is to be productive, questioning must be thoughtful. The information on the questionnaire helps to make this efficient. Other avenues to be explored include rewards and reinforcement in the home environment. These may provide some insight into the type of behavior management techniques that would be acceptable to the parent. Learning in advance that a parent does not believe in physical punishment can prevent a future confrontation if aversive techniques are employed.

Recall Patients

The discussion so far has been directed toward the new child patient. However, consider the case of this recall patient.

Case 6.1

Susan, eleven years of age, came to the dental office with her father for a recall appointment. After a few minutes, Susan was summoned into the operatory by the dental hygienist and, without hesitation, the youngster followed the hygienist. At the conclusion of the appointment, the dentist reported to her father that Susan's teeth were excellent and that she was a good patient. Susan's father replied, "I'm surprised. She stayed up most of the night worrying about this visit. "Oh," said the dentist, "I didn't know!"

Case 6.1, Discussion: This case points out that functional inquiries are not limited only to new patients. When children have been patients for a long time, situations change and a periodic history review is in order. Based upon her father's remarks, the child was quite anxious. If the dentist had known about Susan's emotional state, she might have managed her differently or spoken to her about the problem. How was the dentist to know?

A recall history review is not as detailed as a new patient inquiry. It is generally conducted with a written questionnaire that provides an update on administrative information and health history. However, there are other questions to be asked, as shown in Table 6-3. The first question asks about oral hygiene. If a parent notes that the home care is adequate and, on examination, the child's oral hygiene appears neglected, something is wrong. It may be that the parent's expectations differ from those of the dentist. In this instance, consultation is necessary to re-establish hygiene goals. Or it may be that the child attends to the oral hygiene but requires further instruction.

Table 6-3. Responses to these questions can be helpful when updating the health history. They can alert the dental team to a potential problem.

How do you think your child has maintained his/her oral hygiene?
☐ good ☐ fairly good
☐ not very well ☐ poor
Does your child have concerns about coming for this dental appointment?
☐ no anxiety ☐ a little anxiety
☐ anxious

The second question is a behavioral one. If a child really approaches the office with fear, after being a patient in the office for several years, the dental team must make every effort to reduce the fearfulness over future appointments. A good way to begin is by asking "Were you nervous coming here today?" Children are usually truthful and will confirm or deny the suspicion. "Tell me why." Sometimes the answer is simple: "I don't like the taste of that (fluoride gel)." Many dentists keep several fluoride flavors in the office and can reply, "We have several kinds here. Today, you choose one. We will find one that you like." The point is—as in Susan's case—important information may be missed or problems undiscovered. The Pediatric Treatment Triangle variables are constantly changing and the astute clinician keeps patient information up-to-date.

2. Pre-Appointment Behavior Modification

Psychologists have developed many techniques for modifying patients' behaviors by using the principles of learning theory. Behavior modification, sometimes called behavior therapy, may be defined as the attempt to alter human behavior and emotion in a beneficial manner and in accordance with the laws of learning theory (Eysenck 1964). These laws state that rewarded behavior tends to occur more often in presence, and unrewarded or punished behavior tends to be extinguished or disappear. Behavior therapists use various conditioning techniques to effect behavior changes. In this section, pre-appointment behavior modification refers to anything that is said or done to positively influence a child's behavior before entering the dental operatory. In recent years, some of the methods employed include pre-appointment mailings, audiovisual modeling, and patient modeling.

Why use pre-appointment behavior modification? Dental anxiety represents a general state in which the individual is apprehensive and is prepared for something negative to happen (Klingberg 2008). It persists in our society. In a recent survey of 583 children nine to twelve years old, only 64% reported liking their last dental visit, while 11% didn't like their visit and 12% were afraid to go to the dentist (AlSarheed 2011). With data like this, it is apparent that dental anxiety remains a common problem. It appears to develop mostly in childhood and adolescence (Locker et al. 2001). Consider the following scenario and what can be done to prevent it.

Case 6.2

Sally, a four-year-old, had not visited any dentist previously. It was now time for her first dental visit and her crying could be heard as she and her parent approached the office. As they came nearer, Sally's crying had a crescendo effect, alerting the entire dental office team to the presence of the new, anxious patient. Entering the office, the parent said, "Quiet! I told you that you would not get a shot today."

Case 6.2, Discussion: There are many possible reasons for Sally's behavior. Her apprehension may have originated in the family unit. It may be caused by (1) behavior contagion, (2) threatening the child with the dentist as a punishment, (3) well-intentioned but improper preparation, (4) discussing dentistry problems within earshot of the child, or (5) sibling attitudes. The question is, what can be done to ease the child's introduction to dentistry?

Pre-appointment contact

Many parent and child concerns can be alleviated. Pre-appointment contact can provide directions for preparing the child patient for an initial dental visit and, therefore, increase the likelihood of a successful first appointment. It also can diminish a parent's apprehension. The sequence of events in many dental offices is: (1) the parent phones to make an appointment, (2) the appointment is made for some time in the future, and (3) the parent is contacted as a reminder the day before the dental appointment. Years ago, Tuma (1954) suggested sending a pre-appointment letter explaining what is to be done at the first visit. He hinted that this could modify the behavior of some children. In addition to serving as an appointment reminder, it established good public relations. He explained that child management in dentistry was based on sound principles of psychology, and he suggested rewards for good behavior or as tokens of affection—not as bribery. He implied that rewards for negative behavior only reinforced it and established bad habits. Thus, Tuma explained basic pediatric dentistry management techniques in psychological terms to parents.

Box 6.1 The pre-appointment letter

Your Child's First Dental Visit

Dear (Name),

I am writing to you because I am pleased with the interest you are showing in your child's dental health by making an appointment for a dental examination. Children who have their first dental visit when they are very young are likely to have a favorable outlook toward dental care throughout life.

At the first appointment we will examine your child's teeth and gums, and take any necessary x-rays. For most children, this proves to be an interesting and even happy occasion. All of the people on our staff enjoy children and know how to work with them.

You parents play a most important role in getting children started with a good attitude toward dental care, and your cooperation is most appreciated. One of the useful things that you can do is to be completely natural and easy-going when you tell your child about the dental appointment. This approach will enable your child to view the appointment primarily as an opportunity to meet some new people interested in maintaining good oral health.

Good general health depends in large part upon the development of good habits, such as sensible eating and sleeping routines, exercise, recreation, and the like. Dental health also depends on good habits, including proper tooth brushing, regular dental visits and avoidance of excessive sweets. We will have a chance to discuss these points further during your child's appointment.

Best wishes, and I look forward to meeting you.

Sincerely,

(Name)

(Wright, G.Z., Alpern, G.D. and Leake, J.L. J Dent Child 1973:40,273)

Following up on Tuma's suggestion, Wright et al. (1973) conducted a randomized, controlled study that demonstrated the beneficial effect of the pre-appointment letter. They mailed these letters to mothers of children three to six years of age who had appointments for first dental visits. The behavior of these children was compared with that of another group who had not received letters. As a result of the contact, children were better prepared by their mothers for their dental visits and were more cooperative. This was especially true for children three to four years old.

A simple letter can do much to relax a mother and help her prepare her child for the dental visit. In the study of Wright et al. (1973), mothers acknowledged their appreciation of the dentist's thoughtfulness. They welcomed the concern for their children. The demonstrated effect is of great importance to the clinician. It reduced maternal anxiety and favorably affected the patient's dental office behavior. Box 6.1 is a sample of the letter.

Nowadays, parental anxiety still needs to be considered, and new technology offers different options for pre-appointment contact. Many pediatric dentists have web sites, and a pre-appointment letter can be put on the site. Many patients provide their e-mail addresses to the dental office, and letters can be sent directly to them. Other technology software programs such as TeleVox® (®TeleVox Software Inc.) enable practices to send pre-appointment reminders and instructions to ensure parents remember and are well-prepared for appointments with their dentist. These programs can leave the information in various languages.

The work of Bailey et al. (1973) has also supported pre-appointment contact. By comparing maternal and child anxiety levels, they observed that a youngster exposed to a parent's positive attitude toward a dental visit reacted more positively. Behavior was better for children prepared properly by parental discussion. It appears, then, that if the elements of surprise and lack of information are removed by parent preparation, children are more likely to cooperate.

Recommendations for many types of pre-appointment mailings have been made. Correspondence has run the gamut from the simplest welcoming letter to bombarding the mailbox with all manner of mailings. These have included pre-appointment questionnaires, dental society information flyers, commercial booklets, complicated statements of office policy, and even dental

comic books. Numerous mailings can make too much of the first dental visit. Over-preparation can confuse the parents or provoke anxiety. Thus, the final effect of some of these approaches may be opposite the intention. The uncomplicated pre-appointment letter welcomes the patient, spells out the basic, first-appointment procedure avoiding dental terminology, and generally states the philosophy of good dental health care. This is sufficient.

Audiovisual modeling

This strategy can be applied before the appointment and in the clinic. The social learning theory proposed by Bandura (1977) has become perhaps the most influential theory of learning and development. While rooted in many of the basic concepts of learning theory, Bandura believed that direct reinforcement could not account for all types of learning. His theory added a social element, arguing that people could learn new information and behaviors by watching others. Factors involving both the model and the child patient can play a role in the success of observational learning (modeling). The child has to pay attention, remember what was observed, reproduce the behavior, and have good reason (motivation) to want to adopt the behavior. Without these factors, observational learning becomes ineffective.

Since the child must pay attention, anything that detracts attention will have a negative effect on observational learning. If modeling by audiovisual means in the dental office, a staff member should be present to direct the child's attention to the model.

The ability to store information is also an important part of the learning process. Retention can be affected by a number of factors, so it is helpful if the staff member points out key parts of the presentation. The staff may question the child to reinforce the learning. Later, it is vital for the child to recall information and act on the observational learning. Once the child has paid attention to the model and retained the information, he should be led to the operatory with the parent. The procedure in the operatory should follow the model as closely as possible so that the child can actually reproduce the behavior.

Finally, for observational learning to be successful, the child has to be motivated to imitate the behavior that was modeled. Reinforcement plays an important role in motivation. For example, if a child sees a departing patient praised for their good behavior and given a prize, that motivates the new patient.

During the 1970s there were at least eight investigations into the merit of using videotaped modeling. Most of these studies used different procedures. For example, some had an assistant working with a child, while others left the child alone. The videotape presentations differed.

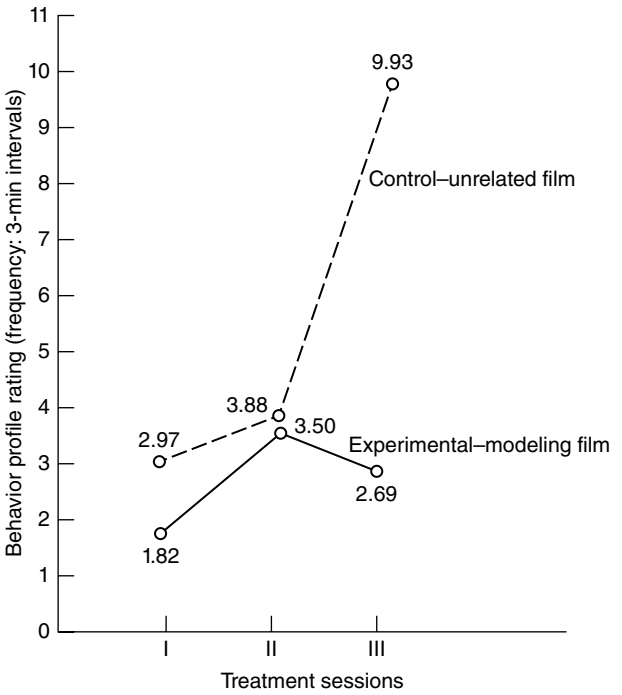

Figure 6-1. The graph shows mean behavioral differences. The higher behavior profile rating indicates less cooperation. Note the wide difference in behavioral profile ratings between the two groups. Adapted from Melamed, B.G. et al. J Dent Res 1975: 54, 797.

As a consequence, results from these studies were mixed. A most supportive study was that of Malemed et al. (1975). They divided children between five and eleven years of age into two groups. One group viewed an unrelated film and the other watched a modeling film. Their results, which are summarized graphically in Figure 6-1, demonstrate the benefit of modeling.

Greenbaum and Melamed (1988) contend that research on modeling indicates that this technique offers dentists a means of reducing fear in child patients of all ages. They recommend it for children who have had no prior exposure to dental treatment. They further suggest that with videotape technology, the practitioner has the means to incorporate patient viewing of pre-recorded modeling tapes as part of the usual waiting period. Such a procedure creates a prepared patient, and the dentist will spend less time in behavioral management tasks.

Audiovisual modeling has several advantages. Since it is a "canned" presentation, nothing inadvertently creeps into the presentation that could influence the child negatively. However, an audiovisual presentation has two obvious disadvantages: (1) there is expense, as it requires special equipment and space, and (2) unless the presentation is developed by the dentist, it can be impersonal. For these reasons, some practitioners prefer live models.

Live models

There are three types of live models in a general practice: siblings, other children, and parents. Research by Ghose et al. (1969) evaluated the benefit of sibling models. The study concentrated on the effect of siblings on three- to five-year-old children without previous dental experiences. Sibling pairs entered the clinical area together, and the older child was examined first. Next, the younger child was examined while the older child observed. Similarly, dental prophylaxes and radiographs were performed for the children. At a second visit, a local anesthetic was administered and a restoration was completed. Sibling pairs serving as a control group were examined and treated separately. The study concluded that the presence of the older sibling had a favorable effect on the behavior of younger child at the first visit (Figure 6-2). The presence of a big brother or sister also seemed to maintain or even improve the younger child's behavior during subsequent visits. Recall appointments in particular provide an excellent modeling opportunity for children (similar to parent recall appointments).

Using non-related children as models is also beneficial. Investigating this strategy, White and colleagues (1974) employed an eight-year-old model for children four to eight years of age. They divided subjects into three groups and compared the beneficial effects from either a modeling or a desensitization approach, with a control group having no preparation. They observed less avoidance behavior with both experimental groups and found that those children with the model seldom asked for a parent to be present. Similar results in the clinical setting were described by Adelson and Godfried (1970). They emphasized that the model was given a high status and rewarded for good behavior in the presence of the observing child.

Figure 6-2. The older sibling models for the younger one. Both children learn when an explanation is provided by the dentist.

The merits of modeling procedures using audiovisual or live models are recognized generally by psychologists. The merits are as follows: (1) stimulation of new and positive behaviors, (2) facilitation of behavior in a more appropriate time, (3) decrease of fear-related, inappropriate behavior, and (4) extinction of fears. These procedures offer the clinician some interesting ways to modify children's behaviors before they are seated in the dental chair. Unfortunately, in the years since the 1970s, there has been little behavioral science research on this subject. Hopefully this area will be visited again in the near future.

3. Effective Communication

Although communication can occur in different ways, most non-pharmacological strategies are highly dependent upon verbal communication. There are many facets to good verbal communication.

Establishing communication

It is widely agreed that the first objective in the successful management of a young child is to establish communication. By involving a child in conversation, a dentist not only learns about the patient, but also relaxes the youngster. There are many ways to initiate verbal communication.

Case 6.3

Dr. A.: Do you go to school?
Jimmy: Yes.
Dr. A.: Do you like school?
Jimmy: Yes.
Dr. A.: Well, let's see your teeth.

Case 6.3, Discussion: Jimmy responded to Dr. A.'s questions but was not actively involved in communicating. Dr. A. was in a hurry "to get to the mouth." Welbury et al. (2005) refer to this type of communication as a preliminary chat. They suggest initiating conversation with non-dental topics. Many young children are very proud of their new clothing and they like to be asked about it. Older children often wear team sweaters, school crests or group uniforms (e.g., Brownies, Cubs, Beavers), and they like to be questioned about their activities. Whatever the ploy for initiating a conversation, questions should be phrased so that a child cannot offer a simple "yes" or "no" reply. Next, ask an open-ended question such as "What are those badges for?" This tends to establish communication. The process

of drawing a child out and into communication with others around them is referred to as externalization. If other children in the family have attended the office previously, there should be information such as siblings' names, pets, schools, or hobbies to call upon. This makes the initial questioning much more personal.

Children are often shy and reluctant to talk when they are first exposed to a new experience and to new people. When they have gained confidence and are comfortable in the unfamiliar environment, they will usually speak more freely. During the first dental visit they may speak more readily to a dental assistant. This enables the dentist to listen and make an evaluation of the comprehension and emotional maturity of the child.

Message clarity

A common theme throughout the literature in pediatric dentistry is that effective communication is essential to the development of a trusting relationship with the child patient. It is a critical requisite for the pediatric dentist in gaining cooperation (Nash 2006). To be effective, the message has to be clear. To ensure clarity, be certain that the child is addressed at the appropriate level of comprehension. This can be easily overlooked. Consider this example.

Case 6.4

Dr. B. is preparing a tooth for a restoration. Access is difficult and the child's head must be still. The child moves her legs, causing her entire body to shift slightly, and Dr. B. says in a calm voice, "Jenny, you must sit still. This will only take a minute. Do you understand?" Jenny nods her head affirmatively, but again changes her leg position, causing her head to move. So Dr. B. repeats the instructions in a firm voice. Jenny does not move for about twenty seconds, during which time half of the preparation is complete. She then moves again. This time Dr. B. repeats instructions in a firm, displeased tone. "Jenny, sit still. Don't move." The cavity preparation was completed without further difficulty and the child is complimented for her behavior.

Case 6.4, Discussion: Two aspects of this case are noteworthy. First, the patient was four years old and the message may not have been understood. Dentists sometimes fail to communicate effectively (Chambers 1976). That may have been the problem in this case. If we say to a child "Open your mouth" or "Climb up into the chair," the child likely will understand the instruction. But when the dentist said, "Sit perfectly still. This will only take a minute." Dr. B. probably thought that the instructions to Jenny were clear and that good communication was established. That assumption may be incorrect. It is possible that the child did not truly understand what was meant by "sit still," and it is probable that she had no concept of what constitutes a minute because she began moving after twenty seconds. Second, when the instructions were given on the first two occasions, they were delivered in a calm voice. On the third occasion, a firm displeased tone seemed to gain the result and the child was still. This is known as voice control.

There are other ways to deal with this situation. Dr. B. could have been more explicit and explained the problem to the child. "Jenny, the tooth that I am going to fix is way back here," he could have said, pointing to the tooth. "I need you to help me. This is very important. If your head moves, even a little, then your tooth moves too. If you move your legs, it moves your head and your head moves the tooth. Try not to move your head, your arms or your legs while I am working on the tooth. I am going to count out loud and when I finish counting, we will be done." By stressing the importance, the child's awareness of the situation may be enhanced. By asking her to help, she is a member of the team.

Clarity only occurs when the message is understood in the same way by the sender and the receiver. There has to be a "fit" between the intended and understood messages. For children with limited vocabularies, more detailed verbal communication is often needed, and sometimes it has to be supplemented in other ways. Consider a common experience in the home environment. A three-year-old approaches the hot stove. Her mother says, "Go away, its hot." If the child does not understand the meaning of hot, the she may return again. On the other hand, if the mother clarifies the verbal command and supplements it by picking up the child, placing the hand near the hot plate, and explaining that "hot hurts," the message becomes clearer. An analogy in pediatric dentistry is the three-year-old who lifts a hand to the mouth while the dentist is using an explorer. Saying "put your hands down" gives a command, but the child may not pay much attention to it. In effect, it scolds the child. Demonstrating the sharpness of the instrument and telling the child to keep his hands down in order not to get hurt is more effective communication.

To improve message clarity with young children, pediatric dentists and their office personnel have to use euphemisms sometimes. These are non-offensive word substitutes. For most pediatric dentists, euphemisms are like a second language. The following is a small glossary

of word substitutes that can be used to explain procedures to children.

Dental Terminology	Word Substitute
Air blast	Wind
Alginate material	Pudding
Burr	Brush
High speed suction	Vacuum cleaner
Explorer	Tooth feeler/counter
Rubber dam	Rubber raincoat
Stainless steel crown	Tooth hat
Study models	Statues of teeth
X-ray film	Tooth picture
X-ray equipment	Tooth camera
Pit-fissure sealant	Tooth (nail) polish

Figure 6-3. The dentist explains the procedure to the child patient. Note that the child has ear phones in place. Effective communication can only come from one source at a time. Avoid ear phones and other distractors when communicating.

Multisensory communication

The spoken word is not the only means of communication. Nonverbal communication, such as stroking the hand of a young child, communicates the feeling of warmth. A dental assistant's smile conveys approval and acceptance. Similarly, these feelings can be transmitted through the eyes. Since communication is a reciprocal process, children who avoid eye contact are telling the dentist that they are not yet ready to cooperate fully. Hence, effective communication occurs through a multisensory approach.

Whenever communication occurs there is a transmitter, a medium, and a receiver. The dentist or dental health team is the transmitter, the office environment provides an array of media, and the child is the receiver. It is widely recognized that certain characteristics are typical of all three for good behavior management (Moss 1972).

The transmitter may be one or all of the members of the dental health team during a child's dental visit. However, one fundamental rule must be recognized. Verbal transmission may come from only one direction at any given time . Children cannot divide their attention between two adults simultaneously or be distracted (Figure 6-3). If the dentist has entered into a discussion with the child, then the assistant must refrain from commenting. Typically, the error of two adults speaking to the child at one time occurs under stress. If a child resists an injection, the dentist may be trying to control her, and often a well-meaning dental assistant chimes in with words for the child. The communication then comes from two directions and the message becomes unclear.

The attitude of the transmitter is often conveyed through the voice. Voice intonation, tone, and modulation can express empathy and firmness. Often it is not what is said but rather how it is said that creates an impact. Young children do not always hear or understand words and sentences, thus repetition is almost always required. The transmission must be constant. A kind pattern can give a young child a feeling of security and promote behavior management.

Since communication is multisensory, posture, movements, and position of the dental health team are extremely important nonverbal communication signs. Generally, movements should be slow and smooth, designed to convey a positive attitude and instill a feeling of security in the patient. Rough or gentle application of instruments also conveys an operator's attitude. When speaking to a child, approximate the child's level in the dental chair rather than tower above him.

The medium in the dentist-patient communication system is complex. While it obviously involves the projections of the office personnel, it also encompasses the dental office environment. Office design, pictorial displays, and background music all are media of communication. They convey messages, and should therefore be considered. When we deal with the school-age group, the latest music group may be preferable. Quiet background music, however, would be more likely to promote a settling effect for the very young child. The importance of the dental office environment is discussed in greater detail in Chapter Sixteen.

The visual channel must always be considered in multisensory communication. Sometimes those things which may seem natural to the dentist may be unsettling to a patient. A case in point is cited by one of the authors:

Case 6.5

One week, two children were referred to Dr. C. as behavior problems. After chatting with both of these children, Dr. C. did not understand why they were considered behavior problems. Trying to comprehend the reasons for their misbehaviors, Dr. C. asked them what frightened them during their previous dental experiences. Both children (from the same office) referred to the "ugly" posters in the dentist's office. When checking with the dentist, Dr. C. learned that the office had new charts on the operatory walls, which were produced by a commercial company to demonstrate the progress of periodontal disease. It was a family practice, but the office medium catered to adults.

Case 6.5, Discussion: A friendly atmosphere sets the mood when a child patient and parent enter the reception room (see Chapter Sixteen). The welcoming smile of the receptionist, the décor of the room, and a homey atmosphere can all play an important role in establishing communication. The dentist treating children in general practice has to seriously consider how children react to the office environment.

Children in their roles as receivers also have characteristics that need to be recognized by the dental team for effective behavior management. Their focus of attention is narrow and indivisible. The messages being communicated must be continuous to hold their attention. If the dentist has to leave the operatory, someone else must transmit; otherwise the receiver builds up concerns. This oversight commonly occurs when the dentist leaves the operatory and the dental assistant focuses on chores (such as cleaning instruments) without communicating with the child. Left alone, fear can develop in these children.

Other senses of the receiver can be used to advantage. In school, children are encouraged to touch. Let them touch the rubber dam, prophylaxis cup, cotton roll and other non-harmful objects. Children should also be allowed to use their sense of smell and be made to feel comfortable. The positioning of the patient in the chair is important, and so is the positioning of light. Light shining in a child's eyes can upset her potential as the receiver. Most children are good receivers. The message to be communicated is that the child can relax and need not be afraid.

Previous research has shown that the ability to assess non-verbal communication in children is closely related to the ability to observe. Using videotapes, Brockhouse and Pinkham (1980) studied the observational abilities of 141 participants and found that significant patterns evolved. One pattern was that pediatric dentists were more accurate in their abilities to predict behavior as compared to other experience levels. Dental assistants were significantly less accurate than others, including student groups. This finding was somewhat surprising, as many dental assistants had spent more chair time with children in the clinic than any other group. Another pattern revealed that freshman students had poorer predictive abilities than other dentist or student groups. They lacked clinical or didactic experience. The investigators concluded that experience appears to be the best means of developing the ability to assess non-verbal communication in children, but formal education is also important, perhaps because of the complexity of the communication process.

Confident communication

Speaking confidently to a child can lead to cooperative behavior. Many former dental students can relate to the following case.

Case 6.6

Ms. N., a senior dental student, attempts a cavity preparation for seven-year-old Tyler. Each time she begins cutting the tooth, the child frets. The behavior baffles Ms. N., who is unsure of the depth of anesthesia, and she summons an instructor.

The instructor greets the child and runs the handpiece slightly above the tooth. When Tyler frets again, the instructor stops, explains the noise, solicits the child's cooperation, and completes the procedure without incident.

Case 6.6, Discussion: To support the point that confidence is an important ingredient in communicating with the pediatric patient, a study of communication patterns was reported by Wurster et al. (1979). They examined communication patterns among sixteen randomly selected senior dental students and their child dental patients. Interactions were videotaped during regular treatment appointments. The data showed that the probability of a child's behavior following a practitioner's behavior was related. Patterns of behavior employed by clinicians will lead to a certain type of behavior on the part of the child. If the communication pattern is appropriate, the desired behavior likely will be achieved. In this same study, the operator's confidence level was considered, and the results showed that less confident operators were responsible for 95% of coercive behavior, 86% of permissive behavior and 87% of uncooperative behavior.

Voice Control

Gaining a child's attention is the ultimate aim of voice control. Without the attention of the child, there is no means of communication, and without communication,

the child will never learn to be a good dental patient. The patient will miss the cues, lack motivation, respond improperly and miss the rewards of approbation by his parents and the dental staff. As well as being a method of communication, voice control is thought of as a management technique; therefore, it will be described more fully with the non-invasive techniques in this chapter.

Active Listening

Listening is important in the treatment of all children. Active listening (Wepman and Sonnenberg 1979) or reflective listening (Nash 2006) has the positive effect of reassuring children that what they are going through is a normal part of the human experience. Ways in which children's feelings can be acknowledged include: (1) listening quietly, (2) acknowledging the feeling with a word such as "I see," or (3) giving the feeling a name: "Are you really nervous about coming to see me today?" In dealing with older children, listening to the spoken words may be more important than it is with younger children when attention to non-verbal behavior is often more crucial. An example of good listening follows:

Case 6.7

Dr. S. was preparing to place a rubber dam on nine-year-old Mary. She said, "I don't want that in my mouth."

Dr. S. replied, "You don't like the tooth raincoat?"

Mary said, "No. I can't breathe when you put that in my mouth."

Case 6.7, Discussion: By listening, Dr. S. learned what bothered Mary. The dentist then acknowledged her concern and told her that a big hole will be cut in the raincoat so that she will be comfortable. Dr. S. didn't add new information. She merely listened. The dentist communicated with the youngster, showed an interest in her feelings, and recognized the issue.

Problem Ownership

If a dentist treats an adult and the marginal ridge fractures on the new restoration, the fault is mainly that of the dentist. Similarly, if a child reacts negatively, the problem belongs to the dentist. Often, the first attempt to resolve such a problem involves giving orders to the child, such as "You must stop crying!" and "You must sit still!" These messages tell children that they have no control over the situation, no matter what they are feeling. This is not an unusual scenario:

Case 6.8

Dr. F. is fitting a band on five-year-old Harry's maxillary second primary molar. The saliva-covered band is slippery. The child, who has a small mouth, whimpers and fidgets in the dental chair. Dr. F. is afraid of dropping the band in Harry's mouth and says, "You must sit still and stop crying!"

Case 6.8, Discussion: Most people (including children) do not like to be told what to do, and this approach often increases their resistance. These are "you" messages such as "You are too old to behave like that!" or "You know better than that!" These are negative messages that undermine the rapport that a child could develop with the dentist.

An alternative is to send "I" messages. Effectively communicated, "I" messages establish the focus of the problem where it belongs. They are not negative evaluations of the child, but they identify a problem and establish ownership of it. For example, "I can't fix your teeth if your mouth is not open wide" and "It will take me a lot longer to fix your teeth if you don't open your mouth wide!" The "I" statements are more than just a change in phrasing from "you" statements, which carry an evaluative statement about the child—the "I" statements disclose how the dentist is feeling. They describe a situation that needs to be altered if the dentist is to be able to solve the problem.

Wepman and Sonnenberg (1979) discussed a set of techniques that seemed well-suited to increase the flow of information between the dentist and child patient. Owning the problem and active listening are the first two steps. Both encourage genuine communication. The patient is stimulated to express feelings, and the dentist does the same—a necessary process in communication. If the child behaves in a way that causes an emotion in the dentist, the dentist can and should express, within reason, not only the quality of emotion, but also its strength. Consider the following straightforward approach with a whining child: "Please don't cry. It makes me feel bad. I don't like to feel bad. I like to feel good! You like to feel good too. So, why are you crying?" This brings the problem right to the surface and the dentist is prepared to listen.

4. Non-Pharmacologic Clinical Strategies

Management techniques should be part of an integrated patient approach (Forehand and Long 1999). They contend that it is not a matter of choosing among techniques

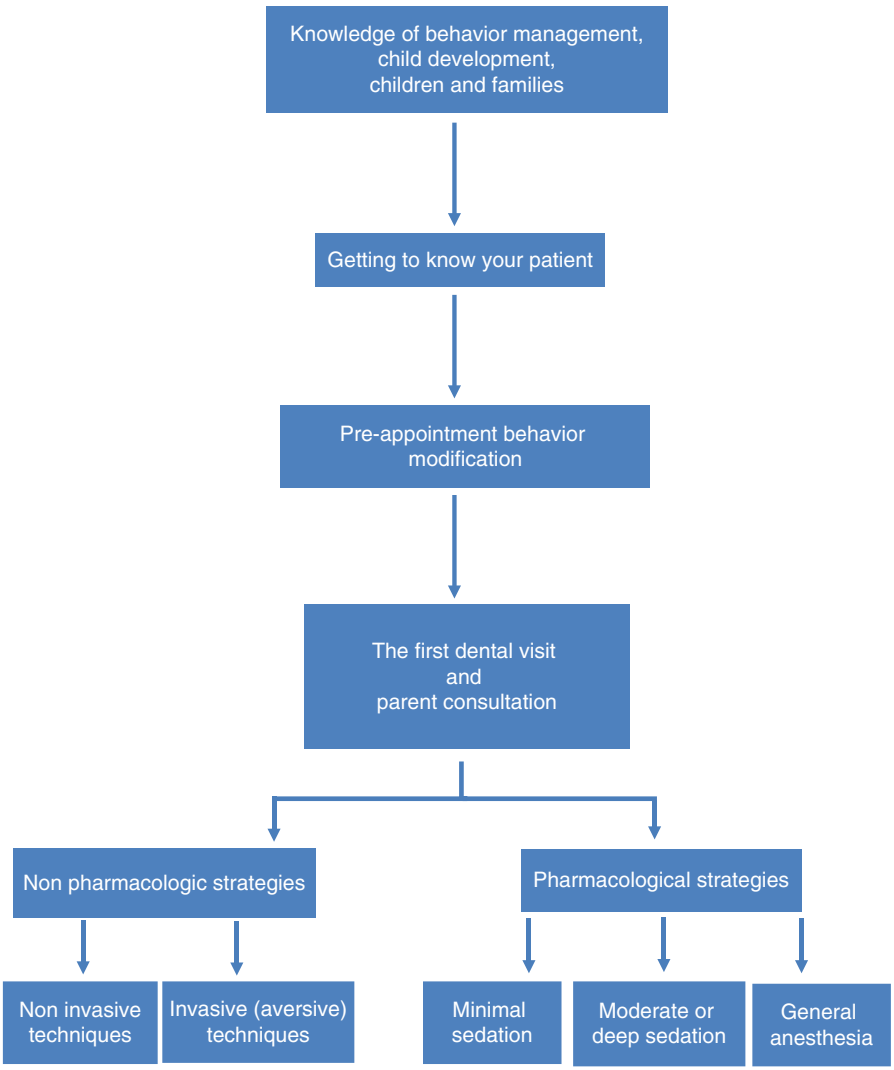

Figure 6-4. This behavioral management plan or flow chart illustrates that the treatment of a child is complex. It involves knowledge of child development, family environments, and behavior management combined with a variety of potential strategies.

but a matter of incorporating the best techniques into a plan. A flow chart or plan for behavior management is shown in Figure 6-4. The flow chart begins with learning about child development, children's behavior and family environments. These are the topics of earlier chapters in this book. Gaining knowledge about families and children is important to behavior management. It is comparable to dentists learning dental material science before performing operative dentistry.

Getting to know your patient is the next stage of the continuum. This was discussed earlier in this chapter. Probing for information and responses from parenting can direct the future management technique.

A review of the literature reveals that there are many sources of uncooperative behavior. Most of these behaviors, however, can be attributed to manifestations of anxiety. Thus pre-appointment behavior modification, discussed earlier in this chapter, is an important part of the behavioral plan.

The plan escalates in intensity as the dentist (or dental hygienist)-child patient interaction occurs during the first visit. Usually, this involves the oral examination and taking any necessary radiographs and perhaps includes a dental prophylaxis and oral hygiene instructions. At this time, if the child requires treatment, the dentist has to determine what management technique will be recommended. Discussion with a parent ensues and the examination findings, course of treatment, and management strategies are discussed.

The American Academy of Pediatric Dentistry (2011) lists numerous management techniques in their guidelines. Some of these are more acceptable to parents than others. In an attempt to explore their acceptability, a group of studies have been conducted

Table 6-4. A comparison of the ranking by parents of their acceptability of behavior management techniques in three studies.

Murphy et al., 1984	Lawrence et al., 1991	Eaton et al., 2005
1. Tell-show-do	1. Tell-show-do	1. Tell-show-do
2. Positive reinforcement	2. N2O	2. N2O
3. Voice control	3. Voice control	3. General anesthesia
4. Physical restraint	4. Active restraint	4. Active restraint
5. Hand-over-mouth	5. Hand-over-mouth	5. Oral premedication
6. Sedation	6. Papoose board	6. Voice control
7. General anesthesia	7. Oral premedication	7. Passive restraint
8. Papoose board	8. General anesthesia	8. Hand-over-mouth

The table was adapted from Eaton et al. (2005). It has been altered slightly to include those techniques that were part of all three studies. Eaton's study was conducted in 2003, but published in 2005.

over two decades. These studies showed videotapes of management techniques to parents while treatment was performed. Parents rated their acceptability of management techniques using a visual analogue scale (VAS). The findings are presented in Table 6-4. It was noted that while a technique may be rated higher or more acceptable than another technique, sometimes the VAS differences were small.

The study by Eaton et al. (2005) concluded that the mean parental ratings were in the acceptable range for all techniques in the study, except for hand-over-mouth. Interestingly, there were large standards of deviation associated with the techniques, indicating considerable variability in parents' attitudes. Comparison of the three studies shown in Table 6-4 reveals that parental attitudes changed over the two decades. While tell-show-do is rated consistently as the most acceptable technique in all studies, the rankings show that general anesthesia has increased in acceptability over the past two decades. Passive restraint (Papoose Board) has been in the lower range of acceptability in all studies, and hand-over-mouth acceptability has progressively decreased over the years, making it the least acceptable in the latest survey.

Data from these studies helps the clinician to select management techniques, but this data has limitations. Parental attitudes change over time. Thus, it is important to keep abreast of new surveys and studies. The children's past dental experiences, which could have influenced the findings, were not explored. The authors noted that it would have been desirable to include more parents and patients from private practices. Social and cultural variables could influence parental attitudes. Nonetheless, before making any management recommendation, dentists should be aware of the acceptability of techniques regionally.

Non-pharmacologic techniques may be classified in different ways. There are those that are non-threatening, which Roberts et al. (2010) refer to as universally accepted techniques. Another group of techniques—those that are used with uncooperative children—limit the movements of child patients. They have been referred to as controversial techniques, and they are not universally accepted. Another way of classifying the two groups of techniques is to refer to them as "non-invasive" or "invasive."

The remainder of this chapter will describe non-pharmacological techniques that are used in pediatric dentistry. Those that are non-invasive include: tell-show-do, behavior shaping, reinforcement, operant conditioning, modeling, voice control, desensitization, visual imagery, humor, distraction and contingency distraction, and parent presence/absence. The invasive techniques are hand-over-mouth (HOM) and physical restraint.

Tell-show-do (TSD)

This technique was formalized and developed into a training technique by Addelston (1959). Specifically, the TSD procedure is as follows. The dentist explains to the child what is going to be done in language that the child can understand. This is done as slowly and with as much repetition as necessary until the child is aware of what the procedure will be. Lengthy, complicated procedures are broken down into steps for easier communication. Armed with the knowledge of language development at various ages, the dentist and all office personnel can use the "tell" portion of the technique advantageously by phrasing instructions with words that are at the child's language level. Second, the dentist shows the child what will be used, and how it works (e.g., hi-speed drill) and how the procedure will be carried out, demonstrating on an inanimate object to be sure that understanding is complete. Third, without deviating from the explanation or demonstration, the practitioner proceeds directly to perform the previewed operation.

When demonstrating to the child, all team members must be fully aware of their transmitting roles. Sudden movements or unexpected noises should be avoided, as these changes can disrupt rapport. An X-ray machine, for example, is large and potentially frightening. After talking about it and demonstrating its use on yourself or an assistant (with the current off), introduce the machine by bringing the X-ray head slowly to the child. Noisy instruments should be demonstrated to children at a distance to avoid startling them. Gradually bring the instrument closer for demonstration and inspection. Operating a hand-piece without touching the child, or letting the patient feel the vibration without cutting the

tooth, allows the child to extinguish any learned association between noise and vibration and pain and undesirable behavior. This is a desensitizing technique or, as it is sometimes called, "approach by successive approximations."

The TSD method can be used on a young child who lacks dental preconditioning at a first visit. It can be used for a child who is fearful because of a prior painful experience in another dental office, or for one who is apprehensive because of information received from parents or peers. The method permits the child to learn a stimulus-response association. It allows the dentist to complete procedures properly and provides a satisfying experience for both individuals. The child visiting the dentist for the first time learns by successive approximations. The dentist or dental team member leads the child step by step.

Nothing evokes fear or anxiety more than the unknown. In the TSD technique, attempts are made to remove the unknown. However, one simple piece of armamentarium is important to the technique and often overlooked: a mirror (Figure 6-5). If a mirror is not used, how can a child see a rubber dam on the tooth? Although the mirror may sometimes interfere with the working area, it is a small inconvenience when the end result is considered.

The TSD technique works because it avoids the fear of the unknown, but another factor that really makes it effective is consistency in not hurting the child. Over the years, the TSD technique has not been used as a preface to local anesthesia. Some clinicians are of the opinion that showing the child the needle and syringe, more often than not, leads to a breakdown in dentist-patient rapport. Because the administration of local anesthesia plays a significant role in a daily pediatric dentistry practice, two conflicting views should be considered.

The proper use of topical anesthetic provides the dentist with the means to inject painlessly, or with a minimal amount of discomfort. The topical anesthetic is applied to the injection site for at least one minute before needle insertion. In addition, the child can be distracted. Many dentists cease conversation at this time. This is an oversight that is likely due to stress. Conversation can be a distractor. Some are of the opinion that the sight of the needle can be frightening and suggest that the child need not see the syringe if it is carried properly to the mouth.

On the other hand, Addelston (1959) used TSD during local anesthesia administration with great success. He advocated letting the child observe the injection with a mirror. Since this is the only procedure omitted in the TSD technique, he has contended that its omission builds fears in children. He has suggested that many clinicians perhaps do not allow children to observe injection procedures due to their personal concerns and apprehensions. Thus, there are two opposing attitudes toward using TSD and the injection technique. Again, clinicians are charged with the responsibility of determining which method works best for them and their patients.

Figure 6-5. The child patient holds a mirror during treatment. If the patient is unable to see what is happening, then tell-show-do is not really occurring. Note that the large mirror blocks the light (top). Use of a small mirror is recommended so that the light is not blocked (bottom).

Behavior shaping

By definition, behavior shaping is that procedure which very slowly develops behavior by reinforcing successive approximations of the desired conduct until it comes to be. Thus, this technique is a simple method of teaching the child step-by-step what is expected in the dental operatory. At the same time, it is a procedure which obviates apprehension. Behavior shaping can be looked upon as a form of behavior modification because it is used to alter conduct according to established principles. The method is used with children who demonstrate sufficient

cooperation to establish communication. With those who demonstrate negative behavior, a reasonable level of cooperation must first be established.

For both Behavior Shaping and TSD, an office's dental team members should follow an established office protocol for introducing new procedures or instruments to children. That protocol might be:

1. State the goal at the outset. "Today we are going to check your teeth."
2. Divide the explanations. "First, we have to count your teeth. We will count the upstairs teeth first. Now, we need to count your downstairs teeth. Next, we have to feel your teeth to make sure they are strong. Let me show you my tooth feeler. This is how I use it (placing explorer on finger nail)."
3. Use age appropriate language. For young children, use euphemisms.

Behavior shaping is a learning model. It is well-recognized that programs which most closely follow the learning theory model will be the most efficient. Those which deviate from the model will be less efficient, with the loss of efficiency directly related to the amount of deviation from the model. Thus, by developing an understanding of psychological principles and by modifying familiar techniques to better fit the model, improved results in the practice of behavior management can be obtained.

Although TSD and Behavior Shaping are similar, there are some subtle differences. They are:

1. Behavior shaping requires positive behavior throughout the procedure. TSD makes no mention of the reactive behavior.
2. Behavior shaping allows retracing of steps. If you have completed telling the child about the procedure and the child looks away when showing an instrument, the clinician has to return to the telling stage. To get the child's attention, it may be necessary at this point to speak firmly to the child.
3. Behavior shaping includes positive reinforcement throughout. TSD makes no mention of reinforcement.

Positive Reinforcement

An integral part of behavior shaping is reinforcement. In the process of establishing desirable patient behavior, it is essential to give appropriate feedback (AAPD guidelines 2011). Positive reinforcement is an effective technique to reward desired behaviors and strengthen their recurrence.

Reinforcement is an important concept of learning theory. If a response results in obtaining a goal, this response is rewarded or reinforced. A stimulus such as a painful tooth is the motivation for a child to visit the dental office. The visit is the response. The elimination of pain is the goal. A pleasant appointment resulting in oral comfort satisfactorily attains the goal, and therefore rewards or reinforces the child's behavior. Similarly, if a child is afraid of injections, and the dentist convinces the child that there will be no pain, delivering a painless injection reinforces the positive cooperative behavior that has been attained.

There are different types of reinforcements. Consider a child who is receiving instructions. During this conversation and any subsequent explanations or demonstrations, when there is a positive response to a suggestion the child is reinforced by a smile and a variety of sounds of approbation (verbal social reinforcers)—"right" or "great" or "that's good." Most reinforcements of everyday life are social in nature. A smile reinforces behavior because the person who is smiling is more likely to supply subsequent reinforcements than one who is not (Ferster 1964). Even a small child has learned this fact. Consider this scenario in which the child is having a tooth restored.

Case 6.9

Dr. A.: "We are almost finished with the job. You are being a good helper!"

A little while later:

Dr. A.: "Can you open your mouth a little wider? Oh, you are a good helper!"

A little while later:

Dr. A.: "Jimmy, can you open your mouth a little more? What a good helper!"

Case 6.9, Discussion: Three times the dentist congratulated Jimmy by telling him that he is a good helper. There is nothing wrong saying that, but it is not an effective reinforcement. "You are a good helper!" is a general statement. For the compliment to be truly effective, the reinforcement has to be specific. When children are rewarded specifically, such as "you are really helping me by opening your mouth wide," the reinforcing statement unsurprisingly causes the child to open wider.

Clinical research in psychology has confirmed that immediate reinforcement is more effective than delayed rewards in enforcing behavior shaping and modification. Skinner (1953) demonstrated the existence of a temporal gradient. Accordingly, reactions followed by immediate reinforcement are better learned than those more removed from the reinforcement. The more immediately reinforcement follows the response, the stronger the association between the cue (good behavior) and the

response (verbal approval). The desired behavior will be learned more readily.

The value of immediate social rewards cannot be overstated. Complimenting a child immediately on any aspect of their behavior which we would like to reinforce should be an integral part of the conversation in the dental office. Praise should concern the child's efforts and achievements, not his personality attributes. This is what immediate social rewards should sound like: "Wow, you're really helping today. I didn't know you could open this wide," or "You are the best patient we've had all day." These comments should come not only from the dentist but from all the members of the staff. The reinforcements, of course, are used only for acceptable behavior.

Any excuse can be used for a compliment. If a child is whimpering or fidgeting, try to ignore it. Consider it minor inappropriate misbehavior. When the patient stops for a while, that is the point to reward the correct response. "Now you're doing great. You are sitting really still. I hope you can keep it up." If the inappropriate response occurs and is not reinforced, the strength of the response progressively decreases and it is eventually eliminated. Consider the following strategy for five-year-old Ralph, who is scheduled for a one-hour restorative appointment. After fifteen minutes, this conversation occurred.

Case 6.10

Ralph: "When can I go home?"
Dentist: "Soon you can go, Ralph."

Five minutes later:
Ralph: "When can I go home?"
Dentist: "It will be a little longer."

Case 6.10, Discussion: Ralph continued to ask similar questions, slowing the progress of the appointment and irritating the dental team. Note that the dentist did not give Ralph an exact estimate of the time. Saying forty-five minutes would likely mean little to him. However, this was not the problem. By replying to Ralph's questions, the dentist gave the child attention, thereby reinforcing the undesirable attention. A better approach might have been not to reply to the first question and in reply to the second question, simply say "This will take quite a bit longer. When you ask me that, I have to stop working, and it makes it slower. So, I can't stop to answer your questions anymore." When a response occurs but is not reinforced, it can eventually be eliminated. This is an example of response extinction. However, when inappropriate behavior—such as raising the hand, clutching at the operator's arm, or moving the head from the headrest—interferes with the treatment, social aversive conditioning by means of voice control will suppress the response. This is especially effective if an alternative response is available for obtaining positive reinforcement. One could say, "No, don't do that," in a loud, firm tone. Then, in a warm, friendly tone, say, "That is better, good." Children will work for rewards and try to be deserving of them.

Overt demonstrations of affection, such as holding and kissing the small, young child, are also a type of immediate social reinforcement useful in maintaining a behavior pattern. However, if the dentist is not customarily overtly affectionate or demonstrative it may be awkward, and both the dentist and the child may be uncomfortable. It is better to be natural. Touching a young child or holding his hand is fine, or an affectionate arm around the shoulder may suffice. These demonstrations of affection, however, have their limitations. Children over nine or ten years of age have reached a more independent stage and can be very aloof. They may feel uncomfortable in this kind of close situation and may take offense when affection is demonstrated. Parents, too, may object to this type of reinforcement, especially with older children. Even children who have been with a practitioner from the age of two or three may be offended by the "touching" display of affection that is used for reinforcement or rapport maintenance.

Finally, reinforcements or rewards also can be described as intangible or tangible. Verbal compliments are intangible rewards. Prizes or tokens are tangible and particularly effective with some patients. However, in some offices they are given indiscriminately at the end of an appointment. Rather than serving as a reward, they are given automatically and have little meaning.

Operant conditioning

One method of behavior modification that has been effective in beneficially altering children's behaviors is operant conditioning. It involves verbal reinforcements followed by tangible rewards. Children are praised verbally, and approval of their behavior is acknowledged. Token systems are used as a tangible reinforcement. Tokens may be many different things: stars, points, poker chips, check marks on a chart, or stamps. When the child has accumulated a sufficient number of tokens, they can be exchanged for back-up reinforcements such as toys, badges, a favorite activity, or food (with a parent's approval). The initial token may not elicit much of a response from a child, but the back-up reinforcements acquire important reinforcing properties. Operant conditioning usually occurs over several appointments. Therefore, unless a child has a

lengthy series of appointments, such as for orthodontic treatment, it likely is not the best strategy to use.

It is clear that positive reinforcement is an important part of tell-show-do, behavior shaping, and operant conditioning. It is more than simply saying "You are a good helper." Rosenberg (1974) points out that "one should learn and then practice to praise effectively." A learned response does not always remain strong, so reinforcement should occur whenever possible. In S-R theory, consistency is critical when reinforcing behavior or ignoring behavior. Otherwise, learning does not happen.

Modeling

A description of the modeling procedure in conjunction with pre-appointment behavior modification was provided earlier in this chapter. Modeling, however, can also serve as a management technique. It can be useful in many ways, but it is particularly helpful in dealing with the adolescent needle phobic patient. As practicing pediatric dentists are aware, these children present some of the most challenging management problems. Wright et al. (1983) described a plan, incorporating psychologically valid principles, to deal with these problem cases. Part of the plan involves the use of nitrous oxide analgesia. However the nitrous oxide sedation alone is likely to fail in these difficult cases. Wright suggests augmenting the procedure with modeling and reinforcement. The modeling can be done with a videotaped procedure or a live model. The advantage of live models is that they can answer questions and explain to the needle phobic patient that they, too, used to be afraid of needles. It is advantageous if the model is of the same sex and close to a similar age. This procedure is an example of expanding behavior management technology that has been urged by behavioral scientists (Kuhn and Allen 1994).

Voice control

This technique was mentioned briefly in the communication section, as it is a communication technique. It is also a management technique. There can be a fine distinction between communication and patient management. The general goal of communication is to impart understanding, whereas that of patient management is to encourage cooperative behavior.

When using voice control for management, sudden and firm commands are used to get the child's attention or to stop the her from whatever she is doing. Once the dentist has the child's attention, conversation should revert to a quieter tone. Monotonous, soothing conversation is supposed to function like relaxing music to set the mood.

Chambers (1976) theorized that voice control is most effective when used in conjunction with other communication, such as tapping a child on the chest or clapping the hands loudly. In these cases, it is what is heard that is important because the dentist is attempting to influence behavior directly and not through understanding. A sudden command to "stop crying and listen to me" may be a necessary preliminary measure, preparing the way for future communication. The same message shouted in a foreign language would probably be equally effective in stopping disruptive patient behavior that is preventing proper communication.

Turner et al. (1988) conducted one of the few studies to determine the effectiveness of voice control. Study subjects three to seven years old were assessed as potential management problems and were assigned randomly to an experimental group (voice control group) or a control group (no voice control). Restorative treatment was performed and treatment sessions were videotaped. Whenever behavior interfered with treatment, the dentist used firm voice tones. In the group with no voice control, if the children misbehaved, the dentist asked them to desist in a normal, conversational voice. The investigators found that children in the voice control group showed less disruptive behavior immediately after the use of a firm voice than the no-voice counterparts. This is one of the few studies to provide empirical data on this technique.

The American Academy of Pediatric Dentistry (2012) succinctly stated that voice control guidelines are (1) to gain the patient's attention and compliance, (2) to avert negative or avoidance behavior, and (3) to establish adult-child roles. The latter refers to establishing authority in dealing with the uncooperative and inattentive but communicative child patient. The dentist, however, must realize that this technique is not acceptable to all parents. In Eaton's study (2005), voice control was in the lower range of acceptability; therefore, if a parent is present, they should be informed about the technique beforehand.

Desensitization

Another method of behavior modification used in dentistry is desensitization. Systematic desensitization, or reciprocal inhibition as described by Wolpe (1969), is the elimination of anxiety response habits by first presenting a stimulus that evokes a mild response. When it no longer causes anxiety, progressively stronger stimuli are introduced until direct control is exerted over the strongest anxiety-producing stimulus. Desensitization involves patient training in progressive deep muscle relaxation. The bond between the stimulus and the anxiety is gradually weakened in the presence of relaxation.

Anxiety and deep muscle relaxation are incompatible and do not occur together.

Unless the clinician is very keen to use this technique, desensitization may be impractical for use in the dental office. It is time-consuming. The clinician also requires special training for it to be effective. It has been included, however, for the clinician to gain an understanding of the technique and to realize that some psychologists can help dental patients by using this approach.

Contingency and distraction techniques

Distracting a child from a potentially difficult or painful procedure is a well-established technique in pediatric dentistry (Allen et al. 1990;Ingersoll et al. 1984; Venham et al. 1981). Many types of audio-visual distractors have been used in either a contingent or non-contingent format, some of which are described in Chapter Sixteen. Verbal distraction also is used effectively during local administration.

Overall, contingency studies have yielded mixed results. Nonetheless, they offer some interesting approaches to behavior management and may be the way of the future. They are also practical as the clinician does not have to invest in special training or equipment. The two contingency techniques that have received attention from behavioral scientists are contingent distraction and contingent escape (Kuhn and Allen 1994). Both are designed for the child who is not cooperating in the dental clinic.

Ingersoll and colleagues (1984) suggested that children's disruptive behavior can be reduced by using a distractor such as an audio tape, which is dependent (contingent) on cooperative behavior, as opposed to providing unlimited access to audio tapes. In the experimental group, three- to nine-year-old children were informed that they could listen to taped material through headphones as long as they were cooperative. If the child became disruptive or uncooperative, the dentist immediately terminated the audio presentation and did not reinstate it until the child exhibited cooperative behavior. The children in the contingent group decreased levels of disruptive behavior, whereas the non-contingent control group had no behavioral change.

Contingent escape takes advantage of the powerful motivation to escape, and uses it to promote more cooperative behaviors. It is based on "raising the hand" to stop treatment, which is a non-verbal management technique that allows a child some control over the dental routine. In contingent escape, brief periods of escape from ongoing dental treatment are provided contingent upon cooperative behavior. Instead of raising a hand, the child can receive praise and brief escape from dental treatment by simply being very still and quiet. Any disruptive behavior by the child delays escape until cooperation is regained.

Contingent escape is based on well-established learning principles and is designed to not only diminish undesirable behavior, but to increase desirable behaviors (Kuhn and Allen 1994). Delayed consequences not tied to specific behaviors fail to teach children how to behave. Contingent escape provides immediate feedback to teach children more adaptive coping behaviors.

Visual Imagery

In the original edition of this book, there was a chapter on hypnosis. Hypnosis is not used by many practitioners today. It is time consuming and requires special training, so it has been omitted. However, visual imagery, which seems to be hypnosis-based, is a technique that can be helpful in certain situations. The visual imagery technique is believed to work with children because they have good ability to imagine and fantasize. The approach may be effective for the elimination of phobic behavior without the disadvantage of the time required to train the patient in relaxation techniques.

Ayer (1973) describes visual imagery where children were asked to imagine that they were playing with their dogs and that the dogs were yelping louder and louder. The children were asked to open their mouths and sit as still as possible. The clinician talked constantly throughout the visits, distracting the children with the imagined setting.

Ayer reported on the successful treatment of three ten-year-old patients who were identified as needle phobic. All of the children cooperated fully and displayed only moderate anxieties during the injections. Each child had three appointments during which extractions were completed. Subsequent contact with the parents of these children, as well as the children's own comments, indicated that the youngsters were no longer fearful of injections and they were now model patients.

Ayer emphasizes an important ingredient for effecting behavior change, indicating that a necessary variable in the successful application of behavioral change techniques—and one that is seldom noted—is time. Behavior change requires both time and patience on the part of the clinician. The time factor, he theorizes, may be one of the main reasons that the recommendations of behavioral scientists are so slow to be implemented in the dental office.

Ayer's writing seems to have gotten lost in the historical literature. Those interested in using visual imagery will find it well worth their time to read Ayer's original paper. The technique has application in the dental office—particularly with needle phobic adolescents.

If the Ayer technique is combined with nitrous oxide analgesia, it can be extremely effective in solving needle phobic cases (Wright 1979).

The Use of Humor

Planned humor assessment and interventions are relatively recent in medical and dental care. However, in recent years there has been a general acceptance of the role of humor in building and maintaining relationships, emotional health, and cognitive function. This part of the chapter will discuss the development of humor and how it can be used to improve conventional management techniques. An understanding of this development will assist pediatric dentists in anticipating the various types of humor unique to each stage of childhood and develop individualized humor interventions (Dowling 2002).

A full discourse on humor theory is beyond the scope of this text, but certain basic definitions are essential. From a psychological perspective, humor involves cognitive, emotional, behavioral, psycho-physiological, and social aspects (Mora-Ripoll 2010). In general, the term "humor" can refer to a stimulus (such as a video), which is intended to produce a humorous reaction—a mental process (perception of amusing incongruities) or a response (laughter, exhilaration). Humor and laughter are typically associated with a pleasant emotional state. For the purpose of this discussion, humor is defined as a stimulus that helps people laugh and feel happy. Laughter is a psychophysiological response to humor that involves both characteristic physiological reactions and positive psychological shifts. Sense of humor is a psychological trait that varies considerably and allows a person to respond to different types of humorous stimuli.

Two main theories explain the functions of humor: the relief theory and the incongruity theory. According to the relief theory, which focuses on the relief of tension, people experience humor and engage in laughter because they sense that stress is reduced in doing so (Kuiper et al. 1993). The incongruity theory focuses on contradictions between expectations and experiences. It purports that people laugh at things that surprise them or that violate an accepted pattern—with a difference close enough to the norm to be non-threatening, but different enough to be remarkable. The incongruity theory emphasizes cognition (Wilkins and Eisenbraun 2009).

Using a cognitive approach to humor, McGhee (2002) developed a theory which traces the development and appreciation of humor in children through defined stages and continues to form the framework for research in this area. It contains six stages, each based on the children's cognitive abilities that enable them to recognize and produce cognitive incongruities (Cunningham 2005). A summary and description of these stages is presented in Table 6-5. The first two stages of child development (Stages Zero and One) are interesting, but Stage Two (12–15 months to 3–5 years) and later stages have more clinical relevance. Understanding the developmental stages can be of practical benefit to dentists who are interested in using humor effectively in the dental setting.

Treating an Object as a Different Object

At Stage Two, children begin producing "jokes" nonverbally by performing incongruous actions such as putting a bowl on their head as a hat or pretending to talk into their shoe. These jokes are any incongruous actions with an object. Another form of typical humor is using the correct object, but applying it to the wrong object; for

Table 6-5. Stages Of Children's Humor as described by McGhee (2002). Reproduced with permission of Paul McGhee.

Stages	Example	Dental Application
Stage 0: First 6 months. Laughter without humor (the pre-humor stage).	Tickling	Smiling and making funny noises
Stage 1: 6 to 12–15 months. Laughter at the attachment figure.	Peek-a-boo	Counting fingers and continuing to tickle the arm
Stage 2: 12–15 months to 3–5 years. Treating an object as a different object.	Using a bowl as a hat	Finger as a toothbrush
Stage 3: 2–4 years. Misnaming objects or actions.	Calling a cat a dog	Misnaming colors calling a mirror blue or a chair red
Stage 4: 3–5 years. Playing with word sounds (not meanings).	"Daddy, Faddy, paddy"	While using the nasal mask tell patient to breathe through their *nose* and not through their *toes*
Stage 5: 6–7 years to 10–11 years. Riddles and jokes.	Why did the boy tiptoe past the medicine chest? He did not want to wake the sleeping pills.	Q. What flowers are the kissing flowers? A. Tulips. Q. Why did the tree come to the dentist? A. To get a root canal.

example, the child may ask: "Brush ear?" In these cases, the same behavior may be just as funny if it is the mother, father, or another sibling who initiates it (McGhee 2010). This stage is significant since it presents the earliest self-created humor. It is the parallel of incongruous actions toward objects from the initial McGhee system of humor development.

In Stage Three, children from two to three or four years of age begin to misname objects or actions. Once the child's vocabulary increases, the young child can extend incongruity humor to misnaming objects or actions: calling a cat a dog, calling a shoe a sock. After age two, parents are asked by their child to name people and things. Toddlers are very excited by the realization that everything has a name, and they begin playing with those names. Many parents first see this new form of humor in the "Show me your nose" game. Even if the parent has always played the game straight, the day always arrives when the child is prompted to "Show me your nose," and exhibits a mischievous grin and points to his or her ear. The child may or may not laugh, but there's no doubt that this is pretty funny to them.

At Stage Four, children ages three to five years start to play with word sounds, if not their meanings. As children's verbal competence grows, they are less dependent on objects as the source of humor. The preschooler may experiment with rhyming words, made-up silly words, and other humorous play that does not directly link to concrete objects within their reach. Many children are especially fond of the verbal expression of humor found in stories and poems like Dr. Seuss' The Cat in the Hat. Humor includes playing with word sounds—not meanings—altering funny words or creating nonsense words. Children become attuned to the way words sound, and begin playing with the sounds themselves. This often takes the form of repeating variations of a familiar word over and over, such as: "daddy, faddy, paddy" or "silly, dilly, willy, squilly" (McGhee 2002). In the latter part of this stage, previously labeled "Conceptual incongruity," there is a dramatic change in the form of humor which emerges due to the fact that children begin to develop conceptual thought (Louizi 2006). Humor is centered on violations of conceptual representations: conceptual incongruity (McGhee 1979). An example of humor based on violation of conceptual representations is a cartoon of a picture of a bicycle with square wheels, or an elephant sitting on a tree limb (Dowling 2002).

In Stage Five, at ages six or seven to ten or eleven years, a general shift in children's humor toward riddles and jokes begins to occur. While the general silliness common in much of the humor in younger children's physical play is still present, there is a gradual reduction in the degree of reliance on physical action for humor. The defining feature of this stage is the acquisition of a new level of cognitive functioning, which permits simultaneous awareness of double meanings of the same word—the key to getting a riddle. (e.g., Q. What are the kissing flowers? A. Tulips.) The shift that occurs in children's humor at about age seven is more striking than that shown at any other age (McGhee 2002). By seven, most children make the exciting discovery that the same word can have two different meanings, and that one can use this revelation to trick others. As they develop, they begin to understand that humor has a meaning—that jokes must resolve from something absurd into something that makes cognitive sense. The pediatric dentist should consider the child's stage of humor development and design and employ the proper use of age-appropriate humor.

Although the role of humor in health has been emphasized in recent years, little has been written about using humor as a communicative tool with children (D'Antonio 1989), particularly in dentistry (Nevo and Shapira 1986). Since humor reduces the emotional distance between people, it has the potential to improve communication not only with children, but with parents as well (Bennett 1996). Humor can assist the pediatric dentist on all levels by relieving anxiety and pain, and establishing a direct path of communication with a new child patient.

Case 6.11

Sue, age four, arrived for her visit accompanied by her older sister Ann, age seven, and their mother. Dr. Patty came into the waiting room to greet the patient. She asked Sue what her name was. Sue ignored her. She asked her how old she was; Sue refused to answer. Dr. Patty tried one more time; she complimented Sue on her shoes and asked where she got them. Sue ran behind her mother and refused to speak with the dentist. Sue's mom showed signs of apprehension.

Case 6.11, Discussion: Greeting patients is the first part of the dental encounter and experience. It often sets the tone for the entire visit. One of the most critical challenges facing the dentist during the patient's first visit is opening up a direct channel of communication with the child, effectively bypassing the parent and talking directly to the patient. Some of the well-known techniques to open communication are complimenting a child about their clothing or asking their name or age. Dr. Patty tried all of these greetings, but Sue refused to communicate with her.

In cases like this, humor can be used to achieve effective communication in several ways. Asking a child their age is often followed by a non-verbal response: they may

identify their age by holding up the appropriate number of fingers. At this point the dentist may employ humor to break the ice by miscalculating the age or exaggerating the age: "Oh, you are already eight!" the child being only four or five. If two siblings are present, and one is obviously taller and older as in the case, the conversation begins: "Who is older?" Addressing the obviously younger child, "Are you older than your sister? I thought you were older but just shorter." Or, as in our case, if the older child answers and identifies herself as Ann, the dentist turns to the younger sibling and asks if her name is also Ann. Most children will immediately answer with a smile and laugh—their name is not Ann! The parent will also laugh in the background and the child will excitedly reply that her name is Sue. Once the child reacts and answers the dentist, the channel of communication has opened. Conversation may continue, "I am happy to meet you. By the way, my name is Dr. Patty, what is your name? I forgot!" Most children now will reply with their name. Most importantly, the effect of humor is cumulative and children relax, expecting more fun to occur. Humor also affects parents, who in turn radiate a relaxed feeling to their children.

Humor can continue. Bennett (2003) suggested asking about the characters with whom children identify, and then making mistakes. "Winnie the Pooh is a horse, right?" While tapping teeth, the dentist can make silly noises. Tap the nose. Get mixed up while counting teeth. During the use of nitrous oxide the child is instructed to breathe "through your nose and not through your toes, it's hard to breathe through shoes!" Ask the patient, "Do you like pickles, shmickels or tickles?"

Whatever you do, it is important for the dentist to adopt a style that is comfortable and natural. The cumulative humor effect creates a good feeling, and parents and children anticipate returning for their next visit with a smile.

Parent presence/absence

Controversial views exist among pediatric dentists as to the benefit or detriment of parental presence during a child's dental treatment (Figure 6-6).

Since the issue of the "parent in or out" as a general policy was discussed in Chapter Four, it is included here as a legitimate non-pharmacologic technique for child management. Most dentists welcome a parent in the treatment room as long as the child behaves. Dentists are able to demonstrate their expertise to parents when their patients cooperate. The problem arises when the dentist must deal with an uncooperative, defiant child. One treatment modality for such children, which is becoming increasingly common, is treatment with pharmacological agents; however, this may be unnecessary and perhaps detrimental to the overall well-being of the child.

Parental presence/absence is not a rule, but it can be used as a tool for successful patient management. Consider the following clinical situation and how separation may be used to manage the child.

Case 6.12

Bobby, five years old, appeared for his first dental visit. In the functional inquiry it was learned that Bobby had visited two other dentists unsuccessfully, leaving the offices without an exam. His mother had mentioned to the dental receptionist that other dentists were incapable of getting him to open his mouth for an examination.

Bobby was now seated on the dental chair. When Dr. Steve asked him to open his mouth, he refused. He also refused to answer questions such as "what's your name?" Ignoring the question, Bobby made a face toward his mother. At this point, his mother jumped into the conversation and answered on his behalf: "Bobby."

Dr. Steve: "How old are you?" Once again, Bobby ignored the dentist. Dr. Steve responded with a stern and disappointed look. Seeing the dentist's reaction, Mommy reassured Bobby: "The dentist won't hurt you! He won't do anything to you! I'll stay with you the whole time!" She moved her chair closer to Bobby and held his hand.

Dr. Steve told Bobby that he must open his mouth so he could count his teeth. Bobby ignored him. When asked again, Bobby screamed. Dr. Steve asked Bobby to stop screaming so that he could hear what he has to say. Bobby looked at his mother. Ignoring the dentist, the child placed his hands on his ears and screamed. Dr. Steve responded in a firm but controlled voice, displaying displeasure with Bobby's behavior: "Bobby, place your hands on your lap! You're expected to behave in here."

The dentist gently tried to move Bobby's hands away from his ears. Immediately, the child's mother interrupted and sternly told the dentist not to touch Bobby. She said with obvious annoyance: "Dr. Steve, Bobby will behave better if you don't get angry with him and use that tone of voice."

Case 6.12, Discussion: For a dentist to deliver safe and effective dentistry to a child, a proper pediatric dental triangle needs to be established. In the scenario described, this was not the case. The child did not relate to the parent and dentist as a team. Rather, the parent

acted as the child's surrogate or protector, shielding him from the dentist. The ultimate authority in the dental office, in the child's view, was the parent, not the dentist. Dr. Steve was up against both Bobby and his mother, reflecting a non-functional pediatric dental triangle as denoted by Figure 5-2. A change needs to be made immediately to create a functioning pediatric dental triangle. The dentist has to gain control of the situation. The child has to understand that the dentist and parent are on the same team. He needs to pay attention and communicate directly with the dentist. In this type of situation, parental exclusion or separation may be used to re-establish the proper child-dentist-parent relationship. Once a parent is asked to leave the operatory, and the child adjusts to the new relationship, the parent may return. If the child's behavior reverts to the former negativity, the parent again is asked to leave. This scenario may repeat itself one or two times. Everyone has to understand that the parent's role is passive and the dentist is in charge. When this has been established, the parent may remain in the room. Ideally, less aversive management techniques will be effective to recondition the child.

Parents should know what their role is in the operatory. In a case such as this one it is critical, and the dentist has to educate parents about their role to ultimately achieve positive behavior modification. The parent should be instructed to ignore minor disruptive behavior and refrain from coaxing or pleading with the child to accept dental treatment. When the "game plan" is explained to parents in advance, even reluctant parents will cooperate. Specifically, regarding parental separation, they need to be told to accept the situation when asked to leave, despite the anticipated pleas of their child. They also should be instructed not to ask for a second chance, but rather to leave at the dentist's cue.

Consider the Case 6.12 scenario with some minor changes. Following the initial telephone contact, the receptionist should note that the child is a potential problem and alert the dentist that the child and parent will need special consultation time. The child's age and previous dental history are red flags regarding the type of patient management techniques that may need to be used to obtain proper patient cooperation. Before entering the treatment room, Dr. Steve should have invited Bobby's mother to the bridging room, leaving Bobby in the play area. A discussion should include the methods of management, including the possibility that the dentist might ask the parent to leave the room for a limited amount of time. The parent must be convinced that she is a key player and is to be envisioned by the child as being in agreement with the dentist. A detailed explanation of tell-show-do and voice control should also be given.

In the previous clinical scenario, none of the non-pharmacologic behavioral management techniques could be employed successfully, since communication had not been established between the patient and the dentist. Further, it is unacceptable to recommend a pharmacologic management procedure without any knowledge of the treatment needs. The use of separation will facilitate and allow the dentist to achieve communication, and then, optimally, patient cooperation.

Restraint

Protective stabilization, or restraint, in the dental setting is the act of physically limiting the body movements of the child to facilitate dental procedures and decrease

Figure 6-6. FOR BETTER OR FOR WORSE © (1995). Lynn Johnston Prod. Used courtesy of the creator and Universal Uclick. All rights reserved.

possible injuries to the child and/or dentist (Roberts et al. 2010). A wide range of techniques and devices have been used in the past to accomplish restraint, ranging from holding a child's head with one hand to a whole body wrap, Papoose Board, or bed sheet (Frankel 1991). The use of protective stabilization, known in the past as passive restraint, is an invasive technique. Currently, it is seen by parents as one of the least favorable methods of patient management (see Table 6-4). When parents are presented with two options, one involving restraint and the other no restraint, many opt for the non-restraining mode of treatment delivery. Indeed, studies have shown that more parents consent to general anesthesia than conscious sedation with passive restraint (Allen et al. 1995; Eaton et al. 2005). However, restraint still has a function in patient management and is part of the armamentarium of some pediatric dentists.

Protective stabilization is mostly used in conjunction with conscious sedation, but it may be indicated in specific clinical situations without sedation. For example, an eighteen-month-old child appears in the office with a traumatic injury, an extruded upper incisor. A radiograph is needed. An attempt to take the film with the child held by the parent fails. A speedy and harmless solution is to place the child in a restraining device with the parent holding the film in place. The procedure could not be accomplished without any form of restraint.

The use of restraint becomes more complicated when considering an older child, perhaps three to five year of age, who requires comprehensive restorative treatment. The dilemma is, should uncooperative preschoolers be treated with protective stabilization coupled with conscious sedation, or is treatment under general anesthesia the better alternative? A survey by Adair et al. (2004) of behavior management teaching in advanced pediatric dentistry training programs showed that 98% of the programs taught that the use of protective stabilization using a restraining device such as a Pediwrap or Papoose board was acceptable for use on the sedated child (see Figure 6-7). However, this is not a universal viewpoint. The exclusion of any form of restraining device has become mainstream practice and the standard of care in many parts of Europe. In the United Kingdom, restraining devices are not acceptable in dental practices under any circumstances (Manley 2004; Morris 2004).

Positive explanations may result in more parents' acceptance of this form of treatment. Kupietzky and Ram (2005) showed that parents who received a positive explanation about restraint showed higher acceptance levels than parents who received a neutral or noncommittal explanation. Consider this clinical case.

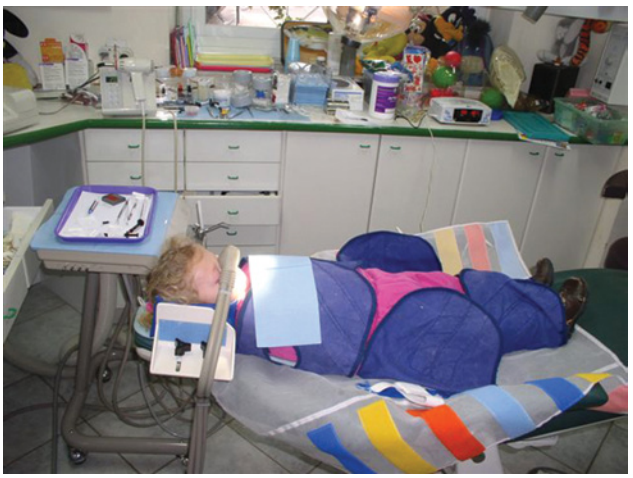

Figure 6-7 The Papoose Board with head immobilizer restraint apparatus (Olympic Medical Group, Seattle, WA) used together with a pediatric Rainbow ® wrap (Specialized Care Co., Hampton, NH).

Case 6.13

A four-year-old child was unsuccessfully treated by a general dentist who used restraint without any premedication or local anesthesia. The parents turned to a qualified pediatric dentist for assistance. The child was successfully treated with restraint and conscious sedation. After treatment, the child was asked by his mother how he felt. He answered that he did not like the previous dentist. "Why?" asked the mother. The child answered, "Because he tied me up!" "But this dentist did the same," said the mother. The child answered, "No he didn't, he put a blanket on me and helped me not to move so he could fix my teeth and they won't hurt me anymore." The child was seen subsequently throughout and became an enthusiastic dental patient with good dental health.

Case 6.13, Discussion: Before using medical stabilization, the parents should be given an honest explanation regarding its use. Depending on the age of the child, an explanation should also be given to the patient. "We will use a blanket. It will help you to not move and it will keep you warm." An excellent prop available for the discussion is a doll in a Pediwrap (see Figure 6-8).

The acceptance of restraints by parents, and more importantly their success in helping to instill a positive acceptance of dentistry by the child patient, depends, to a large degree, on the frame of mind of the dentist using the techniques. If restraint is used punitively, or out or a sense of anger or frustration, then it is unacceptable (Roberts et al. 2010).

Figure 6-8. The Protective Stabilization Model and Board Wrap is an adjunct for introducing children to the apparatus. Courtesy of Specialized Care Co., Hampton, NH.

Hand-over-mouth (HOM)

When the first edition of this book was written, the HOM technique was generally accepted. However, over the past two decades it has gradually become less acceptable to parents (Eaton 2005) and to the profession. In 2006 it was no longer endorsed by the American Academy of Pediatric Dentistry guidelines (AAPD 2006). The teaching of HOM in post graduate programs has also declined dramatically, with only 28% of the programs teaching it as an acceptable technique (Adair et al. 2004). With these attitudes in mind, there was some reluctance on the part of the authors to include this technique with current management procedures. However, a guideline is a standard to help one determine the course of action. It is not legally binding, nor does it restrict practice, and HOM continues to be used today. Oueiss et al. (2010) surveyed members of the AAPD, finding that 350 of 704 respondents (50%) believed that HOM was an acceptable technique. Similar findings were obtained by Newton et al. (2004), who surveyed pediatric dental specialists in the United Kingdom. While 60% were of the opinion that HOM should never be used, 40% favored its use under certain conditions. There were other reasons for including HOM in this chapter. In some countries it is accepted. In others, the acceptability is not even discussed. There are countries where pediatric dentists are legally prevented from using pharmacological approaches, often do not have access to general anesthesia, and have limited alternatives for managing their child patients. For these reasons, it was decided to include HOM in this chapter. It will be discussed by describing the indications for the technique, the technique itself, its psychological rationale, and the controversy surrounding it.

Indications

If a child's behavior is uncontrolled and the child thrashes about in the dental chair, a potentially dangerous situation develops. There is a possibility that a child may cause physical injury to their person. Controlling this type of behavior may require strong sedation techniques, or perhaps the use of general anesthesia. Hand-over-mouth offers an alternative method. It is an invasive, non-pharmacologic method that is most often used during a first office visit.

The major purpose of the technique is to control the child's behavior after other non-pharmacologic approaches have been tried. It is a method of last resort. It enables the dentist to establish communication so that the child can learn the appropriate responses and expectations. HOM is most effective for gaining the attention of children three to six years of age. Before applying the technique, a child should have been prejudged to be of normal intelligence and be able to follow instructions. HOM is not used for children under three years of age who lack the ability to comprehend their situation. The technique is also not used in conjunction with sedation. Children should have a complete awareness of their surroundings when their behavior is modified through this approach.

Technique

When all avenues of communication have failed and the child's behavior remains uncontrolled, HOM is applied. Control must be considered from two points of view: (1) the explicit emphasis of the technique is control of the child's behavior, and (2) the implied meaning of control is a mastery of emotions by the dentist. The latter can be somewhat difficult following several minutes of kicking, screaming, or fighting. Nevertheless, the dentist's response must be a controlled one. There should be no display of anger or annoyance. The approach must be as unemotional as possible, almost matter-of-fact. Failure to control personal emotions may result in improper behavior management, and thus defeat the dentist's purpose. The critical details of the technique are as follows:

- Place the hand over the child's mouth to muffle the noise.
- Bring your face close to the child and talk directly into the ear.
- Quietly, tell the child to stop screaming and listen, and then you will remove the hand.
- Explain that you "only want to talk and look at your teeth."

Figure 6-9. Hand-over-mouth technique is shown with the dentist in close proximity to the child. Use of the technique is highly controversial, but many think it still has a place in pediatric dentistry.

- Repeat the instructions after a few seconds, adding: "Are you ready for me to remove my hand?"
- Caution the child to be quiet when the hand is removed.

It is difficult to describe all the details of the technique in this section. The dentist's position in close proximity to the child's ear is of major importance (see Figure 6-9). Using a soft, monotone voice makes it necessary for the child patient to become quiet so that instructions are audible. The dentist's directions must be specific. Members of the dental health team also need to understand the technique prior to the situation. The dental assistant must know her role. In some cases, it will be to firmly grasp the child's leg and prevent kicking. In other cases, it will be to intercept the patient's hands so there is no interference with the dentist or scratching of the face. There are several variations of the standard technique. Those interested in learning more about them can obtain the information in earlier writings.

Rationale for the technique

Hand-over-mouth or aversive conditioning has a psychological basis. From the behavior modification viewpoint, the laws of learning are applicable to the HOM technique. When a child's behavior is uncontrolled and a hand is placed over the child's mouth to quell the noise, there is a coupling of the active maladaptive act with an unpleasant experience. Immediate punishment of this type lessens the likelihood of the behavior recurring (Azrin et al. 1963). The requirements of an ideal punishing stimulus are: it should have a precise physical specification, it should be constantly in contact with the patient, and the patient should not be able to escape or minimize it by unauthorized behavior. HOM meets these requirements.

The temporal relationship has importance in the HOM conditioning treatment. Once the HOM technique is instituted, the child must cooperate. When the hand is removed, if the child begins to fight or cry out, the hand is immediately replaced and the patient is again told that when the hand is removed, he must cooperate, be quiet, open his mouth, and listen to the dentist. The close association between the fighting and crying and the physical restraint is learned quickly and effectively if little or no time is allowed between the response and the stimulus. Chambers (1970), Craig (1972), and Levitas (1974) pointed out that once the desired behavior is elicited by the hand-over-mouth technique, reward conditioning procedures are instituted immediately. The child is given social verbal reinforcement for behaving properly. Tangible rewards can be given at the end of the visit.

The controversy

Whenever the hand-over-mouth technique has been discussed or demonstrated in the past, there have been strong opposing views regarding its application in the dental environment. It is difficult to discuss the controversy without considering the historical writing.

In the 1960s and 1970s, HOM was a widely accepted management technique. Leaders in pediatric dentistry supported its use in text books at the time (Finn 1963; McDonald 1963; Kramer 1974; Levitas 1974; Wright 1975). There was also evidence of acceptance of the technique in dental practice. A 1972 survey of Diplomates of the American Board of Pediatric Dentistry revealed that 80% of the respondents used physical restraint or some form of HOM for selected cases. Comparable results were found in Craig's study (1972) in the state of Indiana. His survey found twenty-eight of thirty-five pediatric dental specialists used HOM in practice.

The technique became controversial, as not everyone was in agreement with the use of HOM. One reason was the apparent harshness of the technique. Some contended that the management method was unscientific and that it could possibly cause psychological trauma to the child patient (Davies and King 1961; MacGregor 1952). No scientific data has ever been presented to support this viewpoint. Indeed, the opinions of psychiatrists and psychologists were opposite, and they advocated for HOM usage (Goering 1972; Chambers 1970).

In the 1980s, the use of HOM became more controversial. Issues were being raised, however, concerning informed consent and the potential for committing battery (Bowers 1982). Shortly thereafter, Schuman (1987) reported that several dentists who had used HOM had been charged with child abuse or criminal assault

following routine dental procedures. That same year, HOM was singled out by the Virginia Board of Dentistry as a procedure leading to the report of child abuse against dentists (Virginia 1987). In 1993, Casamassimo opined in an editorial that the technique was harsh, raising further legal concern. Thus, pediatric dentists became very concerned about its use in their practices.

Some clinicians employ only gentle psychological methods for managing children. The majority of pediatric dentists, however, use some restraint at one time or another. Emphatically pushing a hand downward which had been raised inadvertently or intentionally to interfere with treatment or lifting a resisting child and forcibly seating the patient in the dental chair to convey a "no-nonsense" attitude are forms of restraint. These techniques often precede the use of HOM. However, change has gradually occurred in the management of children in pediatric dentistry, and it can be attributed to many factors. Casamassimo et al. (2002) surveyed Diplomates of the American Board to determine some of the changes. Based on their findings, most diplomates were of the opinion that parenting styles had changed, and almost 60% felt that their children's behaviors were worse. The relevant changes in practice procedures were a decrease in the use of restraints and HOM and an increase in sedation usage.

Despite current attitudes, it is likely that some pediatric dentists will continue using restraint and HOM. Barton et al. (1993) contend that, used properly, the technique can be kind and effective. Acs et al. (1990) surveyed utilization of HOM and restraint in postdoctoral pediatric dental education programs and compared their findings to an earlier survey by Davis and Rombom (1979). Interestingly, the Acs survey found a discrepancy in professional standards. It seems that program directors with tenures in excess of ten years are more likely to teach HOM and/or restraint than their younger colleagues. Hassan et al. (2010) conducted a survey to determine the alternatives for HOM after it was eliminated from the AAPD guidelines. The respondents selected voice control as the first alternative, and minimum to moderate sedation as the second. Since voice control likely had been tried in many cases before using HOM, the only real alternative to HOM is sedation or general anesthesia. Many clinicians consider HOM a much safer method of child management than the pharmacologic techniques.

5. Retraining

Retraining, like behavior shaping, fits the learning theorist's model of a behavior modification program. Children's responses to the dental situation are altered in accordance with an established set of rules. Rewards are given for positive behavior to reinforce the learning. Negative behavior may be ignored or punished. Indeed, the theory for retraining and behavior shaping is somewhat similar. The clinical difference, however, is that retraining begins with a child possessing negative expectancies and undesirable responses. The behavior may be the result of a previous dental visit or the effect of improper parental or perhaps peer orientation. If the source of the problem can be determined, it is obviously helpful, for then the problem can be avoided through another technique, or de-emphasized, or a distraction method can be used. These ploys begin the retraining program which eventually leads to behavior shaping.

When encountering negative behavior, the objective is to build a new series of associations in the child's mind. In other words, the goal is to alter the stimulus and response. At the outset, state that "we do things differently here." When the child's expectancy of being hurt is not reinforced, then a new set of expectancies is learned. The child realizes that the dentist has followed through and did not hurt him—the dentist can be trusted. This same child develops a new perception of or relationship to the dental office, the dentist, and dentistry itself. In the language of learning theory, the child patient extinguished an unacceptable behavior learned previously and began to discriminate between this office—where anxieties and fears were not necessarily companions—and the last office, where they were present. The fearful child with anxieties modeled from parents and peers can go back to them and boast about learning something.

Assuming that communication is possible, when beginning the retraining process several ploys can be helpful in revising children's expectancies. Avoidance is possibly the most difficult route, for some procedures simply must be carried out. However, if an immature three-year-old patient who recently underwent a poor dental experience presented with a deep carious lesion, it might be possible to avoid extensive pulp therapy at this time by applying a temporizing medication and utilizing an indirect pulp therapy procedure. This allows the final treatment to be delayed until a more opportune visit. Once the child has been retrained and expectancies have been revised, future treatment becomes much easier. Thus, avoidance at the outset can be a worthwhile strategy.

If older children present with histories of negative behavior, they can be queried about their dislikes. Some children may express an intense dislike for materials such as certain prophylaxis pastes or topical fluorides. It is a simple matter to agree with the child and offer a choice of different brands. The fact that a choice is

offered indicates to the child that you have recognized their dislike and that you are prepared to work around the problem. Offering a choice also gives the patient some control of the situation. The techniques of de-emphasizing or substituting help to alter the child's expectancies.

A third ploy, distraction, can be used in many ways. Very young children become restless during long procedures. While working, the dentist can tell the child a story, taking the child's mind off the immediate situation. Additionally, through the proper use of the voice, a certain security can be imparted to the child. Counting the number of teeth aloud serves to hold the attention of the young patient during the initial visit. Counting the seconds helps to distract the child who dislikes a fluoride treatment. As mentioned earlier in this chapter, the use of humor in these situations helps to relieve children's anxieties. Thus, there are innumerable ways in which dentists can provide distraction during the course of treatment.

Choice of words during retraining is highly important, no matter how innocuous the procedure. It is not wise to ask, "Would you like me to clean your teeth?" By phrasing the question in this manner, the dentist offers an option that was not intended. A better alternative would have been, "Do you want the fruit- or peppermint-flavored toothpaste?" The choice is there, but the procedure is not open to question. Allowing choices gives the child a feeling of control of the situation. It is a key technique for independence training.

There are times when it is necessary to use a form of aversive conditioning in combination with retraining ploys. If an undesirable response occurs, whether inadvertent or intentional, the clinician may say, "No, not that way" or "Stop that" or something similar. The sound of the voice changes from a "matter-of-fact" soft tone to an almost harsh, loud or businesslike tone. Azrin et al. (1963) demonstrated that mild punishment suppresses a response if an alternative response is available for obtaining reinforcement. The child who is a behavior problem at the beginning of the visit will probably receive social aversive conditioning by way of voice control from the operator more often than the child who cooperates from the outset. The end-result, however, should be the same—an amenable child undergoing successful dental treatment.

Retraining children can be very satisfying to a clinician. At the outset, a child may exhibit negative behavior in response to inner anxiety or past experiences. Their fearfulness is generalized to all dentists. Eventually, the child learns that this dental office is different from a previous dental office. There is a different stimulus and response. This learned difference is called discrimination. In each case the child visits a dentist, but dentists' cues are different, eliciting different responses. After retraining children, many clinicians develop long-term, close relationships with them.

Summary

This chapter has dealt with a broad spectrum of non-pharmacologic methods of behavior management. It has described techniques which have evolved in dentistry and has related them to psychology, a science which deals with human behavior. Thus, it has tried to provide an interdisciplinary approach.

There are laws which govern human behavior and concepts that govern learning. Programs most closely following a model will be the most efficient in terms of learning. Those which deviate from the models will be less efficient, with the loss of efficiency directly related to the amount of deviation from the model. With the understanding of such learning principles, pediatric dentistry management becomes more effective. An understanding of these laws cannot help having a positive influence on the daily practice of dentistry and on the lines of communication within the pediatric dentistry treatment triangle. Behavior management is studied by pediatric dentists in some depth. Many general dentists and other dental personnel often receive a cursory introduction to the subject. Hopefully, the writing of this book will help increase general knowledge.

The chapter was divided into five parts: getting to know your patient, pre-appointment behavior modification, effective communication, non-pharmacologic clinical strategies, and retraining. In some instances, methods such as voice control and modeling overlap and were touched upon in more than one part. This was pointed out in the text. In many instances, the referencing was historical. That is the way it is nowadays. Wilson and Cody (2005) searched the literature on behavior management, excluding sedation articles. They found that only 168 articles were published in *Pediatric Dentistry* and the *Journal of Dentistry for Children* over a thirty-year period. The number of articles involving clinical studies was less than a third of the total number of articles, 38% were opinion papers, and 32% were surveys or descriptions of behavior management in the dental setting. Wilson and Cody concluded that the evidence-based data to support the effectiveness of behavior management techniques in pediatric dentistry is limited and needs further development. The authors of this chapter are in agreement with the conclusion. Averaging less than two clinical studies on behavior management per year over a thirty-year period is regrettable. If the management of children in the dental environment is one of the keys to the specialty of pediatric dentistry, then more research is needed.

References

Acs, G., Burke, M.J., Musson, C.W. (1990). An updated survey on the utilization of hand over mouth and restraint in post-doctoral pediatric dental education. *Pediatric Dentistry*, 12, 298–302.

Adair, S.M. et al. (2004). Survey of behavior management teaching in pediatric dentistry advanced education programs. *Pediatric Dentistry*, 26, 151–158.

Addelston, H. K. (1959). Child patient training. *Fort Rev Chicago Dent Soc*, 38,7-9, 27–29.

Adelson, H.K. and Godfried, M. (1970). Modeling and the fearful patient. *Journal of Dentistry for Children*, 37, 476–480.

Allen, K.D. et al. (1990). Dentist-implemented contingent escape for management of disruptive child behavior. *J Appl Behav Anal.*, 25, 629–636.

Allen, K. D., Hodges, E. D., Knudsen, S. K. (1995). Comparing four methods to inform parents about child behavior management: how to inform for consent. *Pediatric Dentistry*, 17,180-186.

AlSareed, M. (2011). Children's perception of their dentists. *Eur J Dent.*, 5, 186–190.

American Academy of Pediatric Dentistry (2006). Guideline on behavior management for the pediatric dental patient. *Pediatric Dentistry*, 28, 97–105.

American Academy of Pediatric Dentistry (2012). Behavior guidance for the pediatric dental patient. Reference Manual, *Pediatric Dentistry*, 34, 170–182.

Association of Pedodontic Diplomates (1972). Techniques for behavior management-a survey. *Journal of Dentistry for Children*, 39, 368–372.

Ayer, W.H. (1973). Use of visual imagery on needle phobic children. *Journal of Dentistry for Children*, 40, 125–127.

Azrin, N. H., Holz, W. C., Hake, D. F. (1963). Fixed-ratio punishment. *Journal of the Experimental Analysis of Behavior*, 6, 141–148.

Bailey, P.M., Talbot, A., Taylor, P.P. (1973). A comparison of maternal anxiety levels with anxiety levels manifested in the child dental patient. *Journal of Dentistry for Children*, 40, 25–32.

Bandura, A. (1977). *Social Learning Theory*. General Learning Press. New York, USA.

Barton, D.H. et al. (1993). Dental attitudes and memories: a study of the effects of hand over mouth/restraint. *Pediatric Dentistry*, 15, 13–19.

Bennett, H.J. (1996). Using humor in the office setting: a pediatric perspective. *Journal of Family Practice*, 42, 462–464.

Bowers, L.T. (1982). The legality of using hand-over-mouth exercise for management of child behavior. *Journal of Dentistry for Children*, 49, 257–265.

Brockhouse, R.T. and Pinkham, J.R. (1980). Assessment of non verbal communication in children. *Journal of Dentistry for Children*, 47, 42–47.

Casamassimo, P. (1993). Editorial: Maybe the last editorial on hand-over-mouth technique? *Pediatric Dentistry*, 15, 233–234.

Casamassimo, P., Wilson, S., Gross, L. (2002). Effects of US parenting styles on dental practice: perceptions of diplomates of the American Board of Pediatric Dentistry. *Pediatric Dentistry*, 24, 18–22.

Chambers, D.W. (1970). Managing the anxieties of young dental patients. *Journal of Dentistry for Children*, 37, 363–374.

Chambers, D. W. (1976). Communicating with the young patient. *Journal of the American Dental Association*, 93, 793–796.

Craig, W. (1972). Hand over mouth technique. *Journal of Dentistry for Children*, 38, 387–389.

Cunningham, J. (2005). Children's Humor chapter In W. G. Scarlett, S. Naudeau, D. Salonius-Pasternak and I Ponte (Eds.). *Children's Play* (93–109). Thousand Oaks, California: SAGE Publications.

D'Antonio, I.J. (1989). The use of humor with children in hospital settings. In: *Humor and children's development: a guide to practical applications*.(McGhee, P., ed.) 157–171, Haworth, New York.

Davies, G.N. and King, R.M. (1961). *Dentistry for the preschool child*. E. and S. Livingston, Edinburgh.

Davis, M.J. and Rombom, H.M. (1979). Survey of the utilization and rationale for hand-over-mouth (HOM) and restraint in postdoctoral pedodontic education. *Pediatric Dentistry*, 1, 87–90.

Eaton, J.J. et al. (2005). Attitudes of contemporary parents toward behavior management techniques used in pediatric dentistry. *Pediatric Dentistry*, 27, 107–113.

Eysenck, H. J. (1964). *Experiments in Behavior Therapy*. Pergamon Press, Oxford.

Finn, S.B. (1973). *Clinical Pedodontics*, 4th ed., W.B. Saunders Co., Philadelphia.

Forehand, R. and Long, N. (1999). Strong-willed children: a challenge to parents and pediatric dentists. *Pediatric Dentistry*, 21, 463–467.

Ferster, C. B. (1964). Reinforcement and punishment in the control of human behavior by social agencies. In: *Experiments in Behavior Therapy*, (Eysenck, H. J. ed.), Pergamon Press, New York.

Ghose, L.J. et al. (1969). Evaluation of sibling support. *Journal of Dentistry for Children*, 36, 35–39.

Greenbaum, P.E. and Melamed, B.G. (1988). Parent modeling. A technique for reducing children's fear in the dental operatory. *Dental Clinics of North America*, 32, 693–704.

Goering, P. (1972). To keep the sunlight in a child's life. *Menninger Perspective* 3:10.

Hassan, S.O. et al. (2010). Alternatives for hand over mouth exercise after its elimination from the guidelines of the American Academy of Pediatric Dentistry. *Pediatric Dentistry*, 32, 223–228.

Ingersoll, B.D. et al. (1984). The use of contingent audiotaped material with pediatric patients. *Journal of the American Dental Association*, 109, 717–719.

Johnson, R. and Baldwin, D.C. (1968). Relationship of maternal anxiety to the behavior of young children undergoing dental extraction. *Journal of Dental Research*, 47, 801–805.

Klingberg, G. (2008). Dental anxiety and behavior management problems in paediatric dentistry—a review of background factors and diagnostics. *European Archives of Paediatric Dentistry*, 1, 11–15.

Kramer, W. S. (1973). Aversion—A Method for Modifying Child Behavior. *Presented at the American Academy of Pedodontics Annual Meeting*, Los Angeles.

Kuhn, B.R. and Allen, K.D. (1994). Expanding child behavior technology in pediatric dentistry: a behavioral science perspective. *Pediatric Dentistry*, 16, 13–16.

Kuiper, N.A., Martin, R.A., Olinger, L.J. (1993). Coping humor, stress, and cognitive appraisals. *Canadian Journal of Applied Sciences*, 25, 81–96.

Kupietzky, A. and Ram, D. (2005). Effects of a Positive Verbal Presentation on Parental Acceptance of Passive Medical Stabilization for the Dental Treatment of Young Children. *Pediatric Dentistry*, 27, 380–384.

Lawrence, S.M. et al. (1991). Parental attitudes toward behavior management techniques relative to types of dental treatment. *Pediatric Dentistry*, 13, 151–155.

Levitas, T. C. (1974). HOME-hand over mouth exercise. *Journal of Dentistry for Children*, 41, 178–182.

Locker, D., Thompson, W.L., Poulton, R. (2001). Onset of and patterns of change in dental anxiety in adolescence and early childhood: a birth cohort study. *Community Dental Health*, 18, 99–104.

Loizou, E. (2006). Young children´s explanation of pictorial humor. *Early Childhood Education Journal*, 33, 425–431.

MacGregor, S.A. (1952). Practical suggestions on child management. *New Zealand Dental Journal*, 48, 102.

Manley, M.C. (2004). A UK perspective. *British Dental Journal*, 196, 138–139.

Martin, R.B., Shaw, M.A. Taylor, P.P. (1977). The influence of prior surgical experience on the child's dental behavior at the first dental visit. *Journal of Dentistry for Children*, 44, 443–447.

McDonald, R.E. (1963). *Pedodontics*. C.V. Mosby Co., St. Louis.

McGhee, P. (2002). *Understanding and Promoting the Development of Children's Humor: A Guide for Parents and Teachers*. Kendall Hunt Publishing Company, Dubuque Regional, Iowa.

McGhee, PE. (1979). *Humor its origin and development*. Freeman and Company, San Francisco.

Melamed, B.G., et al. (1975). Use of filmed modeling to reduce uncooperative behavior of children during treatment. *Journal of Dental Research*, 90, 822–826.

Mora-Ripoll, R. (2010). The therapeutic value of laughter in medicine. *Alternative Therapies in Health and Medicine*, 16, 56–64.

Morris, C.D.N. (2004). A commentary on the legal issues. *British Dental Journal*, 196, 139–40.

Moss, S. (1972). Psychology of communication. Presented at the *Northwestern Pedodontic Teachers Conference*, Chicago.

Murphy, M.G., Fields, H.W., Machen, J.B. (1984). Parental acceptance of pediatric dentistry management techniques. *Pediatric Dentistry*, 6, 193–198.

Nash, D.A. (2006). Engaging children's cooperation in the dental environment through effective communication. *Pediatric Dentistry*, 28, 455–459.

Nevo, O. and Shapira, J. (1986). Use of humor in managing clinical anxiety. *Journal of Dentistry Children*, 53, 97–100.

Newton, J.T. et al. (2004). Attitudes toward the use of hand over mouth (HOM) and physical restraint amongst paediatric dental specialist practitioners in the UK. *International Journal of Paediatric Dentistry*, 14, 111–117.

Oueiss, H.S. et al. (2010). Alternatives for hand over mouth exercise after its elimination from the clinical guidelines of the American Academy of Pediatric Dentistry. *Pediatric Dentistry*, 32, 223–228.

Roberts, J.F. et al. (2010). Review: behavior management techniques in paediatric dentistry. *European Archives of Paediatric Dentistry*, 11, 166–174.

Rosenberg, H.M. (1974). Behavior modification for the child dental patient. *Journal of Dentistry for Children*, 41, 111–114.

Schuman, N.J. (1987). Child abuse and the dental practitioner: discussion and case reports. *Quintessence International*, 18, 619–622.

Skinner, B. F. (1953). *Science and Human Behavior*. MacMillan Co., New York.

The Virginia Board of Dentistry (1987). The hand over mouth exercise in handling child patients. *Dental Bulletin*, Issue 1.

Tuma, C. F. (1954). How to help your child be a good dental patient: an open letter to parents. *Journal of Dentistry for Children*, 21, 84.

Turner, C. et al. (1988). Voice control: Effects on children's fear and disruption. *Pediatric Dentistry*, *(abst)* 10, 238.

Venham, L. et al. (1981). Effectiveness of a distraction technique in managing young dental patients. *Pediatric Dentistry*, 3, 7–11.

Welbury, R.R., Duggal, M.S., Hosey, M.T. (2005). *Paediatric Dentistry* 3rd Ed., Oxford University Press, Oxford.

Wepman, B.J. and Sonnenberg, E.M. (1979). Effective communication with the pedodontic patient. *Journal of Pedodontics*, 2, 13–17.

Wilkins, J. and Eisenbraun, A.J. (2009). Humor theories and the physiological benefits of laughter. *Holistic Nursing Practice*, 23, 349–54.

White, L.W. (1974). Behavior modification of orthodontic patients. *Journal of Clinical Orthodontics*, 8, 501–503.

Wilson, S. and Cody, W.E. (2005). An analysis of behavior management papers published in the pediatric dentistry literature. *Pediatric Dentistry*, 27, 331–337.

Wright, G.Z. and Alpern, G.D. (1971). Variables influencing children's cooperative behavior at the first dental visit. *Journal of Dentistry for Children*, 38, 126–128.

Wright, G.Z., Alpern, G.D. Leake, J.L. (1973). Modifiability of maternal anxiety as it relates to children's cooperative behavior. *Journal of Dentistry for Children*, 40, 265–271.

Wright, G.Z. (1975). *Behavior Management in Dentistry for Children*. W.B. Saunders Co., Philadelphia.

Wright, G.Z., Starkey, P.E. Gardner D.E.(1983). *Managing children's behavior in the dental Office*. C.V. Mosby Co., St. Louis.

Wright, G.Z. (1979). Management of needle phobic adolescents. *Ontario Dentist*, 56, 22–25.

Wright, G.Z. and Stigers, J.I. (2011). Non pharmacologic management of children's behaviors. In: *Dentistry for the Child and Adolescent* (J.A. Dean, D.R. Avery and R.E. McDonald, ed.) 9th ed., 32, Mosby Elesvier, Maryland Heights, Mo.

Wurster, C.A., Weinstein, P., Cohen, A.J. (1979). Communication patterns in pedodontics. *Journal of Dentistry for Children*, 48, 159–163.

Chapter 7

Children with Disabilities

Gunilla Klingberg

Introduction

Disabilities affect many people today. Prevalence varies between different countries and cultures, but it is realistic to assume that up to twenty percent of all children and adolescents may be affected by a disability or a chronic health condition (Merrick and Carmeli 2003; Bethell et al. 2008). Further, the number of individuals with disabilities is increasing owing to developments in medical health technology, diagnostic tools, and an increase in the number of medical treatment options. For example, more children who have been born preterm survive because of improvements in medical care, but these children also have an increased risk for disabilities.

This chapter will discuss special child patients with disabilities or chronic health conditions and provide examples to assist with their management in the dental office. It will also focus on how the dental team can work together with the child and family to create positive dental appointments and good oral health. As with all child dental patients, caring for the special child involves the pediatric dentistry treatment triangle—the child, the parent or legal guardian, and the dental team. This chapter will provide details about each corner of the triangle. For dental care and treatment to be successful, all three components of the triangle have to collaborate and communicate. Ultimately, the dentist is responsible for the treatment and should acquire appropriate knowledge about the child's diagnosis or disability, as well as an understanding of the psychology of the family.

Before discussing the corners of the triangle, mention must be made of two important international declarations that have direct bearing on special children. The first is the Convention on the Rights of the Child (United Nations 1989), which was ratified by a majority of nations worldwide. The overriding point in the Convention is that children have rights. According to the third article in the Convention, the "best interest" of the child should be the guiding rule in all decisions involving or affecting children. The Convention has had a significant impact (e.g., The Child Friendly Healthcare Initiative) on the way all children are treated and respected within the health sector. Children have the right to be involved in decisions about treatment, and their points of view should be respected, taking age and maturity into consideration.

The second declaration occurred in 2006 when the United Nations adopted the Convention on the Rights of Persons with Disabilities. Its purpose was "to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity." The Convention noted changing societal views on people with disabilities. Historically, individuals with disabilities have been seen as objects rather than subjects. In the past, society provided help and support for people with disabilities in terms of benevolence and charity. This is no longer an acceptable attitude. The Convention strengthened the position of people with disabilities. It stressed that people with disabilities are subjects and individuals like everyone else, and thereby have the same rights for making decisions that influence their lives, including health-related matters. Dental professionals treating children need to be aware of these societal changes in attitude and apply these principles in their practices.

As this chapter deals with children with disabilities, it is important to define " disability." Today, disabilities and chronic conditions are not only looked upon as diagnoses defined in the International Classification of Diseases (ICD). The understanding and classification of disability and chronic health conditions is also based on a bio-psychosocial model, as articulated in the World

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

Health Organization's International Classification of Functioning and Health (ICF), adopted in 2001, and in the Child and Youth Version, ICF-CY, for individuals up to the age of seventeen, adopted in 2007. The ICF as a model describes human functioning in terms of body structure, body function, activities and participation. These functions are influenced by health condition, environmental factors, and personal factors. Today, the ICF-CY as a classification comprises more than 1600 items related to body structure, body function, activities and participation, and environmental factors. It is universal, it allows comparisons of health conditions with different etiologies, and it can describe a person's health profile from a bio-psychosocial perspective. This perspective holds interest from a dental standpoint, and studies are currently being undertaken to construct a core set in oral health (Faulks et al. 2013). The ICF and ICF-CY provide a new way of understanding the continuum normal→disability. It focuses on the individual's overall health status instead of focusing only on the specific disability or impairment. By doing so, it becomes evident that anyone can experience a health problem, and thereby a disability.

The Special Child

Every child is a unique individual. This is true for healthy children with normal development and maturation, even more so for children with disabilities or chronic health conditions. Children and adolescents show great variation in maturity, personality, temperament, and emotions. Additionally, cognitive reasoning, behavioral repertoires, and communicative skills vary, especially in children with disabilities. This leads to a corresponding variation in vulnerability and ability to cope with dental treatment.

The disabled child patient can be special in many different ways. This chapter focuses on children with special needs owing to disability or chronic health conditions, but it is important to acknowledge that there are other reasons for being special. For example, children may have language difficulties because they migrated to a new country, or simply because they are part of an immigrant family that communicates mostly in their native language. Communication is essential and the basis of successful treatment, and if the child or parent does not speak your language, interpretation might be required. Children who live in deprived socio-economic settings or who have parents with mental or psychiatric illness are other examples that may require special attention from the dentist. And, it must be remembered that not all children develop and mature at the same rate. These children may not necessarily have impairments, but they are late bloomers and communication and treatment may have to be adjusted to their level of maturity rather than to their chronological age. This last example also demonstrates why dentists, especially pediatric dentists, should have knowledge of child development (see Chapter Two). Development and maturation also vary in children with disabilities and medical conditions on an individual basis, and can be affected by a poor socio-economic environment or parental illness.

The best way to learn about a child's capabilities is to ask. A thorough case history is a must, and ideally both the child and the parents should be interviewed. The routine anamnesis for the healthy child should include information about medical diagnoses, medication, family and social contexts, school, and peer-related issues. However, for the special child patient, the interview needs to be more detailed and include specific areas related to the child's condition.

When obtaining a medical history, specifically inquire about the perinatal period and birth. The importance of these developmental periods was emphasized in Chapter Two. Low birth weight or complications like defective saturation or infections can affect nutrition, growth, and development. There are several developmental windows through which all children pass. These windows are open for a limited period of time, and passing through one window, or level, in development provides children with the requirements needed to manage the next level. For example, children born preterm often have difficulties coordinating sucking, swallowing or breathing, which also may be affected by their medical health status (Delaney et al. 2008). Furthermore, children who have problems in breast feeding or sucking as newborns may have an increased risk of developing feeding problems. The developmental train typically forecasts that average children learn to manage fluids and to swallow at an early age (Mason et al. 2005). Based on these skills, children will be able to consume more complex food textures, tastes, and temperatures as they mature and their feeding progresses to include new types of foods. Successful managing and swallowing of the bolus has to be preceded by training and handling of other kinds of foods and liquids. Some children with feeding problems, owing to prematurity or medical problems, develop hyper-sensitivity in the orofacial region, which, if untreated, could make it difficult to carry out oral hygiene procedures like tooth brushing, or even to conduct dental examinations (Mason et al. 2005; Rommel et al. 2003).

The perinatal period is also important for tooth mineralization. Hypomineralization and hypoplasia in enamel have been reported as more common in children born preterm; molar incisor hypomineralization (MIH)

occurs more frequently in these children. Further, it is probable that dental behavior management problems and dental anxiety are more likely for children born preterm than for others (Brogårdh-Roth 2010).

The medical history should cover all medical issues. Information about periods of hospitalization, medications, and physicians responsible for the child's medical care can become detailed and complex. There are several medical diagnoses and medicines that may impact oral health. The dentist is advised to look up both diagnoses and medications in order to find out if there are any direct implications or interactions in relation to dental care. There are also several rare diagnoses and syndromes that the pediatric dentist may encounter. Apart from textbooks, there are several good databases available via the Internet to learn more about general aspects of the diagnoses; for example, Orphanet and National Dissemination Center for Children with Disabilities. Another useful website disomic (Online Mendelian Inheritance in Man) section that can be accessed via PubMed. Some countries also have national centers that specialize in the orofacial and odontological aspects of rare diagnoses. One example is the National Resource Centre for Rare Disorders in Sweden (Mun-H-Center), which provides a website and a smartphone app in English.

Other important case history aspects include information about the child's normal life and his strengths and weaknesses. For children with disabilities or medical health problems, much time is spent discussing the child's problems and weaknesses. It is equally important to learn about the child's strengths.

Knowledge about the strengths of the child is often useful when trying to individualize the appointment. For example, a child might have problems with sudden or loud noises and is easily frightened, but at the same time could be interested in music and may enjoy specific types of music. This information may be important and useful for the dentist. For example, instead of avoiding noise and being concerned about how the child will react to the sound of suction, the dentist could play music during the treatment or explain the treatment and sounds that will occur in terms of music. Some may think this is farfetched, but when working with a special child patient it is often necessary to step out of the more traditional role of the dentist. Being successful with special children implies being open to trying new things and being a bit unconventional in the choice of methods from time to time.

It is not always optimal for children to be present while parents and health care professionals discuss their problems and limitations. One might try to circumvent the problem by either scheduling a parent appointment without the child or arranging a telephone interview. Apart from not exposing the child to negative information, gaining information in advance from the parents makes it possible for the dentist to be better prepared when meeting the special child patient for the first time. By gathering vital information beforehand, the dentist can fully focus on the child and the interactions at the first visit instead of having to start with the anamnesis.

The Family

Parents and family constitute the second component of the pediatric dental triangle. Being a parent of a special child is, in many ways, different from being a parent of a healthy child. Living with a child with a disability affects all aspects of family life. It is known to be a powerful stressor for all family members, although several studies have shown that mothers experience more stress and often take more responsibility for the child with a disability or chronic health condition than the rest of the family (Cairns 1992). The concerns and worries can be life-long. They differ from the more normal worries that all parents have about their children as they grow up. Being a parent of an adult child with a disability will bring concerns about where the child should live, receive adequate help and assistance, and what will happen when the parents are no longer around (Hallberg et al. 2010).

The family's level of self-reliance (capacity) or reconciliation with having a child with a disability influences how they cope with the child's medical and dental care, and how they will manage parenting. It is important that the family balances its subjective feelings of vulnerability and access to support from others. This perspective, emphasizing the need for support, has been reported to increase psychological and physical well-being in families who have a child with a disability (Scheeran et al. 1997). Apart from support from significant others such as relatives and friends, it is important for families to have support and positive responses from professionals within the social sector and health care professions, including dentistry.

Parents and families who are self-reliant and who have become reconciled to their situation tend to develop feelings of confidence in caring for their children. This can gradually lead to their perception of a less stressful and more manageable situation. It will probably affect how they cope with their children's needs in relation to medical and dental treatment, including preventive home care. As prevention of oral diseases requires establishing good rapport with the families, the dental teams need to have good knowledge and insight into the lives of those who have

disabilities. In order to achieve this balance, it is important not only to treat the child, but also to consider the whole family (Trulsson and Klingberg 2003).

In a study by Trulsson and Klingberg (2003), parents of children with severe and complex diagnoses were interviewed about issues related to their children's oral health and dental care. The parents identified five qualities they would like to see in dental teams: respect, involvement, continuity, knowledge, and availability. These five qualities might be regarded as a matter of course, but apparently these needs had not been met. Another interesting finding from the interviews concerned the way that the parents described their children's main orofacial or oral heath-related problems. According to the participating parents, the main problems were related to nutrition and communication. They also mentioned dental malocclusions, but only in relation to the possibility of improving chewing and speech or decreasing the risk of dental trauma, but not in relation to esthetics. No other oral health issues, such as dental caries and gingivitis, were mentioned by the parents. One could argue that this study dealt with children with very complex diagnoses, but nonetheless, it is apparent that the parents' and dentists' views on what is most important may differ.

The Dental Team

People with disabilities may be subject to inequality in oral health, in terms of both prevalence of disease and unmet healthcare needs. While most pediatric dentists have training with special child patients, provision of large-scale primary care is only possible through the education and training of all dentists. The literature suggests that it is vital for the dental team to develop the necessary skills and gain experience treating people with special needs in order to ensure access to oral health care for all persons (Faulks et al. 2012).

The dental treatment for children with disabilities varies greatly. There are many reasons for this, and some of importance are related to the individual dentist and dental team. Studies have pointed to the fact that many dentists and other members of the dental team feel a professional uncertainty in treating individuals with disabilities (Bedi et al. 2001; Hallberg et al. 2003). Reasons offered for this attitude include the fact that many dentists lack previous knowledge and experience in treating patients with disabilities, and there is little relevant training in either undergraduate or postgraduate programs (Kinne and Steifel 1979; Bedi et al. 1986; Bedi et al. 1989). This is troublesome, as the ambivalent attitudes from dental professionals towards these patients may contribute to less treatment offered to these patient groups (O'Donnell 1993; Bedi et al. 2001; Klingberg and Hallberg 2012). Being successful in the dental treatment of special child patients, therefore, depends in large part on the dental team, and specifically on the dentist himself.

Another reason for varying treatment is the economic standard in families. Depending on how dental care and social insurance systems are organized in the country, this will impact dental care for children with disabilities and, in the long-term, the oral health of these children. If pharmacological means are required to treat the patient, it can be quite costly. The special child patient offers a positive challenge for the dentist and an opportunity to progress and learn more within the profession. Managing and treating the special child patient successfully, and having the child return with a smile on his face, yields immense professional satisfaction. That is what makes working with special child patients so special.

The remainder of this chapter deals with specific disabilities. It will offer some helpful hints for the dentist and the dental team.

Physical Impairments

Physical impairments constitute a wide group of diagnoses with some having a substantial impact on the child's daily life in terms of reduced motor ability. The clinical manifestations vary widely from quadriplegia to conditions affecting the function of a limb or part of a limb. Some of the physical disabilities may be present at birth, while others may be acquired as a result of trauma or disease. A common diagnosis in this group is cerebral palsy, with four main subtypes: spastic (muscle stiffness), atheotid (slow movements), ataxic (lack of muscular balance and coordination) and mixed (having symptoms of more than one type of cerebral palsy, the most common being spastic-dyskinetic). Other common diagnoses are muscular dystrophies and spina bifida. For all diagnoses that lead to a decrease in physical activity, especially if the muscle tone is altered, there is a risk that body posture will impact the oral cavity both in terms of growth patterns and oral health. A hypotonic patient sitting in a position where the head is not supported will have an increased risk of developing malocclusions because the muscular forces that normally regulate the growth are affected. The tone is too low in the tongue, cheeks, and related structures. The same is true for the opposite condition—hypertonic patients. Patients with spastic problems sometimes present with self-inflicted injuries or bite wounds. These patients can be hard to treat, and the dentist may have to use a bite support or mouth prop to prevent the child patient from involuntary biting during treatment.

Clinical Considerations

High quality treatment and good patient management is facilitated if the patient is seated in the dental chair and able to relax. Some patients may have problems moving from their wheelchair to the dental chair. However, the patient should be moved onto the dental chair whenever possible, despite the difficulties that this may entail. To reduce the amount of chair movement, which can heighten a patient's anxiety, some prefer to pre-set the chair in the approximate position before seating the patient. Having the child in the dental chair improves the ergonomic position for the dentist, facilitating treatment and thereby improving quality in dental care. A dental clinic has to be designed to accommodate wheelchairs. (Some ideas for these accommodations can be found in Chapter Seventeen). In many clinics dedicated to the treatment of the special child, sliding equipment and lift systems are available to move the patient to the dental chair.

To make the dental chair more comfortable for patients, different kinds of cushions may be used. A cushion to sit on is very useful for most of the younger patients, as the normal dental chair is designed for an adult's full body length (See Figure 7-1). There are also special cushions available that will support the body for patients with low muscle tone or spasticities. These cushions provide a passive support and should not be confused with restraint. Light Velcro is used to keep the cushions in position. For patients with spastic problems, the cushions are adjusted to help flexing knees and hip joints (ideally to a ninety-degree flexion) and to incline the head to a chin-to-chest position. This position can help to reduce spasticities, which in turn makes it easier for the child to relax. These cushions can also be used for patients with intellectual disabilities or neuropsychiatric disorders. Patients without disabilities may also benefit from the comfort of cushions.

Figure 7-1. Special cushions to support the body for patients with low muscle tone or spasticities. For patients with spastic problems, the cushions are adjusted to help flexing knees and hip joints (ideally to a ninety-degree flexion) and to incline the head to a chin-to chest-position.

Some children with dysphagia may have an increased risk of aspiration. Therefore, it is highly important for the dental team to be alert and ready to provide good assistance to remove secretions and dental debris during treatment. For some children, the problems are so severe that all dental treatment will need to be carried out under general anesthesia.

Sedation often helps to reduce anxiety and assist a child with disability to relax during treatment. Minimum sedation is often sufficient; however, all types of sedation and dosages have to be tailored to the individual child. Nitrous oxide-oxygen sedation should not be used unless the child is able to nose breathe. Apart from being ineffective if not inhaled, exposure to nitrous oxide should be avoided for work environmental reasons. An ASA (American Society of Anesthesiologists) physical status evaluation is extremely important for children with disabilities, and the child's physician should be consulted if any questions arise. For some children, dental treatment cannot be carried out conventionally or under sedation—treatment under general anesthesia may be the only alternative. Access to facilities for general anesthesia varies between different countries; however, it is important to strive for these resources for this group of children. Not having this option may lead to either suboptimal dental care and deteriorated oral health, or no treatment at all. From that perspective, access to general anesthesia is a communal obligation if society wants to ensure these children's right to receive oral health care on the same level as others.

Editors' Note: By cradling a child's head against the operator's body, satisfactory stabilization can often be obtained. Using a rubber dam imparts a feeling of security that may be helpful for managing these children. At times, bite blocks may be used in the mouth. A body wrap may be used to help restrain movements, or sometimes a simple strap over a child's ankles may assist with stabilization. This additional armamentarium serves the purposes of protecting the child, facilitating dental procedures, and providing security. In the development of this chapter, it was recognized that there were regional differences. In Sweden and some other European countries, physical restraints are not culturally accepted and are prohibited by law under any circumstance. It should be emphasized that clinicians in these countries are able to treat patients successfully with extra time devoted to working with the parent and child and without the use of restraints. However, in other countries, some forms of restraints are still used and intended as a benefit to the consenting patient and/or parent.

Another form of physical impairment is obesity. The Centers for Disease Control and Prevention (CDC) has categorized obesity as an epidemic with physical, psychological, and social consequences in adults and children (CDC 2009). The prevalence of overweight and obesity is rising in many developed and developing countries and, most worryingly, among children. Currently, 32% of children and adolescents in the United States are overweight or obese (Ogden et al. 2010). In England, almost a quarter of children now enter primary school either overweight or obese, rising to one in three by age eleven. Available data for all other countries indicates a rising trend.

The rise of obesity within populations can have an impact on dental professionals. Problems extend from the effect of obesity directly on dental disease, to medical conditions influencing the development and treatment of dental disease, to the practicality of treating the obese in a conventional dental primary care setting (Reilly et al. 2009). Although the speed of the obesity epidemic has been greater than the recognition of the impending crisis by healthcare services (Levine 2012), many hospitals and dental clinics in developed countries now recognize the need for bariatric equipment such as beds, hoists, wheelchairs and commodes to take patients weighing more than 350 kg.

Many obese children come from families with lower socio-economic standards. There are several factors that contribute to overweight and obesity: bad dietary habits, high consumption of fast foods, sucrose-rich beverages, refined wheat bread, little or no physical activity, as well as some genetic influence. Even though dental caries are not always seen in overweight or obese young children, the risk for both caries and gingival inflammation will increase if the weight is not treated. Overweight and obesity affect the ASA evaluation of the patient, and the dentist should be aware of the effect of adiposity on the distribution, binding, and elimination of many commonly used drugs in dentistry. Obesity may complicate the use of pharmacological methods of patient management, and adverse events during sedation for dental procedures have been reported (Kang et al. 2012). There could be increased risk of respiratory depression when Midazolam or opioids such as meperidine are administered(Kang et al. 2012). Obese children also have a higher incidence of difficult mask ventilation, laryngoscopy, aspiration, postoperative atelectasis, airway obstruction, bronchospasm, major oxygen desaturation, and overall critical respiratory events (Tait et al. 2008).

Besides attending to the obese child's dental needs, dentists who care for children are in a unique position to help address the childhood obesity epidemic for several reasons (Tseng et al. 2010). First, dentists may see children regularly, providing an opportunity for longitudinal counseling and monitoring of weight status often starting at an early age. Second, dentists have a greater likelihood than pediatricians of seeing older children on a regular basis. Third, dentists are credible sources for dietary counseling. Most dentists who treat children feel that dietary counseling is an important component of oral health.

Perhaps the most difficult task and significant barrier for overweight and obesity screening among dental professionals is determining the manner in which a child's unhealthy weight status is to be communicated (Tseng et al. 2010). However, showing empathy and tact will enable the dentist to raise the issue and discover whether the child has had any medical weight counseling. If not, the dentist should help to refer the child for medical evaluation. As treatment for obesity and overweight is composed of several different methods that are individually tailored and decided on after careful medical evaluation, the dentist should limit advice to oral health matters.

Intellectual Disability

According to the American Association on Intellectual and Developmental Disabilities (AAIDD) (former American Association on Mental Retardation) "intellectual disability" is currently the preferred term for the disability that previously has been referred to as mental retardation. This change in terminology is also present in the new DSM-5 manual published in May 2013 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition). Intellectual disability is, by the definition from AAIDD, "characterized by significant limitations both in intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills. This disability originates before age 18." Historically, individuals with an intelligence quotient (IQ) under seventy were considered as having an intellectual disability. However, current definitions include both mental functioning and functioning skills in the individual's environment. As a result, a person with a below-average intelligence quotient may not be considered as having an intellectual disability unless they exhibit deficits in two or more adaptive behaviors. Still, the IQ test is a major tool for measuring intellectual functioning, and according to DSM-5, intellectual disability is considered to be approximately two standard deviations or more below the population, which equals an IQ score of about seventy or below. An IQ between fifty and sixty-nine denotes a mild or educable condition, while an IQ under fifty denotes severe intellectual disability. Approximately 3% of the population is affected by intellectual disability and 0.6% are affected to a severe degree.

There are many causes of intellectual disability. The most common causes include genetic deficits (e.g., Down syndrome), perinatal insults (oxygen deficiency before, during, or after birth), infections (such as rubella or meningitis) or trauma affecting the brain.

Since there are different levels of intellectual disability, the symptoms and manifestations vary widely between individuals. Generally, children with intellectual disabilities are slower in acquiring self-care life-skills, have difficulty remembering things, and have delayed language development. There are children with milder forms of intellectual disability that need very little support, and who often become excellent dental patients. At the other end of the spectrum, there are children with severe or profound disabilities who need twenty-four-hour assistance for all situations. These children frequently require general anesthesia or sedation for their dental care. Comorbidity is common in patients with intellectual disability. Many children with intellectual disability have additional health problems, such as other physical impairments, epilepsy, neuropsychiatric problems, and congenital heart defects or syndromes.

Clinical Considerations

As for all children, the creation of a safe environment for the child patient with an intellectual disability is fundamental for successful dental visits. In order for the child to feel safe, at least three factors have to be fulfilled: 1) a good rapport and relationship between the child, the accompanying person, and the dentist, 2) minimizing the risk of pain during treatment, and 3) helping the child develop a feeling of control. Stepwise introduction using tell-show-do (TSD), sometimes with the help of pedagogic tools like photos or pictures (see Austism Spectrum Disorder), should be performed at a slow pace. The dentist should impart a feeling of control to the patient so that the child knows what is going to happen and feels convinced that the dentist will react or stop if the child signals.

Due to diminished intellectual growth, many children with intellectual disability function with a limited capacity in comparison to other children. Hence, the social functioning of these children is found to be affected, and this is closely related to their degree of impairment. Children and adolescents with intellectual disability need time to feel comfortable in the dental setting, and time has to be invested in these patients. These children also benefit from meeting the same dental team during visits. If this is provided, the dental visits and simple treatments are usually accepted by children with intellectual disability. However, all treatments have to be constantly tailored to the individual patient's capacities and needs. For example, an injection can provoke fear for a child with an intellectual disability, just as it can with any other child, and the numbness following the injection sometimes elicits strong negative reactions. The child with intellectual disability that does not understand why this feeling occurs or that it will eventually disappear. Complications such as biting of an anesthetized lip or cheek can occur; the use of periodontal ligament injections when possible may help prevent this common problem.

Many children with intellectual disability will need help from others to carry out basic procedures like tooth brushing, due to their limited or decreased manual dexterity and/or lack of motivation and understanding of the importance of good oral hygiene. This need for assistance often stretches into adulthood.

Sensory Impairments

This section deals with children possessing varying degrees of auditory and visual impairments. Deficiencies in these senses interfere with communication and may lead to difficulties in patient treatment.

Hearing impairment and deafness occurs in children, although it is much more common in adults and the elderly. There are both congenital and acquired forms, and the level of impairment can vary from mild to total deafness. It should be noted that hearing impairment has comorbidity with other conditions, like intellectual disability, as well as some syndromes. Children who are hard of hearing will find it much more difficult than children who have normal hearing to learn vocabulary, grammar, word order, idiomatic expressions, and other aspects of verbal communication (National Information Centre for Children and Youth with Disabilities 2004). These deficiencies can affect communication and treatment in dental care. Interpretation using sign language might be necessary and should be offered if available. If not, the dental team should ensure that the appointment is scheduled in a way that allows for extra time. Parents can also be of major assistance in interpreting procedures for their child. They should be invited into the operatory because it may be difficult to explain concepts such as local anesthesia to the deaf child.

Problems related to hearing will affect communication during dental treatment. Ideally, the dentist should know how to communicate with sign language. If this is not the case, it is still possible to learn a few signs that can be helpful during treatment. For example, signs for "open your mouth," "good boy/good girl", and "toothbrush," plus social expressions like "welcome," "good-bye," etc. are beneficial. Sign language is not a universal language, and different verbal language areas and cultural regions can have different signs. Usually, older children who cognitively

understand dental treatment can be very good patients. But the dental team has to invest in time and in introduction to accomplish this. Consider the classic behavior-shaping TSD technique. Verbal communication is an integral part of the procedure, and so the deaf child must be managed differently. In fact, almost all of the communication techniques that are described for the average child cannot be used with the deaf child. For example, as many children with hearing impairments or deafness can use lip reading, the dentist should perhaps avoid wearing a mask during treatment (Champion and Holt 2000).

The use of sedation can be helpful for some children with hearing impairments. If the child with deafness needs extensive dental care, this should preferably be carried out under general anesthesia, especially in younger children. New technology has enabled treatment of deafness—especially congenital forms—by cochlear implants. If the child patient is using a hearing aid device or has a cochlear implant, it is sometimes necessary to adjust the head cushion to find a comfortable position for the child during treatment. Sometimes the hearing device has to be disconnected if it doesn't function with the noise during treatment, resulting in more difficulties concerning communication.

The deaf child also partially compensates for hearing loss by use of hearing aids, or manual communication (signs, finger spelling). However, too often these acquired skills are not learned until a child is six or seven years of age, a time when children with normal hearing are learning to read and write. Nonetheless, with gifted children and dedicated teachers, who frequently are the parents, it is often possible to acquire visual communication skills as early as three or four years of age.

Clinical Considerations

Since normal verbalization is impossible with many deaf children, substitute communication procedures must be used to convey information. The following tips are helpful to communicate with the hearing impaired (Nunn, J.H. 2000):

- Remove masks when communicating with the child and reduce background noise.
- Learn a few basic signs.
- Write essential information on a "magic slate," use picture books to explain things.
- Be sure to face the child when communicating and ensure that the light is not behind you or in the child's eyes.
- Use texting, Typetalk or some other of form electronic communication that children use today.

Many procedures have been recommended for establishing rapport and communication with children. Although the dentist may not employ all these procedures for the average child, they are highly important in the behavior management of the deaf child. When tipping the dental chair back, for example, the operator should make sure the child knows beforehand what will happen and then maybe touch the patient to impart a feeling of security. A hand mirror is an invaluable aid during most procedures, but the tactile sense also should be used. Children should be allowed to touch the instruments. This is used to great advantage with the average child; it must be used to the maximum for the deaf child. Use desensitization to introduce new instruments or equipment. For example, when compressed air is used, it should be demonstrated on the operator's cheek or hand, and then on the patient's hand, before it is introduced intra-orally. Since these children learn by touching, they should be allowed as much freedom as the office environment permits. This does not mean being overly permissive; rather, it is intended to allow deaf children to acclimate to the environment. Children have an insatiable curiosity with the gadgetry in the dental office. The deaf child is no exception.

Visually impaired children also present communication problems. Childhood blindness, as defined by the World Health Organization, refers to a group of diseases and conditions occurring in childhood or early adolescence which, if left untreated, result in blindness or severe visual impairment. The estimated prevalence of blindness in children varies from 0.3/1,000 in wealthy countries to 1.2/1,000 in poorer countries (Gilbert 2001).

Blindness can be found in conjunction with other conditions, such as deafness or intellectual disability. As with other conditions, evaluation of the child's intellectual capacity and a clear understanding of intrinsic limitations is extremely important before approaching the patient. When intellectual disability or deafness is found in conjunction with blindness, even the most primitive communication with the afflicted child may be difficult and unproductive. In these instances, referral to a specialist with broad experience with children having disabilities is advisable.

Like many other conditions, blindness occurs in varying degrees and in specific circumstances. Some children may have partial sight. Others may have had normal sight and then lost it. When this occurs after five years of age, children may retain a visual frame of reference. However, without minimal visual experiences, these children out of necessity become highly verbal. Through verbalization, they try to identify objects and understand everyday happenings.

There are four levels of visual function, according to the International Classification of Diseases, 10th

Revision (2010). These are: normal vision, moderate visual impairment, severe visual impairment and blindness. Moderate visual impairment combined with severe visual impairment are grouped under the term "low vision", and together with blindness represents all visual impairment. The dentist should always check with the parents as to the level of the child's impairment.

Clinical Considerations

Since the "show" portion of behavior shaping (TSD) is greatly limited or impossible with visually impaired or blind children, the other aspects of education and conditioning in dental office procedures must be stressed. These children compensate for the lack of visual input by increased use of the auditory, tactile, and olfactory senses. Therefore, new procedures must be carefully explained, maximizing sensory perceptions other than sight. All new sounds and smells should be identified. The children should be allowed to feel new objects, and these objects should be named whenever possible. By the process of exploring with their fingers, blind children develop a great tactile sensitivity. They also tend to be rather passive and inactive because movement is obviously more hazardous and requires more effort for them. They require more stimulation to venture into unknown experiences. Thus, the show technique is accomplished for the blind child with more effort from the dental team in a manner that is different from that used for the sighted child.

Recently, a new technique was developed for training visually impaired children in oral hygiene maintenance (Hebbal and Ankola 2012). Working with ninety-six children six to eighteen years of age at a school for the blind in India, researchers developed the Audiovisual Tactile Performance technique (ATP). This special education technique follows a pattern: children are informed about the importance of teeth and a brushing method; children then feel teeth on a model and brush the model; once mastered, the children feel and brush their own teeth. The study demonstrated that visually impaired children could maintain an acceptable level of oral hygiene when taught using a special customized method. It is often difficult to treat blind children and extensive treatment may require sedation and/or general anesthesia. Therefore, the focus should be on disease prevention.

Neuropsychiatric Disorders

Neuropsychiatric disorders include several diagnoses like autism and attention deficit hyperactivity disorder (ADHD), and are expected to affect at least 5% of the child population (Gillberg 1995). The diagnoses are based on a specific set of symptoms describing the main domains of problems experienced by the individual person. A person's diagnosis may change over time, as problems and symptoms change with individual development (Gillberg and Coleman 2000). There have been some changes of the definitions and naming of the different diagnoses in the new version of the DSM, a DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) that was published in May 2013 (American Psychiatric Association). One of new features is that Autism Spectrum Disorders (ASD) now will incorporate several previously separate diagnoses, whereas DSM-4 included pervasive developmental disorders (PDD), a spectrum of disorders from Asperger's Syndrome (mild) to autism (more challenging symptoms).

Autism Spectrum Disorders (ASD)

According to DSM-5, the individual should meet four different criteria in order to be diagnosed with ASD: persistent deficits in social communication and social interaction across contexts, not accounted for by general developmental delays; restricted, repetitive patterns of behavior, interests, or activities; symptoms must be present in early childhood (but may not become fully manifest until social demands exceed limited capacities), and; symptoms together limit and impair everyday functioning (American Psychiatric Association).

Clinical Considerations

The literature reports no differences in prevalence of caries between children with ASD and others, providing there is no other underlying medical condition. A probable reason for this is that families or caregivers are able to provide a good diet for the child, with a low intake of cariogenic items. However, there are reports of more plaque and gingivitis compared with dental records of healthy children. The reason may again be related to families or caregivers, as many children and adolescents with ASD are dependent on help from others to carry out oral hygiene procedures. Brushing the teeth of children and adolescents with ASD is often difficult.

If the dental team knows beforehand that the child has been diagnosed with ASD, it is advisable to discuss the case history and treatment with the parents before the first visit. This could be achieved by either contacting the family by phone or scheduling a separate appointment with the parents alone. One advantage of having the parents visit the clinic before the child's appointment is that they might feel more comfortable when they bring their child—they easily find their way, know where to park, and already know the dentist.

Additionally, parental input may be more important for ASD child patients than for average children.

Interviews with parents should focus on the child's strengths, what the child likes, appropriate rewards, and whether or not the child speaks and if not, the best way to communicate. It is also important to find out about the child's fears, particularly things like noise or a strong light. Children with ASD are often overly sensitive to sounds, tastes, smells, and sights. In the dental treatment situation, children with ASD need help to understand and focus on the treatment. Many children feel comfortable with established rituals, which can be used for treatment. It is important for the patient to meet the same dentist and preferably the same assistant or dental hygienist in order to get to know the personnel and learn to trust them. Several appointments are often necessary for an introduction to dental care. As for most patients with neuropsychiatric disorder, children with ASD need help to both understand and to focus on the treatment situation. Reducing incoming visual and auditory stimuli is often helpful. This will be discussed further when describing the management of patients with ADHD.

As many children with ASD have difficulty with abstract reasoning, the communication should be modified to suit the individual patient. Use concrete language and eliminate abstract concepts. Many children with ASD are quite literal and often misunderstand abstract sayings like 'it's raining cats and dogs' or 'take my hand.' It is wise to be clear and objective in communication. Just tell the child what you want to achieve, give simple directions, and skip the small talk. Avoid detailed explanations and nonverbal cues—the child will often be happier with very concrete information. For example, you fix a tooth because it is broken. The reason behind the cavity is not important.

The introduction to examination or treatment may be carried out over a number of appointments spaced one or a few days apart. Alternatively, several short appointments sequentially on the same day may be used. A stepwise introduction to gradually more stress-provoking items and parts of a normal dental visit is carried out. It is important to allow sufficient pause between the steps if that is what the child requires. Praising and rewarding the child is essential, and it should immediately follow good cooperation.

Many children and adolescents with ASD and other neuropsychiatric disorders use pictures or photographs as an aid in communication. The dentist can easily create this type of individually customized aid by using a digital camera and a printer. The set of photos should include pictures of the dental clinic, as well as the dentist and the staff whom the patient will meet. A photo of an open mouth will symbolize "open your mouth," and other useful pictures can depict a toothbrush, equipment for prophylaxis, a mirror, the operatory lamp, and the dental chair. The photographs can be arranged in a photo album in the sequence the patient will see them at the appointment (Bäckman & Pilebro 1999). The album also can be used as a pedagogic tool both at home when preparing for the visit and during the appointment as an aid to communicate what will happen next. Knowing what will happen is probably one of the most important factors to reduce anxiety and prevent behavior management problems in all children. For children with neuropsychiatric disorders, it may be more difficult to ensure that the child fully understands what will happen and that she feels at ease with that information. Pedagogic tools like the photos in the album or written social stories describing the expected course of events are very useful and function as an itinerary or travel plan for the appointment. Parents can help with this, as they know what their child will experience during the dental appointment and they will be better prepared to support and encourage their child both before and during the visits.

In most instances, parents should be encouraged to remain with their child during treatment. Many dentists acknowledge that most parents can be helpful, as they signal that the treatment is satisfactory. Further, the children feel safe having someone as a support in the special or strange situation. Undoubtedly, there are exceptions to parental presence. Some fearful or dental phobic parents will not be supportive to the child, and there could be parents who refuse to be present. In some instances, the dentist may not want the parent present during treatments like oral surgery.

The introduction to treatment can be carried out by a dental assistant or hygienist. Once the child is judged to feel safe with all introductory steps, an examination appointment is scheduled with the dentist, preferably with the same personnel who performed the introduction.

Photographs are used during this appointment to show the child the different steps in treatment. Using the same photos and having the same hierarchy of treatment steps helps the child to cooperate and feel safe, even when meeting a new member of the dental team. The album signals that "this is the way we do things here and you, the patient, can rely on us." This kind of aid is also useful when treating other patients, like patients with ADHD, intellectual disability, or even young or anxious children (Bäckman and Pilebro 1999). Photographs also can serve as tools or aids for tooth brushing at home. For this purpose, photos could show what will be used to brush the teeth, toothpaste, a helping parent, and for some patients, illustrations of tooth surfaces to be cleaned (Pilebro and Bäckman 2005).

It is usually possible to carry out a dental examination with a mirror and probe, and to perform preventive measures like tooth brushing, polishing, and applying topical fluorides after this kind of special introduction to dental care. But for a majority of children with ASD, it is more problematic to take radiographs or restorative treatment. Not all children can be managed with non-pharmacologic techniques. Some patients do well with light sedation, while others do not. For the latter, general anesthesia is often required for comprehensive dentistry. Knowing that a child may require a general anesthetic for treatment, every effort should be made to help the patient remain healthy. The preventive care should preferably include both chair-side prevention and enhanced self-care, and it can be conducted by dental hygienists and/or trained dental assistants. To enhance the dental care, ASD children are scheduled for frequent recall appointments to maintain contact and ensure successful experiences. There are also specific issues concerning communication and environment to minimize the risk for behavioral problems. They will be elaborated upon in the ADHD section.

Attention Deficit Hyperactivity Disorder (ADHD)

This is a relatively common disorder affecting 3-7% of children and adolescents (Faraone et al. 2003). Hence, it is something that all dental health care personnel are likely to meet. More boys than girls are diagnosed, although girls, who show fewer observable symptoms—as hyperactivity—are supposedly under-diagnosed. The etiology is not fully understood, but it is regarded as a highly heritable disorder in most cases of familial origin. Parents with ADHD have a greater than 50% probability of having a child with ADHD. A majority of children with ADHD have at least one close biological relative who presents with symptoms of ADHD. However, the disorder can also be acquired, and some individuals have a combination of genetic and acquired ADHD. At the present time, it is not possible to distinguish between these two types of ADHD—they both present similarly, and both usually respond to treatment with the same psycho-stimulant medication (Voeller 2004). ADHD can be considered a disorder of neurotransmitter function, with particular focus on the neurotransmitters dopamine and norepinephrine. Inattention, hyperactivity, and impulsivity are the main problems in ADHD, and the diagnosis can be of a combined type (most common) in which the individual exhibits symptoms in all domains. Treatment includes both medication (mainly with methylphenidate or amphetamine) and psycho-educative strategies with didactic programs for parents and teachers.

There is much disagreement regarding the oral health status of children with ADHD. However, it appears that there is a slight increase in risk for dental caries, especially as reports point to higher frequency of food and beverage intakes and a lower frequency of tooth brushing in children and adolescents with ADHD (Blomqvist et al. 2007).

Clinical Considerations

Reports indicate more dental behavior management problems and more dental anxiety in children with ADHD (Blomqvist et al. 2006). The reason for this is not fully understood, but it is likely that many children with ADHD have difficulties adjusting their level of activity to the demand of the dental setting. Many children and adolescents with ADHD behave and function at a lower age level in the dental setting. If the dental team does not understand the reason behind the child's behavior and does not adapt the treatment and demands to the child's capacities, there is an obvious risk for behavioral problems. Forcing a child to accept treatment is never a good idea. Instead, children with ADHD are often successfully managed when given an appropriate introduction to the treatment. The chances of a successful appointment are enhanced if the child feels safe and trusts the dental team. To achieve this, the dentist must allow himself sufficient time for the treatment. An environment that helps the child focus on the dental treatment must be provided, thus facilitating acceptance of treatment.

As for all special child patients, preventing oral health problems and promoting a positive attitude and acceptance of dental care should have the highest priority. Try to reduce disturbing visual and auditory noise to help the child focus on the treatment. To help the child concentrate, reduce unnecessary sensory input by turning off the radio or music, closing the door to the treatment room to reduce background noise and disturbances, and removing visual distractors like toys or books. This might seem strange, as it counters the working of most dental offices. However, one of the problems for children with ADHD is to select and filter the incoming stimuli. They drown in too much input. The same caution applies to communication. Dentists and other health professionals often think that conversation and small talk is beneficial for the patient. While this is true for many patients, this is not the case for children with neuropsychiatric disorders. Like children with ASD, the child with ADHD needs to be informed as to what will happen during the treatment. Again, using photos can be helpful. Further, the child needs to know who they will meet and who will do the treatment, the length of the treatment procedure, and finally, what will happen afterward. Using direct and objective guidance during the treatment helps the child

to focus. It is far better to direct the child by saying "Sit in the chair," rather than "Would you like to sit in the chair?" (Blomqvist 2007). The first statement is a direct instruction, whereas the latter statement could be interpreted as a question. A child may well reply to the question with a "No, I don't want to." In that case, it is next to impossible to proceed with the planned treatment without encountering problems.

At this time, readers should have recognized similarities in the approach to many different disabilities. Many of the techniques used to manage children with ASD are the same used for other neuropsychiatric disorder including ADHD, for children with intellectual disabilities, and for other children with special needs or anxiety. The key is to select what works best for the individual child.

Concluding Remarks

Meeting patients with disabilities is not always easy, and carrying out dental treatment is even more difficult. While this is something that dental professionals have to accept, we also must be sure that it does not color our views, and care must be taken to avoid discrimination against this large group of individuals.

Research has shown that there are several possible barriers keeping children with disabilities from receiving oral health care on the same premise as others. The barriers involve factors that are related to the child patient, the family, and the medical and dental health professionals. The problem is that the oral health of children with disabilities is not a priority issue, and that no-one seems to take an overriding responsibility for this area (Klingberg and Hallberg 2012). Many of the barriers have been identified in this chapter.

There is a risk that children with disabilities will not have the same access to dental care or receive the same dental treatment as others. If unattended, this will lead to inequalities in oral health—that is unacceptable. This can be changed. A first step is to learn more about all children—how they develop and mature physically, emotionally, and cognitively. Secondly, one should learn more about disabilities and how different diagnoses affect oral and general health. Finally, practice with an open mind. Dentists who are motivated to treat special children will find it both stimulating and rewarding.

References

American Association on Intellectual and Developmental Disabilities. http://www.aaidd.org/index.cfm.

American Psychiatric Association. DSM-5 Development. http://www.dsm5.org/Pages/Default.aspx.

Bäckman, B. and Pilebro, C. (1999). Visual pedagogy in dentistry for children with autism. *ASDC Journal of Dentistry for Children*, 66, 325–331, 294.

Bedi, R., Champion, J., Horn, R. (2001). Attitudes of the dental team to the provision of care for people with learning disabilities. *Special Care in Dentistry*, 21, 147–152.

Bedi, R. and O'Donnell, D. (1989). Long-term effects of a course on dental care for handicapped persons. *Journal of Dental Education*, 53, 722–724.

Bethell, C.D. et al. (2008). What is the prevalence of children with special health care needs? Toward an understanding of variations in findings and methods across three national surveys. *Maternal and Child Health Journal*, 12, 1–14.

Blomqvist, M. et al. (2006). Oral health, dental anxiety, and behavior management problems in children with attention deficit hyperactivity disorder. *European Journal of Oral Sciences*, 114, 385–390.

Blomqvist, M. et al. (2007). Dental caries and oral health behavior in children with attention deficit hyperactivity disorder. *European Journal of Oral Sciences*, 115, 186–191.

Brogårdh-Roth, S. (2010). The preterm child in dentistry. Behavioural aspects and oral health. PhD Thesis. Malmö University, Sweden.

Centers for Disease Control and Prevention (2009). Obesity: At a Glance 2009. Available at: "http://www.cdc.gov/nccdphp/publications/AAG/pdf/obesity.pdf." Accessed May 23, 2013.

Champion, J. and Holt, R. (2000). Dental care for children and young people who have a hearing impairment. *British Dental Journal*, 189, 155–159.

Cairns, I. (1992). The health of mothers and fathers with a child with a disability. *Health Visit*, 65, 238–239.

Child Friendly Healthcare Initiative. http://www.cfhiuk.org/. Accessed April 2013.

Delaney, A.L. and Arvedson, J.C. (2008). Development of swallowing and feeding: prenatal through first year of life. *Developmental Disabilities Research Reviews*, 14, 105–117.

Faraone, S.V. et al. (2003). The worldwide prevalence of ADHD: is it an American condition? *World Psychiatry*, 2, 104–113.

Faulks, D. et al. (2013). Using the International Classification of Functioning, Disability and Health (ICF) to Describe Children Referred to Special Care or Paediatric Dental Services. *PLoS One*, 8, e61993.

Faulds, D.et al. (2012). The value of education in special care dentistry as a means of reducing inequalities in oral health. *European Journal of Dental Education*, 16, 195–201.

Gilbert, C. (2001). New Issues in Childhood Blindness. *Community Eye Health*, 14, 53–56.

Gillberg, C. and Coleman, M. (2000). *The Biology of the Autistic Syndromes*, 3rd ed. Mac Keith, London.

Gillberg. C. (1995). Epidemiological overview. In: *Clinical Child Neuropsychiatry*. (ed C. Gillberg). 4–11. Cambridge University Press, Cambridge.

Hallberg U and Klingberg G. (2007) Giving low priority to oral health care. Voices from people with disabilities in a grounded theory study. *Acta Odontologica Scandinavica*, 65, 265–270.

Hallberg, U., Oskarsdóttir, S., Klingberg, G. (2010). 22q11 deletion syndrome—the meaning of a diagnosis. A qualitative

study on parental perspectives. *Child: care, health and development*, 36, 719–725.

Hallberg, U., Strandmark, M., Klingberg, G. (2003). Dental health professionals' treatment of children with disabilities: a qualitative study. *Acta Odontologica Scandinavica*, 62, 319–327.

Hebbal, M. and Ankola, A.V. (2012). Development of a new technique (ATP) for training visually impaired children in oral hygiene maintenance. *European Archives of Pediatric Dentistry*, 13, 244–245.

International Classification of Diseases, 10th Revision (ICD-10), World Health Organization.

Kang, J. et. al. (2012). The safety of sedation for overweight/obese children in the dental setting. *Pediatric Dentistry*, 34, 392–396.

Kinne, R.D. and Stiefel, D.J. (1979). Assessment of student attitude and confidence in a program of dental education in care of the disabled. *Journal of Dental Education*, 43, 271–5.

Klingberg, G. and Hallberg, U. (2012). Oral health—not a priority issue a grounded theory analysis of barriers for young patients with disabilities to receive oral health care on the same premise as others. *European Journal of Oral Sciences*, 120, 232–238.

Leung, W. (2013). Patients with mental health disorders deserve better. Pg.L8, *The Globe and Mail*, Toronto, Canada.

Levine, R. (2012). Obesity and oral disease—a challenge for dentistry. *British Dental Journal*, 213, 453–456.

Mason, S.J., Harris, G., Blissett, J. (2005). Tube feeding in infancy: implications for the development of normal eating and drinking skills. *Dysphagia*, 20, 46–61.

Merrick, J. and Carmeli, E. (2003). A Review On The Prevalence Of Disabilities In Children. *The Internet Journal of Pediatrics and Neonatology*, 3 (1), DOI: 10.5580/29ac.

Mun-H-Center. National Orofacial Resource Centre for Rare Disorders.http://mun-h-center.se/EN/Mun-H-Center/Mun-H-Center-E/. Accessed April 2013.

National Dissemination Center for Children with Disabilities. http://nichcy.org/. Accessed April 2013.

National Information Centre for Children and Youth with Disabilities. (2004). Publication FS3, Washingon, D.C.

Nunn, J.H. (2000). Paediatric dentistry: Are we dealing with hearing-impaired children correctly? *British Dental Journal*, 189, 151–154.

O'Donnell, D. (1993). Use of the SADP for measurement of attitudes of Chinese dental students and dental surgery assistants toward disabled persons. *Special Care in Dentistry*, 13, 81–85.

Ogden, C.L. et al. (2010). Revalence of high body mass index in US children and adolescents. *Journal of the Amerciaan Medical Association*, 303, 242–249.

Orphanet. http://www.orpha.net/consor/cgi-bin/index.php?lng=EN. Accessed April 2013.

Pilebro, C. and Bäckman, B. (2005). Teaching oral hygiene to children with autism. *International Journal of Paediatric Dentistry*, 15, 1–9.

Reilly, D., Boyle, C. A., Craig, D. C. (2009). Obesity and dentistry: a growing problem. *British Dental Journal*. 207, 171–175.

Rommel, N. et al. (2003). The complexity of feeding problems in 700 infants and young children presenting to a tertiary care institution. *Journal of Pediatric Gastroenterology and Nutrition*, 37, 75–84.

Scheeran, T., Marvin, R.S., Pianta, R.C. (1997). Mother's resolution of their child's diagnosis and self-reported measures of parenting stress, marital relations, and social support. *Journal of Pediatric Psychology*, 22, 197–212.

Singh, R.K., Murawat, K., Agrawal, R. (2012). Dental care for the deaf pediatric patient. *Indian Journal of Otolology*, 18, 171–173.

Tait, A.R. et al. (2008). Incidence and risk factors for perioperative adverse respiratory events in children who are obese. *Anesthesiology*, 108, 375–80.

Trulsson, U. and Klingberg, G. (2003). Living with a child with a severe orofacial handicap: experiences from the perspectives of parents. *European Journal of Oral Sciences*, 111, 19–25.

Tseng, R., Vann, W.F. Jr., Perrin, E.M. (2010). Addressing childhood overweight and obesity in the dental office: rationale and practical guidelines. *Pediatric Dentistry*, 32, 417–23.

United Nations. Convention on the Rights of Persons with Disabilities. http://www.un.org/disabilities/convention/conventionfull.shtml. Accessed April 2013.

United Nations. Convention on the Rights of the Child. http://www2.ohchr.org/english/. Accessed April 2013.

Voeller, K.S. (2004). Attention Deficit Hyperactivity Disorder (ADHD). *Journal of Child Neurology*, 19, 798–814.

World Health Organization. International Classification of Diseases (ICD). http://www.who.int/classifications/icd/en/. Accessed April 2013.

World Health Organization. International Classification of Functioning, Disability and Health (ICF). http://www.who.int/classifications/icf/en/. Accessed April 2013.

Chapter 8

Local Anesthesia

Steven Schwartz

Ari Kupietzky

One of the most important and challenging aspects of child behavior management is pain control. Children who undergo early painful experiences during dental procedures are likely to carry negative feelings toward dentistry into adulthood. Therefore, it is important that clinicians make every effort to minimize pain and discomfort during dental treatment. The successful children's dentist must master the skill and art of administering the most painless injection possible. Some clinicians will try to avoid the administration of local anesthesia; however, this often results in poor clinical practice. As a consequence of no local anesthesia, a rubber dam will rarely or never be used and cavity preparations may be left shallow, with the end result far from optimal. In addition, there are times when an anticipated "minor" procedure becomes a major procedure and the patient is placed in a painful situation because of the lack of dental anesthesia.

On the other hand, one of the greatest single fears of the pediatric dental patient is "the needle" (Eichenbaum and Dunn 1971). Childhood fears emanate from many sources, and some can be extremely obscure. One possible cause of general dental anxiety may be previous exposure to invasive medical care in early childhood (Karjalainen et al. 2003). A recent review (Sokolowski et al. 2010) on needle phobia presented several publications suggesting that the fear of needles may result after a negative experience at a physician's or dentist's office. Many childhood fears are learned and may be the result of early childhood conditioning (i.e., "shots" administered from infancy). The average child will receive twenty-one vaccines in up to six to seven injections before the age of six. Children may not be voluntarily cooperative during these immunization procedures, and sometimes they may be physically restrained. Ost (1991) examined subjects with injection phobia, and showed that 56% could trace their fear back to negative conditioning from a health care experience. The mean age onset was eight years and often correlated with a first-time health care–related appointment. This study also determined that 24% of the subjects could trace their phobias to having seen another child, often a sibling, have a negative experience to needles.

As a consequence of these conflicting concerns—the dentist wanting to control pain with local anesthesia and the child fearing the pain of the needle—injection procedures present an almost constant challenge to the dentist's skills. Thus the aims of this chapter, which covers an important aspect of behavior management, are (1) to discuss factors associated with administering injections and (2) to review the most commonly used local anesthetic techniques for children. The chapter will not present every type of local anesthesia, nor will it include detailed techniques. It will focus instead on the most commonly used injections, with an emphasis on how to administer local anesthesia with minimum pain and maximum effect.

Administration of Local Anesthesia

It is extremely important for the dentist to have an effective system for the administration of local anesthesia. Children are very sensitive to body language. Pediatric patients can detect uncertainty or hesitation, which can lead to difficulty. If the dentist's approach, and that of the assistant, are not confident and well-timed, the child may easily sense their attitude and resist every effort that they make (see Communication in Chapter Six). Considerable skill is needed for administering local anesthesia to children while avoiding behavior problems. Some of the following clinical procedures, which have been developed over the years, are widely accepted and highly successful with children. Others, however, are debatable.

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

Preparation of Patient

Preparation of the patient prior to injection consists of two components: mental and physical.

Mental preparation begins with explaining the anesthesia administration process to the child in terminology that they can understand. The child may be sitting upright in a non-threatened position. Consider the following narrative:

> "Today I'm going to put your tooth to sleep, wash some germs out of your tooth and fix your tooth and make it all better. When your tooth falls asleep your lip and tongue will feel fat and funny for a little while. You will not look funny or fat. You will just feel funny and fat.
>
> To make your tooth fall asleep, I am going to use sleepy juice. Only your tooth will go to sleep, not you! The sleepy juice doesn't taste so good, so as soon as I put it next to your tooth, I will wash it away with some water. Oh, and while I put the juice next to your tooth I will give you a little pinch. A pinch only hurts a little. Not a lot. Let's pretend to do it. Not for real, just pretend. I'm going to show you everything I do so you can see how easy this is."

The dentist asks the child to pinch her arm. Some children may hesitate, but after a little coaxing, they will happily proceed to pinch the dentist. At this point, the dentist may turn around and, with a smile, inform the accompanying parent that kids love this part of the procedure. During the pinch the dentist says: "That hurt me, but not a lot. It hurt very little. I do not need to cry for such a little pinch."

The dentist now takes the child's arm and gently pinches the skin. The slight amount of pain created will not upset most children, and the child has now learned an objective association for the expectation of the injection, "the pinch." The dentist proceeds to gently pinch the cheek or gingiva adjacent to the tooth and immediately spray water, demonstrating the feeling of the intraoral pinch and subsequent washing away of the bitter sleepy juice. The dentist then says, "you are a good boy (or girl) and I am sure you can stand a little pinch like that." An overwhelming majority of children will agree and will cooperate during the injection.

Chair Position

Some authors have suggested giving injections, particularly mandibular blocks, with the patient in a somewhat upright position, resulting in the patient's mandible being approximately parallel to the floor and the clinician's elbow close to the body. Most pediatric dentists prefer to deliver local anesthetics with the patient in a supine position (Figure 8-1). This is especially true for those using custom-made benches, as shown in Chapter Seventeen. The anatomical positions and injections are essentially

Figure 8-1. Most pediatric dentists prefer to deliver local anesthetics with the patient in a supine position.

the same. However, when the child is in the supine position, the mandible is at approximately a thirty-degree angle to the floor, and the clinician's elbow will be high, with the arm nearly parallel to the floor. The patient is positioned with the head and heart parallel to the floor and the feet slightly elevated. Positioning the patient in this manner reduces the incidence of syncope that can occur as a result of increased anxiety. In addition, the patient's sudden movements are more easily controlled.

"It will be much easier for me to see your teeth if you lay back, so I will give you a ride and make the chair go back. Before I give you the pinch I will practice with you again and explain everything." Repeating the explanation and pinch while the child is reclined may not be necessary with all children. In addition, if the child has been holding a hand mirror, it should be taken by the assistant with the promise that it will be shortly returned.

Assembling the Syringe

There is debate among clinicians as to whether the syringe and its components should be assembled in or out of view of the patient. The majority of pediatric dentists attempt to keep anesthetic syringes out of the sight of child patients (Starkey 1983). Proponents of assembling the syringe out of the patient's sight assert that most children have developed a fear of the injection during prior visits to the pediatrician, and the slightest suspicion that they are getting an injection will set them off. This is especially true when told stories by older siblings and friends. In addition, the word "injection" has not been used. From the perspective of the child, he or she is simply getting a special pinch with sleepy juice. Introducing the syringe may complicate the process. In

(a)

(b)

Figure 8-2. With the proper technique, the child need not ever see the syringe. It is always passed and held in blind spots, away from the patient's view: under the child's chin (a) and behind her head (b).

addition, some children may insist on removing the cap, thus exposing the needle. With proper technique the child need not ever see the syringe, which is always passed and held in blind spots, away from the patient's view (Figure 8-2).

Proponents of assembling the syringe in view of the patient assert that doing so acts as a desensitization technique. The patient has the opportunity to touch and feel the individual, non-threatening components, reducing patient apprehension linked to prior injections. Clinicians who opt to show the syringe and its assembly in view of the patient may use the following narrative during syringe assembly.

> "I'm going to make the tooth go to sleep and feel fat and funny with my sleepy juice. The sleepy juice is kept in this little glass jar." (Allow the child to hold the cartridge.) "We place the jar in a special water sprayer," (allow the child to hold the syringe) "and we place a plastic straw at the end of the water sprayer." (Allow the child to hold the covered needle.)

Case 8.1

Jack, a six-year-old boy, is seated in the dental chair for his first restorative appointment. The dentist explains to Jack that she will be putting his tooth to sleep by pinching the cheek near the tooth and, at the same time, squirting sleeping juice around the tooth. Jack becomes excited and upset. He asks the dentist: "Are you going to give me a shot? I don't want a shot. Shots hurt. Show me the shot!"

***Case 8.1, Discussion*: Option 1.** The dentist answers: "I am not giving you a shot, only a pinch." The child suddenly moves and sees the syringe. He screams: "You are a liar! You are giving me a shot!" The boy manages to jump off the chair and run out of the room. A severe behavior problem ensued, and no amount of talk from the dentist made any difference to the child. The parents opted to switch to another dentist.

Option 2. The dentist answers: "As I told you before, I am going to give you a little pinch and put your tooth to sleep. Let's pretend and pinch your cheek. See? It only hurts a little. Now let's do it for real." Jack answers: "How do you squirt the sleepy juice? Show it to me!" Dentist: "I am like a magician. Magicians never reveal their tricks. Maybe later, if you are a good patient, I will show you how I do it." Most patients will not ask to see the syringe at the end of their treatment.

Option 3. The dentist answers: "Yes, I am going to give to you a shot, if that is what you want to call it. I know how to give a shot in a special way so that it does not hurt a lot, only a little. I don't call it a shot, I call it a pinch." Jack answers: "Show it to me!" The dentist shows Jack the covered syringe.

There are unlimited ways to successfully manage the above scenario. However, it is obvious that Option 1 is not one of them. The dentist lied to the child, thereby losing all credibility. In Option 2 the dentist never acknowledged that a shot would be given, yet she did not deny it either. She never stated that she would not be giving an injection. In many instances the child will receive the injection, never aware of it being a "shot"—just an uncomfortable pinch. The child was worried about the shot, not the pinch.

Jack had been adversely preconditioned to injections. His fear of the shot might have emanated from his experience with vaccinations. He disliked them and remembered crying. Although he returned from his first dental appointment excited and pleased, he became very anxious in anticipation of the next visit. He had he told his best friend in kindergarten how much fun the visit was. The friend responded by warning him of his next visit, when the dentist would give him a shot.

Administration of the Anesthetic

There are two important goals which one must accomplish during anesthetic administration; controlling and limiting movement of the patient's head and body, and communicating with the patient to draw their attention away from the minor discomfort that may be felt during the injection process. Most clinicians prefer to keep the uncapped needle out of the patient's line of sight. The child should not be asked to close her eyes, as that is usually a sign that something bad or painful is about to occur. In addition, pain perception may be enhanced with eyes closed. Instead, the assistant should pass the uncapped syringe behind the patient's head (Figure 8-2). Once the assistant has handed the syringe to the dentist and has freed her hands, she positions them over the patient. The assistant should not actively restrain or even touch the child's arms unless an attempt is made by the patient to lift her arms to reject treatment (Figure 8-3). Just touching the arms, as if to restrain, may cause apprehension in the child and, at that moment, the youngster may attempt to resist physically. Instead, the dental assistant should position her hands above the child's hands to intercept any untoward movement.

Stabilization

Before placing the syringe in the mouth, the patient's head should be stabilized. There are two basic positions for stabilizing the patient's head. A behind-the-patient position is assumed for injecting the quadrants that are contralateral to the clinician's favored hand and the anterior regions (i.e., right-handed clinicians injecting the left side, left-handed clinicians injecting the right side). The clinician stabilizes the patient's head by supporting the head against the clinician's body with the less favored hand and arm. He stabilizes the jaw by resting the fingers against the mandible for support and retraction of the lips and cheek.

Figure 8-3. The assistant should not actively restrain or even touch the child's arms unless an attempt is made by the patient to lift her arms to reject treatment.

For injections on the same side as the clinician's favored hand (i.e., right side for right-handed clinicians and left side for left-handed clinicians), the clinician assumes a more forward position—eight o'clock for right-handed clinicians, four o'clock for left-handed clinicians (Figure 8-4a and b). The clinician stabilizes the patient's head and retracts the soft tissues with the fingers of the weaker hand resting on the bones of the maxilla and mandible.

Communication and Distraction

The clinician speaks with the patient in a reassuring manner during anesthesia administration. The subject matter can range from describing the process in child-friendly terminology, to praise, to storytelling, to singing, or, if the clinician is totally unimaginative, counting. Avoid words like shot, pain, hurt, and injection, and substitute words like cold, warm, weird, fat, and funny.

"The sleepy juice may feel real cold. So what I'll do is count, and by the time I reach five the water will warm up."

Two distraction techniques which may be employed are described. The child is asked to say "la, la, la, la" during the pinch. Not "ah, ah, ah, ah" but "la, la, la, la." The patient also may be asked to raise the left or right leg during the injection. After depositing the desired amount of anesthetic, the syringe is withdrawn and the needle safely recapped.

Finally, the mouth is rinsed with water from the triple syringe, thus eliminating any blood from view: "Does the sleepy juice taste bitter? Let me rinse it away. Here is some water. Swallow the water. Wow, what a great

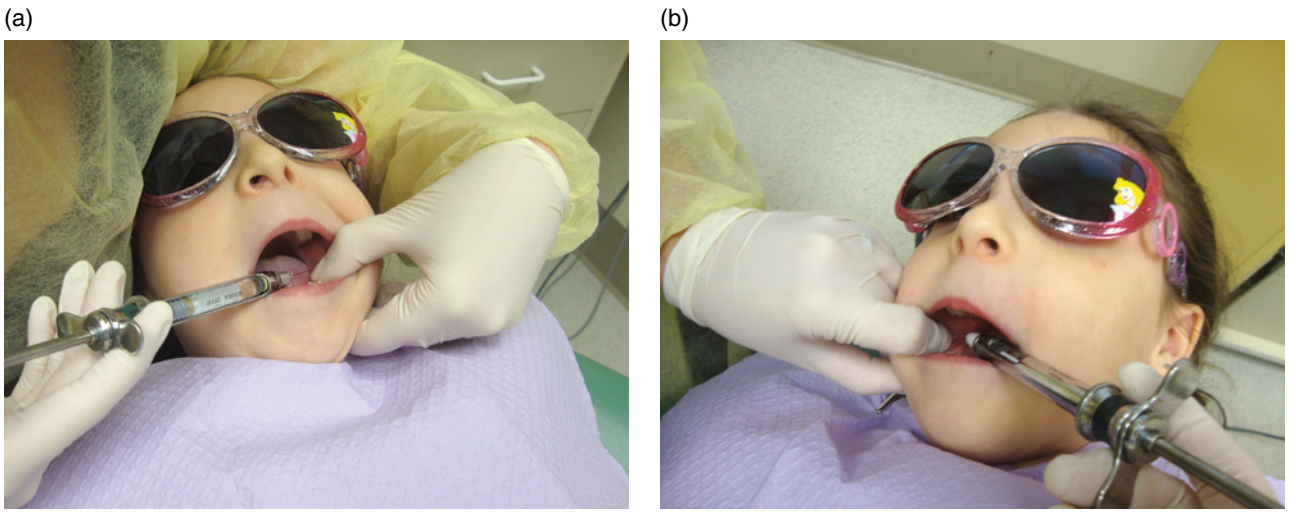

Figure 8-4. A behind-the-patient position is assumed for injecting the contralateral quadrants to the clinician's favored hand (i.e., right-handed clinicians injecting the left side). The clinician stabilizes the patient's head by supporting the head against the clinician's body with the less favored hand and arm (a). For injections on the same side as the clinician's favored hand (i.e., right side for right-handed clinicians), the clinician assumes a forward position of eight o'clock (b).

helper you are." Include a specific compliment: "You were very still."

The assistant may return the hand mirror to the child. "Your tooth and cheek feel fat and funny, but you look the same." The child looks in the mirror and sees that all appears normal, although the mouth does indeed feel strange.

Topical Anesthesia

Topical anesthetics are available in gel, liquid, ointment, patch, and pressurized spray forms. Topical anesthetics are effective to a depth of 2–3 mm and are limited in their effect to reduce the discomfort of the initial penetration of the needle into the mucosa: they offer little benefit when performing a mandibular block. The benefits of topical anesthetics may not be entirely pharmacological; a psychological advantage may ensue. A number of investigations have compared topical anesthetics with placebo intraorally with conflicting results(Meechan 2008). Some show positive benefits from the use of topical anesthesia before needle insertion and others do not. There is no evidence that topical anesthetics have any value in reducing the discomfort of regional block administrations such as inferior alveolar nerve block injections (Meechan 2002). In addition, their disadvantages include a disagreeable taste that may be a cause of patient discomfort, sometimes eliciting crying even before the actual injection is given. In addition, the length of application time may increase apprehension of the approaching procedure in the pediatric patient. The application duration time is a crucial factor governing effectiveness (beyond a placebo). The onset times of topical anesthetics range between thirty seconds and five minutes. Many clinicians do not wait for the anesthetic to take effect; they proceed with the injection almost immediately after placing the topical. In a survey on local anesthesia, Kohli and colleagues (2001) reported that two-thirds of the responding pediatric dentists waited a minute or less. In addition, most practitioners responded that patients disliked the taste, consistency, and the warm or burning sensation of the topical anesthetics. A majority of the respondents (86%) always used a topical anesthetic, while 9% sometimes used a topical anesthetic, 4% rarely used topical anesthetic, and 1% reported that they never used a topical anesthetic. Another reason for widespread use of topical may be the expectation of the accompanying parent, who presumes that its use is crucial for a painless injection. However, if a child has been referred due to behavior problems and the previous dentist used a topical, it might be best to avoid it.

Benzocaine is a very common topical anesthetic. It is not known to produce systemic toxicity in adults, but can produce local allergic reactions. However, the Food and Drug Administration announced in April 2011 that "Topical benzocaine sprays, gels, and liquids used as anesthesia during medical procedures and for analgesia from tooth and gum pain may cause methemoglobinemia, a rare but serious and potentially fatal condition." Children younger than two years appear to be at particular risk. In the most severe cases, methemoglobinemia can result in death. Patients who develop methemoglobinemia may experience signs and symptoms such as pale gray- or blue-colored skin, lips and nail

beds; headaches; lightheadedness; shortness of breath; fatigue; and rapid heart rate.

Application of Topical Anesthetic

Use a 2 × 2 gauze to dry the tissue and remove any gross debris around the site of needle penetration. The effectiveness of the topical will be enhanced when applied onto dry mucosa. Retract the lip to obtain adequate visibility during the injection. Wipe and dry the lip to make retraction easier. "I'm wiping your tooth and gums with my little washcloth to make sure everything is clean."

Apply a small amount of topical only at the site of preparation, thus avoiding anesthetizing the pharyngeal tissues. The topical anesthetic should remain in contact with the soft tissue for one to two minutes. "Now I'm rubbing (goofy, cherry, bubble gum) tooth jelly next to your tooth. If it begins to feel too warm or goofy let me know and I'll wash it away with the special water."

Needle Selection

Controversy centers on both the gauge and length of needles. The most common gauges are 25-, 27-, and 30-gauge. Needles come in three lengths: long, short, and ultrashort. Gauge refers to the diameter of the lumen of the needle; the smaller the number, the greater the diameter of the lumen. For example, a 30-gauge needle has a smaller internal diameter than a 25-gauge needle. There is a trend among dentists toward the use of smaller-diameter needles on the assumption that they are less traumatic to the patient. Proponents of large gauges claim that these needles yield better aspiration and may cause less pain during initial penetration of the mucosa, believing that needles with a smaller diameter result in less injection pain than wider-diameter needles. Studies have refuted both points. Trapp and Davies (1980) and Delgado-Molina and colleagues (2003) reported that no significant differences existed in the ability to aspirate blood through 25-, 27-, and 30-gauge dental needles. On the contrary, the studies concluded that there is increased resistance to aspiration of blood through a thinner needle (e.g., 30-gauge) compared with a larger-diameter needle (e.g., 27- or 25-gauge). With regard to pain experienced by the patient, numerous studies have reported that patients are unable to differentiate among 23-, 25-, 27-, and 30-gauge needles—no significant differences in the perception of pain produced by them were reported (Reed et al. 2012).

Pain associated with dental anesthesia results mostly from the pressure caused when the anesthetic solution is injected into the mucosa—especially during the first few seconds—and less so from the actual needle penetration. The pressure produced is greater when using high gauges than with lower gauges. Needle deflection along the axis of the bevel and breakage must also be considered when choosing the gauge. The smaller the diameter of the needle, the more it deflects. Thirty-gauge needles deflect significantly, whereas 25-gauge needles essentially do not deflect at all. Likewise, 25-gauge needles very rarely, if ever, break during an intraoral injection. This is an important advantage when treating a child who may make sudden movements. Malamed et al. (2010) reported that 99% of the needles that do break are 30-gauge needles. In his classic textbook, *The Handbook of Local Anesthesia*, he recommends using the smallest gauge (largest diameter) needle available, which allows for easier aspiration, less deflection of the needle as it perforates the soft tissue, and less chance of breakage at the hub.

Traditionally, clinicians were taught to decide on the length in relation to the type of injection (block or infiltration), the size of the patient, and the thickness of the tissue. Although a long needle has been recommended for inferior alveolar injections, short needles seem to offer better control to the dentist dealing with children. The long needle recommendation relates to the possibility of needle fracture. Proponents of long needles claim that after a needle fracture, a portion of the needle is exposed for easy removal. However, in the event of this rare happenstance, fracture usually occurs at the hub. In addition, it is never recommended to insert a short needle to the hub. Thus, long needles seem to offer little advantage over short ones, and the authors recommend the short needle for all local anesthetics (excluding the intraligamental injection for which extra short needles are indicated) for children, regardless of their age and the type of injection.

Injection Rate

Another aspect of anesthetic technique that is often mentioned but has not been quantified is the injection rate. Most educators recommend slow injections because a rapidly expelled solution causes discomfort. But how slow is "slow?" Based on videotaped procedures, Starkey and Wright (1983) calculated that a slow injection takes approximately 45 seconds, using an entire 1.8 ml cartridge. In most pediatric cases, two-thirds of a cartridge are sufficient, the injection time being 30 seconds or less. Malamed (2012) recommends an injection time of one minute or more. However, the authors' experience with pediatric patients is not to prolong the injection procedure. Kohli and coworkers (2001) reported in their survey of AAPD members that 56% of the respondents inject a cartridge in less than 30 seconds. The majority (89%) reported their injection time as being under one

minute. A more recent study reported the average injection time of local anesthesia given to 147 children aged four to eleven years as being 48 seconds (Versloot et al. 2005).

Testing for Anesthesia

An important aspect of clinical practice, particularly following a mandibular block administration, is determining the presence of profound anesthesia. When children are asked for signs or symptoms of anesthesia, their responses are often unreliable. Sometimes, by simply observing the child patient sitting in the dental chair and watching the mouth movements, an experienced dentist will intuitively know that the injection has taken effect. Asking a child "Are you numb?" usually will not provide the answer. Most children cannot express the feeling of numbness or understand its meaning. The clinician has to point to non-anesthetized areas and have the child compare them to the anesthetized region, saying, "Tell me where it feels funny." Many dentists have been trained to routinely probe anesthetized areas with an explorer. This does not necessarily indicate profound block anesthesia, and it causes delays in the procedure, which can build apprehension in the child patient. Another approach following a mandibular block is to observe the external signs carefully, question the patient, evaluate for positive responses, and then proceed, placing the rubber dam clamp if restorative dentistry is to be performed. While placing the clamp, the dentist should watch the child's reactions, particularly the eyes. If profound anesthesia has been obtained, there will be no flinching and the procedure can continue. On the other hand, if there is any discomfort, steps can be retraced and appropriate measures taken.

Initial Injection

The first operative visit is undoubtedly the most significant in the dental experience of the child. It may very well be the key to his dental future. Some dentists hold the view that if a choice is to be made between a mandibular block and a maxillary supraperiosteal (commonly known as local infiltration) injection for the child's first local anesthetic experience, the mandibular block should be chosen because of the profound anesthesia that it produces. The authors' clinical impression is that the best choice is the maxillary supraperiosteal injection. This injection is made with virtually no discomfort, and there is minimal risk of missing the target area. Many children in pediatric dental practices receive supraperiosteal injections without realizing that they have been given.

Basic Injection Technique

The anesthetic injection begins by stretching the tissue taut at the administration site (Figure 8-5). When possible, bring the tissue over the needle. Insert the needle 1-2 mm into the mucosa with the bevel oriented toward

(a)

(b)

(c)

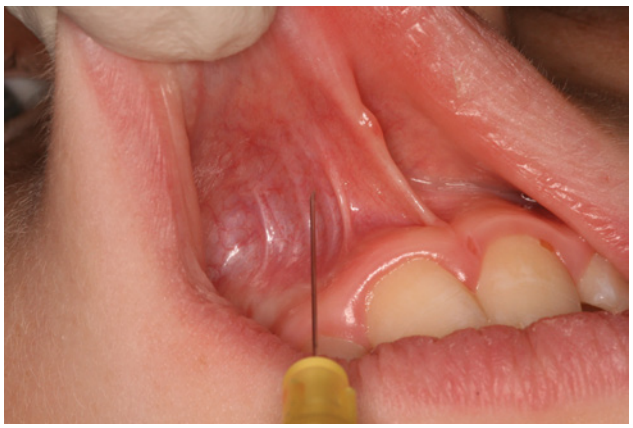

Figure 8-5. The anesthetic injection begins by stretching(a) the tissue taut at the administration site(b). When possible, bring the tissue over the needle(c).

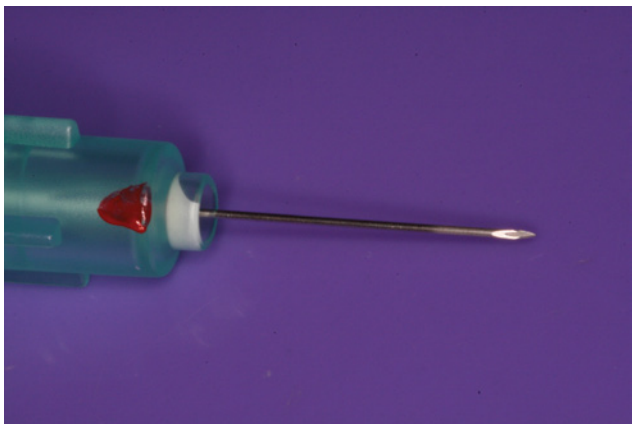

Figure 8-6. The needle's bevel should always be oriented toward the bone. Some needles have a marking on the bevel side to help the clinician orientate the needle properly.

bone (Figure 8-6). Inject several drops of anesthetic before advancing the needle. While injecting, wiggle the patient's cheek. Slowly advance the needle toward the target while injecting up to a 1/4 cartridge of anesthetic to anesthetize the soft tissue ahead of the advancing needle, so that the needle is constantly moving into anesthetized tissue. Aspirate. The depth of insertion will vary with the type of injection; however, one should never insert a needle in its entirety to the hub. Although it is a rare occurrence, retrieving a broken needle fully embedded in soft tissue is extremely difficult. After confirming a negative aspiration, the injection process should take under one minute. Continue injecting during needle retrieval. The clinician should be careful not to inject a greater amount of anesthetic than recommended for the patient's weight. Continue to speak to the patient throughout the injection process. Close observation of the patient's eye and hand movements, along with crying, will alert the clinician to patient discomfort.

Upon completion of treatment and dismissal of the patient, the clinician says to the patient with the accompanying adult present: "You were a terrific helper. You sat still and we finished quickly. We are a good team! I'm giving you an extra special sticker that says 'Careful! Tooth, tongue, lips asleep.' Although we're finished with today's treatment, your tooth will be asleep and your lip and tongue will feel fat and funny for another hour. Don't eat until your lip and tongue no longer feel fat and funny."

Some children who did not cry during treatment may begin to do so after treatment, complaining of "pain" and telling the parent that their mouth hurts. Showing the child the mouth in a mirror will help alleviate concerns that the area is swollen. At this point, the dentist should repeat that the child's mouth is numb and the feeling the patient is experiencing is not pain, but rather numbness. A child who has never had an anesthetic may ask what the word "numb" means. A possible explanation is as follows: "Do you remember when you sat on your foot and your foot went to sleep? Well, that is sort of what numb feels like. Your mouth is asleep. Don't worry, it will wake up soon and feel regular."

Specific Injection Techniques

The most common injection techniques used in pediatric dentistry are presented in the following pages. Detailed descriptions will be omitted; however, clinical tips from a patient management perspective, specific for the pediatric patient, will be reviewed.

Inferior Alveolar Nerve Block

The inferior alveolar nerve block (IANB) is indicated when deep operative or surgical procedures are undertaken for mandibular primary and permanent teeth. While a supraperiosteal injection (infiltration) may provide adequate anesthesia for the primary incisors and molars, it is not as effective for providing complete anesthesia for the mandibular permanent molars. In addition, it provides profound pulpal anesthesia and may be indicated when pulpal treatment is anticipated. A major consideration for IANB in the pediatric patient is that the mandibular foramen is situated at a lower level (below the occlusal plane) than in an adult. Thus, the injection is made slightly lower and more posteriorly than in an adult (Figure 8-7).

Physical position can be an important factor when the dentist is injecting children, particularly when administering a mandibular block. To accomplish the mandibular injection for the right side of the mandible, the right-handed dentist approaches the face from the front. The left thumb is placed with the middle of the thumbnail at the coronoid notch and lightly over the deep tendon of the temporalis muscle (Figure 8-8). The pterygomandibular raphe is medial to the thumb. The needle penetrates the tissue at the middle of the thumbnail and is thus carried between the deep tendon of the temporalis laterally and the pterygomandibular raphe medially, entering the mandibular sulcus at the level of the lingular notch. Unfortunately, this injection provides the dentist with little control over a child's head movement.

On the opposite, or the left side of the arch, the right-handed operator's arm may be placed over the head of the patient and the left thumb on the anterior border of the ramus, with the forefinger just anterior to the mandibular angle and the middle finger just above the mandibular angle. Again, the mandibular sulcus will be at the center of the triangle formed by the tips of

(a)

(b)

Figure 8-7. A major consideration for IANB in the pediatric patient is that the mandibular foramen is situated at a lower level (below the occlusal plane) than in an adult(a). Thus the injection is made slightly lower and more posteriorly than in an adult(b).

Figure 8-8. On the left side of the arch, the right-handed operator's arm may be placed over the head of the patient and the left thumb on the anterior border of the ramus, with the forefinger just anterior to the mandibular angle and the middle finger just above the mandibular angle.

these two fingers and the thumb. When the right-handed operator administers a left mandibular block and places the left forearm over a child's forehead, this technique controls head movements and helps to keep the syringe out of the child's view. For these reasons, when given a choice between right and left sides, many dentists prefer beginning with the left mandibular block.

Technique:

- Lay the thumb on the occlusal surface of the molars, with the tip of the thumb resting on the internal oblique ridge and the ball of the thumb resting on the retromolar fossa. Support the mandible during the injection by resting the ball of the middle finger on the posterior border of the mandible.

Figure 8-9. The best way to visualize the lateral positioning of the needle prior to penetrating soft tissue is to look for the depression seen on the immediate lateral aspect of the pterygomandibular raphe while asking the patient to open as wide as possible and pulling the cheek taut.

- The barrel of the syringe should be directed between the two primary molars on the opposite side of the arch.
- The best way to visualize the lateral positioning of the needle prior to penetrating soft tissue is to look for the depression seen on the immediate lateral aspect of the pterygomandibular raphe while asking the patient to open as wide as possible and pulling the cheek taut (Figure 8-9).

- Inject a small amount of solution as the tissue is penetrated.
- Advance the needle 4 mm while injecting minute amounts (up to a 1/4 cartridge).
- Stop and aspirate.
- If aspiration is negative, advance the needle 4 mm while injecting minute amounts (up to a 1/4 cartridge).
- Stop and aspirate.
- The average depth of insertion is about 15 mm (varies with the size of the mandible and the age of the patient). Deposit about 1 ml of solution around the inferior alveolar nerve.
- If bone is not contacted, the needle tip is located too posteriorly. Withdraw it until approximately 1/4 length of the needle is left in the tissue, reposition the syringe distally so it is over the area of the permanent molar and repeat as above.
- If bone is contacted too early (less than half the length of a long needle) the needle tip is located too anteriorly. Withdraw it until approximately 1/4 length of the needle is left in the tissue, reposition the syringe mesially over the area of the cuspid and repeat as above.
- The needle is withdrawn and recapped.
- Wait one minute before commencing dental treatment.

Lingual Nerve Block

Successful anesthesia of the inferior alveolar nerve will result in anesthesia of the lingual nerve with the injection of a small quantity of the solution as the needle is withdrawn. The clinician must not assume effective anesthesia is attained if the patient only exhibits tongue symptoms. She must also exhibit lip and mucosa symptoms.

Long Buccal Nerve Block

The long buccal nerve provides innervation to the buccal soft tissues and periosteum adjacent to the mandibular molars. For the removal of mandibular permanent molars, it is necessary to anesthetize the long buccal nerve. It is contraindicated in areas of acute infection.

For other procedures, a separate injection for buccal anesthesia is not always necessary in children before the eruption of the second permanent molars, the ramus being narrower in young children. After mandibular block anesthetic, the buccal tissue usually becomes anesthetized—probably a result of anesthetized nerve fibers that emanate from the mental foramen and enervate the buccal mucosa. Expelling the anesthetic solution on penetration and withdrawal probably affects some of the buccal enervating nerve fibers.

Technique:

- With the index finger, pull the buccal soft tissue in the area of the injection taut to improve visibility.
- Direct the needle toward the injection site with the bevel facing bone and the syringe aligned parallel to the occlusal place and buccal to the teeth.
- Penetrate the mucous membrane at the injection site distal and buccal to the last molar.
- Advance the needle slowly until mucoperiosteum is contacted.
- The depth of penetration is 1–4 mm.
- Aspirate.
- Inject approximately 1/8 of a cartridge over 10 seconds.
- The needle is withdrawn and recapped.

Case 8.2

Carol, age three, is a very active youngster who requires restoration of the mandibular left first and second primary molars. She needs shallow occlusal restorations in both teeth. Carol's dentist believes that the teeth should be anesthetized, but is concerned that administering a mandibular block anesthetic to the active child may be difficult.

***Case 8.2, Discussion*:** Giving the active young child a mandibular block injection may be difficult, and it also has three other disadvantages. First, this is Carol's initial experience with dental anesthesia, and long-lasting numbness in the tongue and buccal mucosa could adversely affect her permanent attitude. Second, it can be difficult to render a painless block injection to a highly active child, and the dentist obviously wants Carol to experience minimal discomfort. Third, with long-lasting anesthetic, the active youngster may traumatize the soft tissues postoperatively. Thus, the concern of the dentist in this case is legitimate. The dentist should consider using buccal supraperiosteal (infiltration) anesthesia in place of a mandibular block injection. Two main advantages of this approach are the ease of administration and the minimal period of time that the child patient's mouth is anesthetized. The dentist injects up to 1 ml of local anesthetic solution in the mucobuccal fold adjacent to the mandibular primary tooth to be restored. In addition, the papilla should be anesthetized on the buccal, followed by penetration of the needle to the lingual side. In addition, anesthesia may be supplemented by an intra-ligamental injection (Figure 8-10).

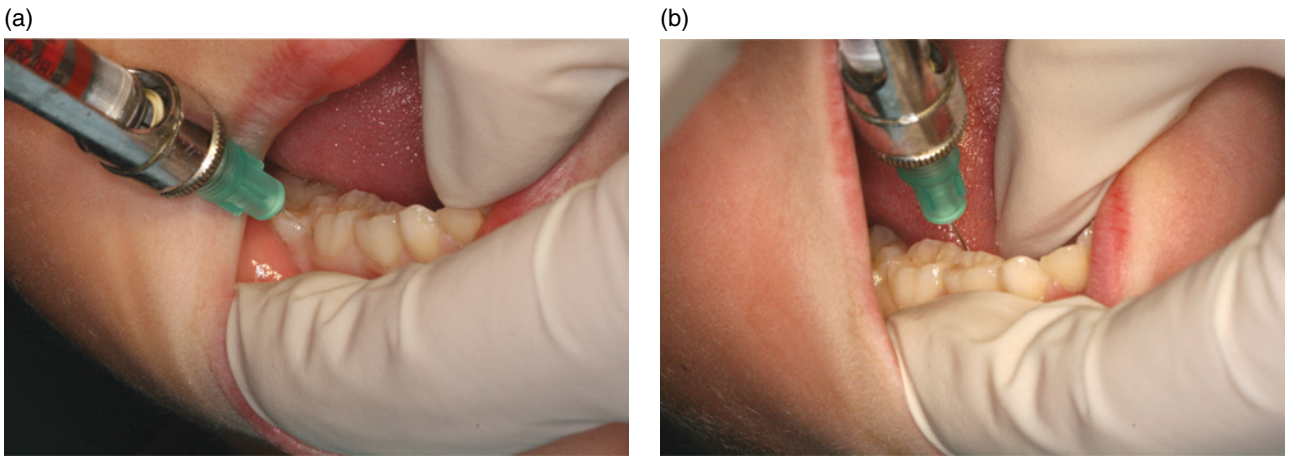

Figure 8-10. The dentist injects up to 1 ml of local anesthetic solution in the mucobuccal fold adjacent to the mandibular primary tooth to be restored. In addition, the papilla should be anesthetized on the buccal followed by penetration of the needle to the lingual side (a). Anesthesia may also be supplemented by an intra-ligamental injection (b).

The supraperiosteal anesthesia technique is useful for minor operative procedures. The problem with this technique is that profound mandibular anesthesia cannot be reliably achieved. Starkey suggests that the technique works best for young children (up to five years of age) who require restoration of mandibular first primary molars, cuspids, and incisors. In older children, or in the region of the second primary molars, bone is denser.

Anesthetizing the Palatal Tissues

Palatal tissue anesthesia has traditionally been indicated for procedures involving manipulation of the palatal tissues, such as extractions, gingivectomy, and labial frenectomy. However, the authors recommend its routine use when treating maxillary molars. It may also be necessary when treating incisors. Unfortunately, it is one of the most traumatic and painful procedures experienced by a dental patient during treatment. The following techniques should help to reduce patient discomfort and, in a small number of cases, eliminate it entirely. Malamed (2012) recommends that the clinician forewarn the patient that there might be discomfort so that they are mentally prepared. If the experience is atraumatic, the patient bestows the "golden hands" award on the clinician. If it is painful, the clinician can console the patient with "I'm sorry. I told you that it might be uncomfortable" (avoid using the word "hurt").

The steps in atraumatic administration of anesthesia in all palatal areas are as follows:

- Provide adequate topical anesthesia (at least two minutes) in the injection area. The applicator should be held in place by the clinician while applying sufficient pressure to cause blanching. Alternatively, clinicians who do not use topical anesthesia apply finger pressure for a few seconds at the injection site. This may reduce the pain caused by the initial penetration of the needle.
- Use pressure anesthesia at the injection site before and during needle penetration and solution deposition. The pressure is maintained with a cotton applicator or with a finger with enough pressure to cause blanching.
- Maintain control over the needle. The use of an ultrashort needle will result in less deflection and greater control. A finger rest will aid in stabilizing the needle (Figure 8-11).
- Inject the anesthetic solution slowly. Because of the density of the palatal soft tissues and their firm adherence to the hard palate, there is little room to spread during solution deposition. Slow injection reduces tissue pressure and results in a less traumatic experience. During the injection, ask the patient to raise a leg off of the chair.

Case 8.3

Mark, age three but small for his age, is a well-behaved child who requires restorative treatment on two central incisors. Strip crowns will be placed. All carious lesions are of moderate depth. The child is sedated with conscious sedation. The dentist is debating whether or not local anesthesia should be used. She is considering labial and palatal injections.

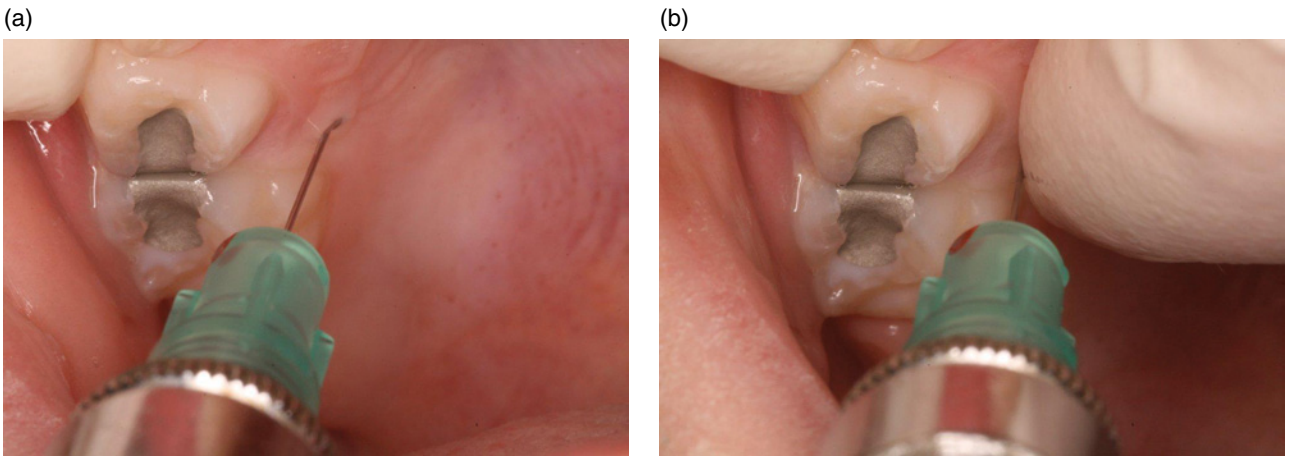

Figure 8-11. For palatal injections, the use of an ultrashort needle will result in less deflection and greater control (a). A finger rest will aid in stabilizing the needle (b).

***Case 8.3, Discussion*:** Although dentists treating children should always anesthetize for restorative treatment, there are exceptions. With proper technique, caries removal can be achieved with minimum pain in this region. Tooth preparation for a strip crown is minimal. In most instances, indirect pulp capping will be the treatment of choice avoiding pulpal pain. In addition, the child is sedated and attention to correct doses of local anesthesia must be made, taking into consideration the weight of the child and the interaction with the sedative.

The actual injection may be just as painful as the restorative procedure. It takes considerable skill to administer a pain-free anterior injection. Even those dentists possessing this skill worry about hurting the child patient. In addition, the palatal injection, which can be painful, should be avoided when possible. In most instances, a labial injection will suffice.

If the dentist anticipates pulpal treatment or possibly a complication which may involve extraction, local anesthesia is mandatory. For the supraperiosteal injection on the facial side for the primary anterior teeth, the soft tissues are retracted to reveal the junction of the firmly fixed gingival mucosa and the loose or movable alveolar mucosa. A topical anesthetic may be applied to the area, with the puncture point located in the movable alveolar mucosa, very close to the junction with the gingival mucosa. The dentist deposits a drop or two of solution immediately and then waits a few seconds before advancing the needle to a point opposite the apex of the tooth. In the primary dentition the needle will usually not be advanced more than a millimeter or two. Note that in Figure 8-12, in the primary dentition, the apex of the teeth will be very near the point of insertion of the needle. Following labial anesthesia, palatal anesthesia

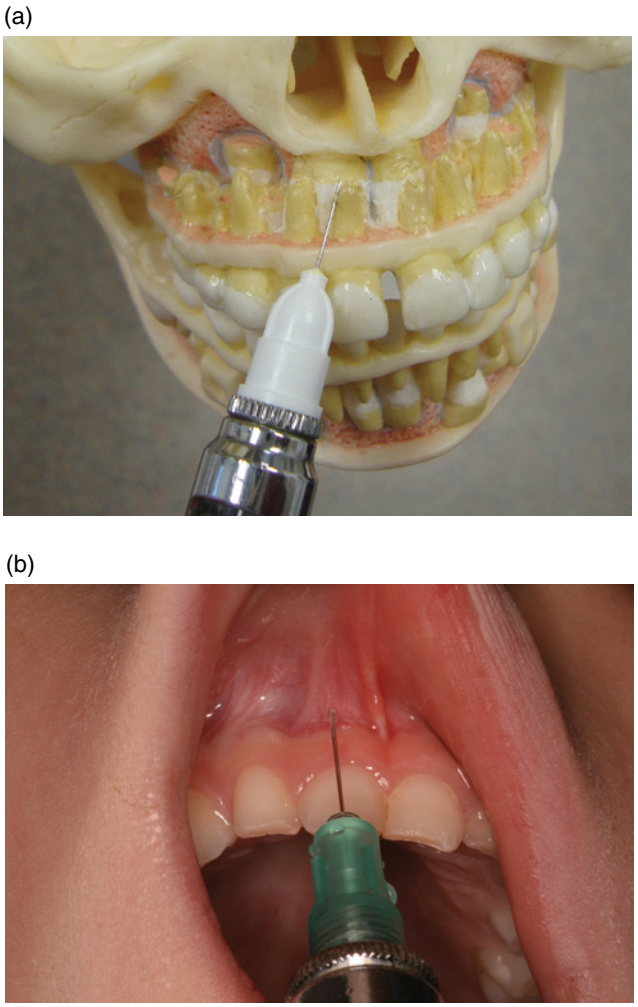

Figure 8-12. In the primary dentition, the apex of the teeth (a) will be very near the point of insertion of the needle at the level of mucobuccal fold (b).

may be accomplished by applying digital pressure to the palate opposite the involved teeth and inserting the needle under the finger with the bevel of the needle flat against the mucosa on the side of the papilla. A very small amount of anesthesia solution is deposited. Blanching will occur and is a sign of proper technique.

Supraperiosteal Injections (Local Infiltration)

Supraperiosteal injection (commonly known as local infiltration) is indicated whenever dental procedures are confined to a localized area in either the maxilla or mandible. The more appropriate term for this type of anesthesia is "supraperiosteal" rather than "infiltration" because supraperiosteal indicates the placement of the anesthetic, whereas infiltration refers to the technique of injecting the solutions directly into the tissues to be treated. The terminal endings of the nerves innervating the region are anesthetized. The indications are pulpal anesthesia of all the maxillary teeth (permanent and primary), mandibular anterior teeth (primary and permanent), and mandibular primary molars when treatment is limited to one or two teeth. It also provides soft tissue anesthesia as a supplement to regional blocks. It is contraindicated in areas where dense bone covers the apices of the teeth (i.e., the permanent first molars in children). It is not recommended for larges areas due to the need for multiple needle insertions and the necessity to administer larger total volumes of local anesthetic that may lead to toxicity.

A number of studies have reported on the effectiveness of injecting local anesthetic solution in the mucobuccal fold between the roots of the primary mandibular molars (McDonald 2011). When comparing the effectiveness of mandibular infiltration to mandibular block anesthesia it was generally agreed that the two techniques were equally effective for restorative procedures, but the mandibular block was more effective for pulpotomies and extractions than mandibular infiltration. The mandibular infiltration should be considered in situations where one wants to perform bilateral restorative procedures without anesthetizing the tongue. Bilateral anesthesia of the tongue is uncomfortable for both children and adults.

Technique:

- Retract the cheek so the tissue of the mucobuccal fold is taut.
- Apply topical anesthetic.
- Orient the needle bevel toward the bone.
- Penetrate the mucous membrane mesial to the primary molar to be anesthetized, directing the needle to a position between the roots of the tooth. Slowly inject a small amount of anesthetic while advancing the needle to the desired position and injecting about a 1/2 cartridge of anesthetic.
- If lingual tissue anesthesia is necessary (rubber dam clamp placement), then one can inject anesthetic solution directly into the lingual tissue at the free gingival margin, or one can insert the needle interproximally from the buccal and deposit anesthesia as the needle is advanced lingually.
- The needle is withdrawn and recapped.
- Wait one minute before commencing treatment.

Case 8.4

Sara, a five-year-old, required a large restoration on her maxillary second primary molar. The dentist deposited 1 ml of local anesthetic supraperiostaily and between the buccal roots of the tooth to be restored. During the cavity preparation, Sara cried and complained of pain. The dentist re-anesthetized the child, who continued to complain, "It hurts." Was Sara misbehaving?

***Case 8.4, Discussion*:** The dentist will need to determine if the child's reaction is indeed due to pain or perhaps a behavior management issue. In order to rule out pain, the dentist needs to be confident that the anesthesia technique used was correct.

Sometimes it can be difficult to discern actual pain from an avoidance tactic. In this case, however, the possibility of inadequate anesthesia should be considered. Although most dentists probably use supraperiosteal anesthesia for operative procedures on maxillary second primary molars, bone thickness is a problem. The second primary molar roots lie deep within the zygomatic process of the maxillary bone. If a supraperiosteal injection is to be effective, the anesthetic solution must penetrate a considerable amount (about 1 cm) of bone. Therefore, for more profound anesthesia, a posterior superior injection is desirable. Anesthesia in this region is not a problem in adults because the forward growth of the maxilla carries the second premolar anterior to the zygomatic process of the alveolar bone. In adults, a supraperiosteal injection provides adequate anesthesia because the second premolar has only a thin layer of alveolar bone overlying its buccal root.

The possibility that the anesthesia given to Sara may have been inadequate is quite probable. Supraperiosteal injections often have to be made over both the mesial and distal roots to anesthetize the middle and superior nerve branches. When performing restorative dentistry on the maxillary first permanent molar, two buccal injections are

needed for profound anesthesia. In addition to a tuberosity injection, a supraperiosteal injection is required over the mesial buccal root, since this root is innervated by the middle superior alveolar nerve. A single injection midway between the buccal roots does not routinely yield profound anesthesia. For the maxillary second permanent molar, only a tuberosity injection is necessary.

For the sake of continued discussion, the same case occurs, but both buccal injections were given and Sara starts crying hysterically as the high-speed drill touches the tooth.

In this case, the dentist is confident that the injection has taken effect. Sara is reacting to the sound of the drill. She expects pain. The child was previously treated without local anesthesia and associated the activation and sound of the high-speed drill to pain. Whenever the previous dentist used it, it hurt. A patient's apprehension can often cause local anesthetic failure (Kaufman et al. 1984). Nerve conduction may be blocked successfully from a neurophysiological perspective, but as soon as the patient anticipates or hears the sound of the drill, she perceives pain. The patient will need to be reconditioned. As soon as Sara experiences a painless procedure, she will understand and cooperate. This problem can be resolved by discussing the procedure with the child and explaining that every dentist is different and today's appointment will be better than her previous one.

To avoid this scenario, the dentist should always begin procedures involving a high-speed without initial contact with the tooth. Rather, he should activate it next to the tooth without contact, which emits the characteristic sound, thus isolating the sound of the drill from the cutting of tooth structure. If the parent is present, let the parent know this without alerting the patient to the test. If the child starts to complain of pain, the dentist shows the child with the aid of a mirror that the drill is not touching the tooth. The child is reassured that all will be all right. The drill is once again used, not touching the tooth at first, and finally cutting the tooth begins.

Supplemental Injection Techniques

Periodontal Ligament Injection (Intraligamentary Injection)

The periodontal ligament (PDL) injection has been used for a number of years as either a method of obtaining primary anesthesia for one or two teeth or as a supplement to infiltration or block techniques. The technique's primary advantage is that it provides pulpal anesthesia for 30–45 minutes without an extended period of soft tissue anesthesia, and is therefore extremely useful when bilateral treatment is planned. It is useful in pediatric or disabled patients when there is concern of postoperative tissue trauma to the lip or tongue. Intraligamental anesthesia delivered by a high pressure syringe is often associated with damage to the periodontal tissue, which results from the physical trauma formed at the time of injection and from the cytotoxic effects of the anesthesia. Damage heals within a few weeks. This is of particular concern to the pediatric dentist treating primary teeth.

In their study, Brannstrom et al. (1984) suggested that developmental disturbances to the underlying permanent tooth buds might occur. A high-pressure intraligamental anesthesia injection was used to anesthetize sixteen monkey primary teeth. Teeth in the contralateral positions were not injected and served as controls. Hypoplasia or hypomineralization defects developed in fifteen permanent teeth, but in none of the controls. The position of the enamel lesions indicated that the disturbance occurred at the same time on all affected teeth. Based on this study's findings, the use of intraligamental anesthesia on primary teeth with a developing permanent tooth bud has been contraindicated (Moore et al. 2011). However, a clinical study by Ashkenazi et al. (2010) using a computerized syringe system for delivery of intraligamental anesthesia concluded that it does not damage the underlying permanent dental bud in children four years or older. In any event, its use may be beneficial to the pediatric dentist when treating permanent molars. This is also a good technique for removing lower bicuspids bilaterally for orthodontic treatments. Since it is injected into a site with limited blood circulation, the technique is also advantageous for treating patients with bleeding disorders.

The PDL technique is simple, requires only a small amount of anesthesia, and produces instant anesthesia. Two devices were developed for this technique and were very popular for a period, the PERIPRESS (PERIPRESS®, Universal Dental Implements, Edison, NJ) syringe/pen and the Ligmaject syringe (Ligmaject, IMA Associates, Boston, MA). However, the authors' experience allows for the use of a standard syringe fitted with an ultrashort needle. The ultrashort needle is placed in the gingival sulcus on the mesial surface and advanced along the root surface until resistance is met. Initial finger pressure is applied on the attached gingiva. In multirooted teeth, injections are made mesially and distally. If lingual anesthesia is needed, the procedure is repeated in the lingual sulcus. Approximately 0.2 ml of anesthetic is injected.

Considerable effort is needed to express the anesthetic solution, placing a great deal of pressure on the anesthetic cartridge with the possibility of breakage. There are syringes specifically designed to enclose the cartridge and provide protection from breakage. Since so little anesthetic solution is necessary, Malamed (2012) suggests that when using a conventional syringe, expressing half the contents of the cartridge prior to injection will reduce the pressure exerted on the walls of the cartridge and reduce the likelihood of breakage.

Computer-Controlled Anesthetic Delivery System

"The Wand" currently named CompuDent (Milestone Scientific Inc, Livingston, NJ.), is a computer-controlled local anesthetic delivery system. The latest version of the Wand is called the single tooth anesthesia (STA) system. The systems consist of a conventional local anesthetic needle inserted into a disposable pen-like syringe. A foot-controlled microprocessor controls the delivery of the anesthetic solution through the syringe at a constant flow rate, volume, and pressure. Studies with children have shown contradicting results. Some reported lower pain ratings for injections with the Wand® in comparison to injections with the traditional syringe (Gibson et al. 2000, Allen et al. 2002, Palm et al. 2004). Others found no differences between the two injection methods (Asarch et al. 1999, Ram et al. 2003). A disadvantage of the system which is especially important when treating a child patient is the extended injection time of computerized systems. The injection time of the Wand is much longer than that of the traditional method, so children who already react negatively to an injection seem to be in distress longer with the Wand system. Versloot et al. (2008) reported the mean injection time with the Wand being three times as long as with the traditional syringe. The authors' experience is that with proper technique, the traditional syringe can be used successfully with most, if not all, patients.

Complications

Postoperative Soft Tissue Injury

Accidental biting or chewing of the lip, tongue or cheek is a problem seen in very young pediatric and disabled patients. Soft tissue anesthesia lasts longer than pulpal anesthesia and may be present for up to four hours after local administration. The most common areas of trauma are the lower lip and, to a lesser extent, the tongue, followed by the upper lip (Figure 8-13).

Several preventive measures can be followed:

- Advise the patient and accompanying adult about the possibility of injury if the patient bites, sucks, or chews on the lips, tongue, and cheek. If not clearly forewarned, a parent may accuse the dentist of creating the resulting damage during the operative session.
- The sensation created by the local anesthesia will be new to most children. They should be reassured that it will go away within an hour or two. They also should delay eating and avoid hot drinks until the effects of the anesthesia have totally dissipated.
- Sedated children may fall asleep after being discharged and cause damage. Parents should be instructed to observe the child during the ride home.
- Reinforce the warning with patient stickers.

(a)

(b)

Figure 8-13. The most common areas of trauma are the lower lip (a) and, to a lesser extent, the tongue, followed by the upper lip (b).

Anesthetic Toxicity (Overdose)

While rare in adults, young children are more likely to experience toxic reactions because of their lower weight. Most adverse drug reactions occur within 5–10 minutes of injection. Overdoses of local anesthetics are caused by high blood levels of anesthetic as a result of an inadvertent intravascular injection or repeated injections. Local anesthetic overdose results in excitation, followed by depression of the central nervous system and, to a lesser extent, of the cardiovascular system.

Early subjective symptoms of the central nervous system include dizziness, anxiety, and confusion, and may be followed by diplopia, tinnitus, drowsiness, and circumoral numbness or tingling. Objective signs include muscle twitching, tremors, talkativeness, slowed speech, and shivering, followed by overt seizure activity. Unconsciousness and respiratory arrest may occur. The initial cardiovascular system response to local anesthetic toxicity is an increase in heart rate and blood pressure. As blood plasma levels of the anesthetic increase, vasodilatation occurs, followed by depression of the

myocardium with a subsequent fall in blood pressure. Bradycardia and cardiac arrest may follow.

Local anesthetic toxicity is preventable by following proper injection technique—i.e., aspiration during slow injection. Clinicians should know maximum recommended dosages (MRD) based on weight. If lidocaine topical anesthetic is used, it should be factored into the total administered dose, as it can infiltrate into the vascular system. After injection, the patient should be observed for any possible toxic response as early recognition and intervention are the keys to a successful outcome. One cannot over-emphasize the universal importance that all dental practitioners treating children should consistently calculate a weight-based MRD of both local anesthetics and sedative agents. Additionally, clinicians should adjust downward the doses of local anesthetic when sedating children with drugs that are known to cause respiratory depression. For example, it has been well-documented that sedation with opioids and other CNS depressant agents like chloral hydrate may increase the risk of local anesthetic toxicity due to their synergistic CNS depressing effects, especially in children (see Chapter Twelve). In addition, local anesthetic toxicity reactions may be masked by the administration of benzodiazepines during sedation, thus making it more difficult for the practitioner to recognize a local anesthetic overdose. The two most common local anesthetic solutions used in pediatric dentistry are 2% lidocaine with 1/100,000 epinephrine and 3% mepivacaine (used in children when the vasossodepressor is contraindicated). The maximum dosage of both lidocaine and mepivacaine is 2.0 mg/lb (4.4 mg/kg) and the maximum total dosage is 300 mg.

Referring to Table 8.1, it is possible to approximate the maximum recommended dosage and amount of local anesthetic agents for patients of specific weight and type of anesthetic. For example: To calculate the maximum amount of lidocaine 2% with 1:100,000 epinephrine and the number of cartridges that can be safely administered to a 30-pound patient, the clinician would perform the following calculations.

Table 8-1. Quick Dosage Chart.

			AAPD Maximum Recommended Dosages		
			2% Lidocaine Epinephrine 1:100,000	3% Mepivicaine with or without vasoconstrictor	4% Articaine Epinephrine 1:100:000
			4.4 mg/kg* 2.0 mg/lb* MRD 300 mg*	4.4 mg/kg* 2.0 mg/lb* MRD 300 mg	7.0 mg/kg 3.2 mg/lb MRD 500 mg
			36 mg/1.8 ml cartridge	54 mg/1.8 ml cartridge	72 mg/1.8 ml cartridge
			every 8 kg = 1 cartridge **every 20 lbs = 1 cartridge**	**every 12 kg = 1 cartridge** **every 30 lbs = 1 cartridge**	**every 10 kg = 1 cartridge** **every 22 lbs = 1 cartridge**
Age	**Kg**	**Lbs**	**Maximum number of 1.8 ml cartridges**		
			2% Lidocaine	3% Mepivicaine	4% Articaine
1 + yrs	7.5	16.5	0.9	0.6	0.7
2–3 yrs	10.0	22.0	1.2	0.8	1.0
	12.5	27.5	1.5	1.0	1.2
4–5 yrs	15.0	33.0	1.8	1.2	1.5
	17.5	38.5	2.1	1.4	1.7
6–8 yrs	20.0	44.0	2.4	1.6	2.0
	22.5	49.5	2.8	1.8	2.2
9–10 yrs	25.0	55.0	3.1	2.0	2.4
	27.5	60.5	3.4	2.2	2.7
	30.0	66.0	3.7	2.4	2.9
11+ yrs	32.5	71.5	4.0	2.6	3.2
	35.0	77.0	4.3	2.9	3.4
	37.5	82.5	4.6	3.1	3.7
	40.0	88.0	4.9	3.3	3.9

*Note: The clinical guidelines in the American Academy of Pediatric Dentistry 2012–13 Reference Manual recommend reduced dosages as compared to the manufacturers' maximum recommended dosages by weight and maximum total dosages for lidocaine (7.0 mg/kg, 3.2 mg/lb and 500 mg maximum total dosage) and mepivicaine (6.6 mg/kg, 3.0 mg/lb and 400 mg maximum total dosage).
Reference: American Academy of Pediatric Dentistry Reference Manual 2012–13, 184.

A quick approximation using Table 8-1:

30 lb divided by 20 (every 20 lb = 1 cartridge)
= 1.5 cartridges

An exact calculation using the maximum dosage:

Maximum Dosage (mg/lbs) × weight (lbs)
= Maximum Total dosage (mg)
$2.0 \times 30 = 60$ mgs

Maximum Total Dosage (mg) ÷ mg/cartridge
= Maximum cartridges
$60 \div 36 = 1.67$ cartridges

Thus, for a 30-pound child, the maximum safe administration is 1.67 cartridges of lidocaine 2% with 1:100,000 epinephrine. The quick approximation of 1.5 cartridges is clinically insignificant when compared to 1.67 cartridges, given that most cartridges do not have markings allowing for accurate dispensing of the anesthetic.

The clinician should be aware of the drug interaction between local anesthetic and sedative agents when administering enteral or parenteral sedatives for behavior management. The action of the sedative has an additive depressive effect on the central nervous and cardiovascular systems and can initiate overdose consequences.

Case 8.5

Steve, a 36-pound (16.4 kg), four-year-, one-month-old male patient presented to a dental clinic for extensive restorative treatment involving three quadrants. The patient's medical history included obstructive sleep apnea, and he was reported as being congested on the day he presented for dental treatment. Steve was placed in a papoose board and was administered three cartridges of 2% lidocaine (108 mg, 6.6 mg/kg) within three minutes. After a few minutes, the child appeared to fall asleep. Within fifteen minutes of beginning treatment, the dental assistant noticed that the patient's tongue was purple. He was unwrapped from the papoose. The patient's vital signs were checked and there was no detectable pulse or breathing. CPR was started and the paramedics were called. Paramedics arrived within four minutes of the call and assumed the resuscitative efforts. The patient was intubated, after which a volume of thick, mucous-filled fluid was suctioned from his airway. When the paramedics' efforts to resuscitate the child were unsuccessful, the child was transported to the local children's hospital, where he was pronounced dead.

***Case 8.5, Discussion*:** Tragically, unlike the other cases presented in this chapter, this case is an accurate description of an actual overdose that occurred. It was presented as a closed malpractice insurance claim (Chicka et al. 2012). One unexpected finding was that 41% of claims involved the administration of an overdose of a local anesthetic agent, ranging from 118% to 356% of the MRD. The widespread use of local anesthesia in dentistry is generally very safe and effective. Serious adverse reactions involving children are usually the result of dose-dependent toxicity reactions. The study's findings suggest that there continues to be local anesthetic overdoses, resulting in significant morbidity and mortality in children.

The child in this case received one cartridge more than he should have:

$2.0 \times 36 = 72$ mgs, Maximum Total Dosage (mg)
÷ mg/cartridge
= Maximum cartridges, $72 \div 36 = 2$ cartridges.

Allergic reactions

Although allergic reactions to injectable amide local anesthetics are rare, patients may exhibit a reaction to the bisulfite preservative added to anesthetics containing epinephrine. Patients may also exhibit allergic reactions to benzocaine topical anesthetics. Allergies can manifest in a variety of ways, including urticaria, dermatitis, angioedema, fever, photosensitivity, and anaphylaxis.

The cases and selected texts have been adapted with permission from Paul E. Starkey's chapter on local anesthesia for children in: *Managing Children's Behavior in the Dental Office*, GZ Wright, PE Starkey, Gardner DE. CV Mosby Company, St. Louis MS 1983.

References

Allen, K.D. et al. (2002). Comparison of a computerized anesthesia device with a traditional syringe in preschool children. *Pediatric Dentistry*, 24, 315–320.

American Academy of Pediatric Dentistry. (2012). Guidelines on use of local anesthesia for pediatric dental patients. *Pediatric Dentistry*, 34, 183–189.

Asarch, T. et al. (1999). Efficacy of a computerized local anesthesia device in pediatric dentistry. *Pediatric Dentistry*, 27, 421–424.

Ashkenazi, M., Blumer, S., Eli, I. (2010). Effect of computerized delivery intraligamental injection in primary molars on their corresponding permanent tooth buds. *International Journal of Paediatric Dentistry*, 20, 270–275.

Brannstrom,. M, Lindskog, S., Nordenvall, K.J. (1984). Enamel hypoplasia in permanent teeth induced by periodontal

ligament anesthesia of primary teeth. *Journal of the American Dental Association*, 109 , 735–736.

Chicka, M.C. et al.(2012). Adverse Events during Pediatric Dental Anesthesia and Sedation: A Review of Closed Malpractice Insurance Claims. *Pediatric Dentistry*, 34, 231–238.

Delgado-Molina, E., et al. (2003). Evaluation and comparison of 2 needle models in terms of blood aspiration during truncal block of the inferior alveolar nerve. *Journal of Oral and Maxillofacial Surgery*, 61, 1011–1015.

Eichenbaum, I.W. and Dunn, N.A. (1971). Projective drawings by children under repeated dental stress. *ASDC Journal of Dentistry for Children*, 38, 164–173.

Gibson, R.S. et al. (2000). The Wand vs. conventional injection: a comparison of pain related behaviors. *Pediatric Dentistry*, 22, 458–462.

Karjalainen, S. et al. (2003). Frequent exposure to invasive medical care in early childhood and operative dental treatment associated with dental apprehension of children at 9 years of age. *European Journal of Paediatric Dentistry*, 4, 186–90.

Kaufman, E., Weinstein, P., Milgrom, P. (1984). Difficulties in achieving local anesthesia. *Journal of the American Dental Association*, 108, 205–208.

Kohli, K. et al. (2001). A survey of local and topical anesthesia use by pediatric dentists in the United States. *Pediatric Dentistry*, 23, 265–269.

Malamed, S.F., Reed K.L., Poorsattar, S. (2010). Needle breakage: incidence and prevention. *Dental Clinics of North America*, 54, 745–756.

Malamed, S. (2012). *Handbook of Local Anesthesia*, 6th ed. Mosby Elsevier, Missouri, U.S.A.

McDonald, R.E. et al. (2011). Local anesthesia and pain control for the child and adolescent. In: *McDonald and Avery's Dentistry for the Child and Adolescent*, (eds J. Dean, D. Avery and R. McDonald), 9th ed. 243–244. Mosby Elsevier, Missouri, U.S.A.

Meechan JG. (2002). Effective topical anesthetic agents and techniques. *Dental Clinics of North America*, 46, 759–766.

Meechan, J.G. (2008). Intraoral topical anesthesia. *Periodontology 2000*, 46, 56–79.

Moore, P.A. et al. (2011). Periodontal ligament and intraosseous-anesthetic injection techniques: Alternatives to mandibular blocks. *Journal of the American Dental Association*, 142 (suppl 3), 13S-18S.

Ost, L.G. (1991). Acquisition of blood and injection phobia and anxiety response patterns in clinical patients. *Behaviour Research and Therapy*, 29, 323–332.

Palm, A.M., Kirkegaard, U., Poulsen, S. (2004). The wand versus traditional injection for mandibular nerve block in children and adolescents. Perceived pain and time of onset. *Pediatric Dentistry*, 26, 481–484.

Ram, D. and Peretz, B. (2003). The assessment of pain sensation during local anesthesia using a computerized local anesthesia (Wand) and a conventional syringe. *Journal of Dentistry for Children*, 70, 130–133.

Reed, K.L., Malamed, S.F., Fonner, A.M. (2012). Local Anesthesia Part 2: Technical Considerations. *Anesthesia Progress*, 59, 127–137.

Sokolowski, C.J., Giovannitti, J.A., Boynes, S.G. (2010). Needle phobia: etiology, adverse consequences, and patient management. *Dental Clinics of North America*, 54, 731–744.

Starkey, P.E. (1983). Local Anesthesia in Children. In: *Managing Children's Behavior in the Dental Office* (eds G.Z. Wright, P.E. Starkey, D. E. Gardner), 123–143. The C.V. Mosby Company, St. Louis, Missouri, USA.

Trapp, L.D. and Davies, R.O. (1980). Aspiration as a function of hypodermic needle internal diameter in the in-vivo human upper limb. *Anesthesia Progress*, 27, 49–51.

Versloot, J., Veerkamp J.S.J., Hoogstraten, J. (2005). Computerized anesthesia delivery system vs. traditional syringe: comparing pain and pain-related behavior in children. *European Journal of Oral Science*, 113, 488–493.

Versloot, J., Veerkamp, J.S., Hoogstraten, J. (2008). Pain behaviour and distress in children during two sequential dental visits: comparing a computerised anaesthesia delivery system and a traditional syringe. *British Dental Journal*, Jul 12; 205(1):E2; discussion 30–1. doi: 10.1038/sj.bdj.2008.414. Epub 2008 May 23.

Chapter 9

Introduction to Pharmacological Techniques: A Historical Perspective

Gerald Z. Wright

Ari Kupietzky

This introduction provides a brief chronologic history of pediatric dental sedation, beginning with the 1970s. It focuses on changes that have occurred in the United States in the last forty years, as Americans have led the changes. Knowing what has transpired in the past helps to understand current regulations and practices.

In 1998, the American Academy of Pediatric Dentistry (AAPD) used the terms minimal, moderate, and deep to categorize sedations (Reference Manual 2010–2011). These are different degrees of central nervous system depression, each corresponding to a level of sedation relaxation. However, in the first edition of this book, Musselman and McClure (1975) categorized drugs differently. They opined that decisions concerning the type of drug and the suitable route of drug administration may be made, in part, on the basis of the level of a child's cooperative behavior. They classified sedation as two types: preventive premedication and management medication. A preventive premedication is used when a child is stressed by the dental situation, but is still communicative. There are different types of behaviors—scared, timid, apprehensive—that could be considered candidates for a preventive medication. Management medication is used for children who are unable to control their behavior or for those lacking in cooperative ability. The dentist would find it difficult or impossible to obtain adequate radiographs on these children. Verbal communication may have little meaning for them.

These sedation categories are rarely used today, but it is sometimes helpful to think of the drug you are about to use in this way. Consider the following case.

Case 9.1

Jill, age four, was a healthy child requiring four quadrants of dentistry. At the initial examination the child appeared cooperative, but the dentist recognized her apprehension. When the napkin was placed on Jill's chest, a very rapid heartbeat was felt. The child's eyes followed every movement of the dental team. She talked incessantly and laughed forcefully, as if trying to camouflage her concern.

Despite these observations, the dentist elected to treat Jill with Behavior Shaping, a non-pharmacologic approach. Performing dentistry quadrant by quadrant, the dentist achieved good patient cooperation at the first and second restorative appointments. At the third visit the child cried at the injection but eventually calmed down. When the time arrived for the fourth appointment, Jill's parent had to forcibly bring her to the office. The child cried continuously and hysterically, refusing the injection.

***Case 9.1, Discussion*:** The case illustrates an excellent example of when a preventive medication might be used. The child was obviously apprehensive at the first visit, and her behavior changed from cooperative to highly uncooperative by the fourth appointment. If the child had received a preventive medication, a more favorable outcome may have resulted. A contemporary example of a preventive medication is nitrous oxide inhalation analgesia. Thinking in terms of the child's cooperative behavior is a useful way of guiding drug selection.

In 1975, numerous sedation agents were being used in private practices and teaching venues. To determine

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

which sedation agents to include in the original edition of this book, a survey of members of the American Board of Pedodontics (now AAPD) was undertaken (Wright and McAulay 1973) to determine: (1) which drugs were used by the members, and (2) what the common methods of drug administration were. The survey concluded that hydroxyzine (Atarax, Vistaril) was the most popular sedating agent when used alone.

Hydroxyzine, a minimal sedation agent, can serve as an excellent preventive medication. It is best used for children three to six years of age and those who are timid, apprehensive, or highly anxious. However, the drug by itself likely will not be sufficient. Success in patient management requires both pharmacological and non-pharmacological techniques; the individual dentist's training and experience makes the difference in choice and efficacy of techniques employed (Phero, 1993). This is especially true when using a minimal or preventive medication. Indeed, since a patient's awareness may be somewhat dulled, greater emphasis is placed on using a very good non-pharmacologic approach. As the sole sedating agent, hydroxyzine has limited success with older children, but nowadays it is often used in combination with other agents. When used with nitrous oxide, its antiemetic effect can be advantageous.

Chloral hydrate was the next most popular drug when used alone, and it was usually employed as a management medication. In 1975, pediatric dentists were still trying to determine the proper dosage . There was little agreement. Maximum suggested dosages for a four-year-old child ranged from 750 mg to 1000 mg (Sim 1975) and sometimes as high as 1250 mg (Smith 1977). While historically there was confusion as to the correct dosage, it did not prevent its use, and deep sedations often were obtained with the limited monitoring that was available at that time. Chloral hydrate is no longer manufactured commercially in the United States, but it remains available at local pharmacies and in other countries. For this reason, it has been included in this book.

When it came to drugs used in combination, promethazine (Phenergan) and meperidine (Demerol) were the most popular. When children were "strongly apprehensive," the combination of Phenergan and Demerol were used widely as a management medication. The 1975 survey reported that 35% of ABPD members administered medication intramuscularly. The injections were likely for meperidine.

The Wright and McAulay survey also found that only 44% of pediatric dentists were using nitrous oxide at the time. In 1996, Wilson reported that 89% of AAPD members were using nitrous oxide, doubling its usage over a span of twenty years. Similar trends are revealed by consecutive surveys undertaken by Houpt (1985, 1993, 2002) as part of the Project on Usage of Sedative Agents by Pediatric Dentists (USAP). Because nitrous oxide—oxygen inhalation analgesia—is now highly popular, an expanded chapter has been devoted to its application in pediatric dentistry.

In 1973, the survey revealed that slightly more than 10% of pediatric dentists administered drugs submucosally. The majority of pediatric dentists administered Nisentil (alphaprodine HCl) in this way. The drug was synthesized by Ziering and Lee in 1947 and was used by physicians in obstetrics for many years. Although Nisentil is not used in dental practice today, it has great historical importance, as its use led to major changes in pediatric dental sedation practices.

Pediatric dentists used Nisentil to control the behavior of difficult child patients, particularly those three to six years of age. The drug acted rapidly, with a peak effect of five to ten minutes. It was similar to Demerol, but 2.5 times more potent. Its side effects included respiratory depression, nausea, and vomiting. Like Demerol, its effects could be reversed with a narcotic antagonist. In 1980, Nisentil was suddenly withdrawn by the manufacturer Roche Laboratories, a division of Hoffman-LaRoche.

The American Academy of Pediatric Dentistry (AAPD) voiced its concern to Roche Laboratories about the sudden withdrawal of Nisentil. Many pediatric dentists were outraged, as they relied on the drug to manage their patients. To deal with the Nisentil issue, a symposium was held in Los Angeles in 1981 and its proceedings were published in a special issue of *Pediatric Dentistry* the following year. Chen (1982), representing Roche Laboratories, cited four cases of adverse experiences with the drug. Children twenty-eight months to four years died or suffered cerebral damage due to anoxia. Key information extracted from 7,372 cases gathered from the files of twelve dentists using Nisentil was as follows: patients ranged from two to twelve years of age, drug efficacy was rated between 2.8 and 2.9 (3 max), dosage was 5–15 mg in most cases, and severe adverse reactions occurred in 8/7,372 cases.

Aubuchon (1982) also presented an important report at the symposium. Basing his findings on 2,911 questionnaires, his main conclusions were: a narcotic sedative technique was the most popular means of sedating pediatric patients, narcotic sedations had an adverse risk reaction of 1:5,000 as compared to a risk of 1:20,000–30,000 for non-narcotic agents, and an alphaprodine sedation is as safe or safer than a meperidine sedation. Creedon (1982) and Troutman and Renzi (1982), citing their experiences and case reports, provided further support for the use of Nisentil. The symposium panel concluded that although there were other drugs available for pediatric dental sedation, none were as effective as Nisentil. Two outcomes of the symposium were that: (1) better education was needed for practitioners

choosing to use sedation medication, and (2) there needed to be a set of guidelines to establish a basic standard of care for these procedures. Until that time there were no formal sedation guidelines.

Shortly thereafter, the AAPD Board of Directors appointed an ad hoc committee charged specifically with developing and writing the guidelines. The committee consisted of appointed members from the AAPD and representatives from American Society of Dentistry for Children, American Academy of Pediatrics, and Roche Laboratories. In 1983, the committee presented the guidelines to the AAPD membership, leading to controversy and fury. Many objected to the content of the guidelines—they viewed them as possible regulation of their practices—and serious opposition was heard. Subsequently, the guidelines underwent further changes and presentations at AAPD annual meetings. Input was also obtained from the Academy of Pediatrics section on Anesthesiology, the American Dental Society of Anesthesiology, and the American Association of Oral and Maxillofacial Surgery. In the end, the guidelines were the result of a consensus of opinions, and the final document was entitled "Guidelines for the Elective Use of Conscious Sedation, Deep Sedation and General Anesthesia." Following a few minor changes at the behest of the American Academy of Pediatrics, the guidelines were jointly published in the July 1985 issue of *Pediatrics* and in the December 1985 issue of *Pediatric Dentistry*. Those guidelines are the basis for guides today. It is interesting to reflect upon this period of time. If Nisentil had not been withdrawn, how long would it have taken for pediatric dentistry to have sedation guidelines?

The guidelines focused on details which theoretically act to protect and promote the welfare of children who required sedation. From the practitioner's viewpoint, the guidelines could be perceived as mediating major change in practice. For instance, maintaining time-based records of sedation may be misconstrued as a significant logistical problem.

- Who in the operatory is to be trained to record physiological parameters?
- What should be on the data gathering form?
- When is it really necessary to record monitored parameters?
- What do the guidelines offer in providing guidance to these questions?

Sedation guidelines are not static: they need to be dynamic, and they require modification on a periodic basis. Fortunately, the AAPD had the foresight to recognize the potential need for modification, and in 1992 the subcommittee on sedation convened to evaluate all aspects of the guidelines. They were revised further in 1996, 2000, 2005, 2008, and 2011. Guidelines also have to be adjusted to satisfy the laws of various states, provinces, or nations.

While sedation usage was increasing, it was very difficult to determine the effectiveness of the guidelines. Consequently, Davis (1988) surveyed Diplomates of the American Board of Pediatric Dentistry (ABPD). He found that the two most important reasons for the increase in sedation usage were that (1) 54% of pediatric dentists claimed they now treated more difficult patients, and (2) many (32%) felt the need to provide more efficient care due to economic pressures. Interestingly, 12% felt that they were now better prepared to use conscious sedation and 39% decreased their sedation usage because of the difficulty in complying with the AAPD guidelines. The latter two findings suggested that the guidelines were beginning to have a positive effect.

Compliance with the guidelines was slow. Houpt (1993) found that practitioners who used sedation monitored their patients in a variety of ways. Most evaluated by the color of their patient's appearance, but only 54% used a precordial stethoscope and only a third of practitioners took blood pressure. On the other hand, pulse rate was taken by 83%, respiration was monitored by 80%, and 69% used a pulse oximeter. What was difficult to determine in this report was whether the monitoring was appropriate for the types of sedation administered.

Six years after the guidelines were published, further need for changes was evident based upon survey responses from 95% of pediatric dentistry program directors. A survey report by Wilson (2001) found an increase in conscious sedation lecture hours, as compared to earlier data. It was also found that midazolam was the most frequently used sedative and there was an increase in emergency preparedness. In some cases there were no changes. Oral administration remained the predominant route and, importantly, the precordial stethoscope, pulse oximeter, and blood pressure cuff were the most commonly used monitors. The anticipated sedation depth and sedation agents were key factors in choosing these monitors.

While the use of sedation to treat children was increasing, not everyone in the 1990s was in favor of the increase. Griffin and Schneiderman (1992) questioned the need to sedate and suggested that before sedating, pediatric dentists should consider:

- the urgency of treatment.
- deferral of treatment until the use of non-pharmacologic techniques is appropriate.
- weighing the benefit versus the risk.

Studying and adhering to guidelines is critical—they assist clinicians to deliver safe sedation to their child

patients. A recent (and disturbing) report (Chicka 2012) of seventeen closed malpractice cases revealed that in all cases, guidelines were not observed. Overdoses and instances of inadequate monitoring were found in anesthesia cases for pediatric dental patients, and nine cases resulted in death or permanent brain damage. While there will undoubtedly always be untoward incidents such as these, there is no excuse for disregarding the guidelines.

The foregoing is a brief summary of the history of pediatric sedation. It reveals how the area of pediatric dental sedation has changed. And it is still changing. Considering recent surveys, Johnson et al. (2012) reported change. From 1,219 survey returns, they found that 63% of the respondents practiced conscious sedation primarily to help provide care for patients who were difficult to manage. That is quite different than earlier findings that showed economics to be one of the prime reasons for sedation. Those who did not practice conscious sedation gave exposure to liability as the main reason. Years ago, that was not a major consideration. Wilson and Nathan (2011) followed up on the 2001 survey of program directors. They found varying experiences in training programs, and they concluded that there was a need to strengthen competencies in sedation practices in academic programs. In earlier years there was no mention of competencies. Thus, sedation in pediatric dentistry is continually changing. That challenges the practitioner to keep up with the changes.

The shifts in sedation practices within pediatric dentistry reflect the many changes occurring within modern society. Traditionally, widely acceptable behavior management techniques such as tell-show-do (TSD) and other, more aversive methods were used by pediatric dentists. However, due to evolving societal norms, their use is slowly being phased out. In May 2006, the AAPD eliminated the hand-over-mouth exercise (HOM) technique from its clinical guidelines on behavior management. Pediatric dentists are also hesitant to use other techniques. Today, many parents refuse to be separated from their child, and others will not allow voice control, stating, "We never raise our voices to our children, why should we allow you to do so?"

Without the ability to use these time-proven techniques, pediatric dentists will often find their hands tied when confronting a defiant, uncooperative and/or over-indulged child who is perhaps accompanied by over-protective parents. Casamassimo et al. (2002) reported the effects of changing parenting styles on dental practices in the United States. The majority of pediatric dentists (92%) indicated that parenting style changes were probably (54%) or definitely (38%) responsible for changes in patient management. Respondents felt that parenting styles had changed because parents were less willing to set limits, less willing to use physical discipline, unsure of their roles as parents, too busy to spend time with their children, and too self-absorbed or materialistic. Practitioners reported using much less assertive behavior management techniques due to these changes. Adair (2004) also found that the great majority of practitioners believed that parenting styles had changed during their years in practice, and that these changes may have contributed to an increase in behavior management problems in the dental setting. Thus, a trend within the profession is to use sedation and general anesthesia more frequently as a means of treating many young children in the dental office that in previous years may have been successfully treated non-pharmacologically. Anesthesiologists also have detected this change. Olabi's survey (2012) concluded that the use of dental anesthesiologists for administration of deep sedation and general anesthesia appears to be an emerging trend in pediatric dental practice. It is amazing that within such a relatively short period of time, the acceptance of general anesthesia by parents has drastically changed: in 1991 (Lawrence et al. 1991) it was rated as being the least acceptable of all techniques, and in 2005 (Eaton et al. 2005) it was ranked as the third-most acceptable. To expect today's dentist to achieve the administration of uncompromised and proper dental treatment without the use of aversive patient management or pharmacotherapy techniques is unrealistic. This is the rationale that prompted the decision to include chapters describing sedation and general anesthesia techniques.

References

Adair, S.M. et al. (2004). A survey of members of the American Academy of Pediatric Dentistry on their use of behavior management techniques. *Pediatric Dentistry*, 26, 159–166.

American Academy of Pediatric Dentistry. (2006). Guideline on behavior guidance for the pediatric dental patient. Reference Manual 2006–07. *Pediatric Dentistry*, 28, 97–105.

American Medical Association Council on Drugs. (1971). *AMA drug evaluations*. 223. Chicago.

Aubuchon, R.W. (1982). Sedation liabilities in pedodontics. *Pediatric Dentistry*, 4, 171–180.

Casamassimo, P., Wilson, S., Gross, L. (2002). Effects of changing U.S. parenting styles on dental practice: perceptions of diplomats of the American Board of Pediatric Dentistry. *Pediatric Dentistry*, 24, 18–22.

Chen, D.T. (1982). Alphaprodine HCl: characteristics. *Pediatric Dentistry*, 4, 158–163.

Chicka, M.C. et al. (2012). Adverse events during pediatric dental anesthesia and sedation: A review of closed malpractice insurance claims. *Pediatric Dentistry*, 34, 231–8.

Creedon, R.L. (1982). Alphaprodine in 20 years of practice experience. *Pediatric Dentistry*, 4, 187–189.

Davis, M.J. (1988). Conscious sedation practices in pediatric dentistry: a survey of members of the American Board of Pediatric Dentistry College of Diplomates. *Pediatric Dentistry*, 10, 328–329.

Eaton, J.J. et al. (2005). Attitudes of contemporary parents toward behavior management techniques used in pediatric dentistry. *Pediatric Dentistry*, 27, 107–113.

Griffin, A.L. and Schneiderman, L.J. (1992). Ethical issues in managing the noncompliant child. *Pediatric Dentistry*, 14, 178–181.

Houpt M. (1989). Report of project USAP: The use of sedative agents in pediatric dentistry. *Journal of Dentistry for Children*, 56,302-309.

Houpt, M. (1993). Project USAP the use of sedative agents in pediatric dentistry: 1991 update. *Pediatric Dentistry*, 15, 36–40.

Houpt M. (2002). Project USAP-2000. Use of sedative agents by pediatric dentists: A 15-year follow-up survey. *Pediatric Dentistry*, 24, 289–294.

Johnson, C. et al. (2012). Conscious sedation attitudes and perceptions: a survey of American Academy of pediatric dentistry members. *Pediatric Dentistry*, 34, e132-137.

Lawrence, S.M. et al. (1991). Parental attitudes toward behaviour management techniques used in pediatric dentistry. *Pediatric Dentistry*, 13, 151–155.

Musselman, R.J. and McClure, D.B. (1975). Parmacotherapeutic approaches to behavior management. In: *Behavior Management in Dentistry for Children*, (Wright, G.Z. ed), 147. W.B. Saunders Co., Philadelphia, PA, USA.

Olabi N.F. et al. (2012). The use of office-based sedation and general anesthesia by board certified pediatric dentists practicing in the United States. *Anesthesia Progress*, 59, 12–17.

Phero, J.C. (1993). Pharmacologic management of pain, anxiety, and behavior: conscious sedation, deep sedation and general anesthesia. *Pediatric Dentistry*, 15, 429–433.

Reference Manual (1993–1994). *Pediatric Dentistry*, 15, 51–53.

Reference Manual (2010–2011). *Pediatric Dentistry*, 32, 67.

Sim, J.M. (1975). Pharmacotherapeutic approaches to behavior management. In: *Behavior Management in Dentistry for Children*, (Wright, G.Z, ed) 165–195. W.B.Saunders Co., Philedalphia, PA, USA.

Smith, R.C. (1977). Chloral hydrate in dentistry for children with handicaps. *Master's Thesis*, University of Iowa, Iowa City.

Troutman, K.C. and Renzi, J. Jr. (1982). The efficacy of alphaprodine in pedodontics. *Pediatric Dentistry*, 4, 181–161.

Wilson, S. (1996). A survey of the American Academy of Pediatric Dentistry membership: nitrous oxide and sedation. *Pediatric Dentistry*, 18, 287–293.

Wilson, S. (2001). Conscious sedation experiences in graduate pediatric dentistry programs. *Pediatric Dentistry*, 23, 307–314.

Wilson, S. and Nathan, J.E. (2011). A survey of sedation training in advanced pediatric dentistry programs: thoughts of program directors and students. *Pediatric Dentistry*, 33, 353–360.

Wright, G.Z. and McAulay, D.J. (1973). Current premedicating trends in pedodontics. *Journal of Dentistry for Children*, 40, 185–188.

Chapter 10

Sedation for the Pediatric Patient

Stephen Wilson

Introduction

Only a few short decades have witnessed a multitude of significant changes associated with the pharmacological management of children for dental and medical procedures. As shown in the previous chapter, there are many possible reasons for the change. Importantly, these include the development and implementation of sedation guidelines by professional groups and the unpredictable but constantly evolving professional and societal influences affecting behavioral management techniques, including sedation practices. There seems to be a tendency, however, for pediatric dentists to practice pharmacological management of children in a similar vein to that in which they were trained (Houpt 2002). Thus, the practice of sedation in the United States has likely retained much from the past.

One aspect of pharmacological management that remains constant is the quest for the "magic bullet." The "magic bullet" is thought of as a single sedative agent or concoction of sedative agents which, when given to a child patient, will: a) ensure that the child is peaceful in demeanor and responds favorably during the procedure, b) harbors enough working memory to retain the impression of a pleasant experience at the dental office, c) is minimally affected by invasive dental interventions from physiological, behavioral, and emotional perspectives, and d) is always safe in the hands of the clinician. So far, the only "magic bullet" that comes close but does not fully satisfy this idyllic state is that of general anesthesia. One might predict that the future will see such a "magic bullet," but not in the same heuristic conceptualization that we currently embrace. Rather, it may involve the use of some selective, reversible effect on various neuroanatomical loci of the brain using an, as yet, undiscovered psychopharmacological concoction or other interventional procedure.

Sedation and Pediatric Dentistry

One popular method used today in clinical care of patients who experience fear, anxiety, and/or pain is pharmacological intervention. In fact, sedation of children is a very common and accepted modality of patient management during potentially painful procedures. Its popularity is due, in part, to its effective and efficient ability to overcome in variable degrees the mental and emotional anguish and behavioral expressions of the patient who otherwise is unable to provide satisfactory personal management of the distressing situation.

The process and need for safety in performing sedation during dental procedures involves several factors that are directed toward positive general outcomes. Some of these factors can be seen in Table 10-1. Clinicians must have a strong cognitive understanding of clinical expertise in, and respect for each of these factors, often reflected in the concept of professional competency. Unfortunately, little is currently known about practitioner competency surrounding the knowledge of and adherence to these factors, either in the educational or practice communities. Indirectly, information through surveys over the decades has suggested that many practitioners perform sedations on a regular basis (Houpt 1989, 1993, 2002), but documented information of the details of the sedations and even their effectiveness are mostly non-existent. Nonetheless, several important factors, which the dentist should have gleaned through formal training and experience, are discussed briefly in the following sections.

The Child

Essential knowledge of the child's age, cognitive development, temperament, and coping styles becomes key to planning and negotiating interactions aimed at

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

Table 10-1. Major factors and their considerations in performing sedations.

Major factors	Considerations
Child characteristics	Age, cognition, temperament, style of coping, parent-child relationship
Drug characteristics	Dose and concentration, mechanism of action, effects, pharmacokinetics, pharmacodynamics, adverse events, contraindications, formulations
Protocol	Standardized process, checks and balances, quality improvement measures
Patient monitoring	Monitors, significant and implications of measures monitored
Practitioner training	Breadth and types of experiences, programmatic versus empirical influences, recognition and response to patient signs and symptoms
Clinical staff knowledge	Similar to practitioner training
Sedation guidelines	Knowledge of and adherence to guidelines
State rules and regulations	Knowledge of and adherence to state regulations
Emergency prevention and management	Training, recognition, and interventional abilities

arriving at a safe and successful clinical outcome (see Chapter Two). Usually, children under three years of age are not easily managed during stressful or painful procedures using behavioral interactive techniques. The likelihood that such techniques will become more successful increases once the youngster has a better comprehension and mastery of speech, symbolic manipulations, and coping strategies. Thus, pharmacological management of the child who is under three years becomes a more promising and rational approach in managing behavior, assuming the depth of the sedation is sufficient to overcome the child's natural instincts of fight or flight during the procedure. Generally, deep sedation (DS) or general anesthesia (GA) is needed, but they carry a greater risk for the child and clinical team.

Children cope with varying degrees of success during challenging clinical situations. There are few studies in dentistry investigating cognitive coping strategies, parental or staff-assisted interventions (e.g., distraction or breathing exercises), or other mechanisms used to cope with acute or chronic pain and perceived stress. However, interventional studies designed to minimize anxiety, stress, and pain in non-dental settings have been investigated by others. For convenience, they are listed with the references at the end of the chapter. Investigations into how children cope with stressful situations potentially involving pain have led to such concepts as information-seeking and information-limiting individuals (Fortier et al. 2009). In other words, some children do better when told about details of a procedure that they will undergo, whereas others use different techniques, including limiting information about the procedure.

Temperament may be defined as how a child typically responds to a novel environment as well as the child's basic daily expression pattern in a host of solitary and social situations. It was initially described in relation to the clinical environment in the 1960s by Thomas and Chess (1963). As such, temperament has received considerable attention in explaining some behaviors associated with various settings (Lopez et al. 2008; Fortier et al. 2010; Lee and White-Traut 1996). Several characteristics supporting differences in temperament have been described (Lochary et al. 1993) and can be seen in Table 10-2.

Table 10-2. Domains of temperament.

Parameter	Characteristic
Sensitivity	threshold level for change in environment
Approachability	initial response to new settings
Adaptability	response over time to new settings
Mood	tendency toward happy or unhappy attitude
Distractibility	tendency to be sidetracked
Activity	daily amount of energy expended
Regularity	predictability in daily routine
Intensity	amount of energy in response to setting
Persistence	ability to stick to task

Temperamental characteristics of children are thought to be related to child behavior in clinical situations (Caldwell-Andrews and Kain 2006; Tripi et al. 2004). Interestingly, there is a significant amount of information concerning the contribution of child temperament to behaviors witnessed in the dental environment (Arnrup et al. 2003; Arnrup et al. 2007; Klingberg and Broberg 1998, 2007) Children can generally be divided into three groups: a) easy—those are very interactive, friendly, and easily managed; b) slow-to-warm up—those who generally do well with appropriate guidance but need some time to overcome minor anxieties; and c) difficult—those who are withdrawn and display overt disruptive behaviors with little provocation (Lochary et al. 1993). The results of some studies suggest that shy children in the dental setting express more distress and negative behaviors in response to dental procedures (Jensen and Stjernqvist 2002; Quinonez et al. 1997), whereas those

who are adaptable and approachable exhibit less disruptive and more appropriate interactive behaviors (Lochary et al. 1993; Radis and Wi 1994). A clinician should always be cognizant of children's behaviors preoperatively in hopes of finding clues that may aid in anticipating interactions with the child once dental procedures begin. For instance, a concerted effort should be made to observe the interaction of the dental staff with children during initial introductions and exchanges of pleasantries, patient weighing, and introduction to the office in general and the clinical operatory in particular. These interactions can help to predict behavior and anticipate potential behavior management strategies.

A parent's demeanor, body language, concerns, desires, anxieties, and opinions are also important considerations. Parents usually have beliefs and value systems that tend to fit their generation, lifestyle, and life experiences. It is appropriate for the practitioner to ascertain the parent's opinion in discussing behavior management possibilities.

There is some evidence suggesting that parenting skills have changed over recent decades and that these changes influence how children tend to respond in the dental environment, as well as in other social settings (Casamassimo et al. 2002; Schorr 2003). Practitioners report that children tend to cry and are more difficult to manage than in the past. Furthermore, some view today's parents, compared to recent generations, as more liberal in rearing their children. As an extension of that view, many believe that this less-involved parenting style is a detrimental trend in that parents fail to set limits and are less involved in guiding their children in psychosocial and socialization processes. Even the concept of the family is different than it was when this textbook was initially written (see Chapter Four). As a newer generation of professionals transition into providing care, their attitudes, opinions, and orientations toward delivery of care may change, reflecting similar sentiments of parents of their age. It will remain speculative as to what management technologies may prevail in the future. But it is possible, based on societal trends today, that a greater reliance on pharmacological management will predominate in managing children for medical and dental procedures.

Patient Assessment

One of the most important and comprehensive aspects in the decision to use pharmacological agents in aiding the management of the child is that of patient assessment. Patient assessment includes a detailed review of the medical history and major physiological systems (e.g., cardiovascular) and performing a physical assessment of the child, focusing on auscultation of the chest and heart, viewing the upper airway structures including tonsils, ascertaining an impression of the patient's behavior and temperament, and determining the patient's amount of dental needs. Medical consults following the initial review of the patient's conditions are also a part of this process.

By performing these preliminary procedures, one is able to determine the physical risk and status of the patient in undergoing the sedation and dental procedure, the drug(s) and dose(s) selected, and possibly an impression of the likelihood of a successful outcome. A similar process occurs when assessing a patient for general anesthesia, with the outcome being a physical risk category assigned to the patient. The standard physical risk categories used in medical and dental care are those of the American Society of Anesthesiology (i.e., ASA classifications) and can be seen in Table 10-3.

The review of systems and medical history implies asking appropriate questions and, if anything other than "normal" arises, follow-up queries to determine the

Table 10-3. American Society of Anesthesiology (ASA) physical risk categories.

ASA Class*	Patient Status	Comment
I	A normal, healthy patient.	No organic, physiologic, or psychiatric disturbance, healthy with good exercise tolerance
II	A patient with mild systemic disease.	No functional limitations, has a well-controlled disease of one body system
III	A patient with severe systemic disease.	Some functional limitation, has a controlled disease of more than one body system or one major system, no immediate danger of death
IV	A patient with severe systemic disease that is a constant threat to life.	Has at least one severe disease that is poorly controlled or at end stage
V	A moribund patient who is not expected to survive without the operation.	Not expected to survive > 24 hours without surgery, imminent risk of death

*There is an ASA VI, but it refers to a brain-dead individual whose organs may be harvested.

issue and its impact, medications, hospitalizations, acute or chronic home care, and outcome of any previous intervention. If there is or has been a problem with a system, a consult with the patient's primary care physician is often advisable.

Auscultation of the chest using a stethoscope is needed to confirm that the intrathoracic airway is clear and not congested or indicative of other abnormalities (e.g., asthmatic wheezing). Typically, placement of the bell on the various fields of the chest and back is done. In preschoolers, another good location to hear breath sounds in under the arm pit and lateral border of the chest. The primary goal in listening to the heart is determining if there is a regular rate and rhythm (e.g., sinus rhythm). If there is anything unusual or different from a typical "lub-dub" of each cardiac cycle, or if any other sound is heard, a consult with the child's physician is usually recommended. Sites can be found on the Internet allowing one to hear differences between normal and abnormal respiratory and cardiac sounds. A visit to those websites is highly recommended. Listen to the sounds to gain a basic appreciation of what is normal and abnormal.

The size of the tonsils is very important in appreciating the amount of airway space that they occupy between the anterior and posterior pillars separating the oral from the pharyngeal portion of the oropharynx (Figure 10-1). Strong consideration of the risk of large tonsil size is imperative, especially if the likelihood that unconsciousness may occur during sedation. Tonsils greater than 50% of the airway diameter are usually contraindicated with drugs like chloral hydrate. Chloral hydrate may increase the probability of airway blockage due to relaxation of the tongue muscles, which, due to gravity in a supine patient, fall backward against soft tissue. A very important question that should always be asked of the parent is whether the child snores during sleep. The likelihood of snoring increases as the size of the tonsils increase.

It is rare that one cannot visualize the tonsils and transitional aspects of the portion of the oropharynx. If the child is fairly cooperative, one may ask them to point their chin toward the ceiling while in a supine position, open as wide as possible, and say a soft "ahhh." The clinician seated directly behind the patient with good lighting should be able to judge the size of the tonsils and how much of the patent space they occupy. If a child is uncooperative, the following technique can be used to visualize the tonsils. A mouth mirror or tongue blade can be placed on the posturing tongue and slowly moved distally until the gag reflex is triggered. The clinician has to quickly observe the tonsil size during the gag movement, where the tonsils and soft tissue collect in the center of the airway space and move slightly cephalad.

(a)

(b)

Figure 10-1. Tonsil size is very important in appreciating the amount of airway space that they occupy between the anterior and posterior pillars separating the oral from the pharyngeal portion of the oropharynx: visible tonsils of average size (a) versus enlarged tonsils which may result in airway blockage (b).

The patient will not vomit, but the clinician has to be prepared to observe the tissues during this quick reflex. A second gag attempt is not recommended.

Finally, an assessment of the child's dental needs is critical in terms of the number of teeth or quadrants of dentistry requiring treatment, the technical challenge of the procedures, and the degree of immobility needed for the type of procedures anticipated. These, along with the child's temperament, are important variables in deciding the selection of agents and their doses prior to preparing the sedation "cocktail." For instance, an ultrashort procedure such as extraction of the maxillary primary incisors may only require a moderate dose of midazolam. Midazolam has a rapid onset but a short duration of action, whereas two or more quadrants of dental restorations may require a triple combination of drugs such as low dose chloral hydrate, meperidine, and hydroxyzine. This combination affords the dentist a

longer working time. Those who do not vary the drug regimens or doses are likely to have a lower rate of successful sedations than those who have the training and skills associated with various drug regimens.

Sedation Protocol

Establishing and adhering to a good sedation protocol will facilitate pharmacological management of the child and minimize the likelihood of making an error within a sequence of activities associated with the delivery of dental care. Another benefit of relying on a regular and standardized procedural sequence is that it allows the incorporation and synchronization of other staff or colleagues as collaborators in safeguarding patient welfare. As a team, a set of checks throughout the process diminishes errors of omission, overt forgetfulness, and probabilities of sequential flaws. A sense of teamwork will evolve and can be strengthened by regular reviews and application of risk management principles, with the goal of continual quality improvement.

There are key steps within a protocol that should be highlighted for emphasis in guaranteeing the best possible outcome for the patient. They are important because they increase favorable interactions between controlled and uncontrolled factors (e.g., dental procedure versus child temperament, respectively), provide primary and secondary defenses against procedural hazards, and communicate a strong feeling of competency in performing professional duties. An example of a sedation protocol that may reflect these principles is shown in Table 10-4.

Table 10-4. An example of a sedation protocol.

Timing	Steps
Pre-sedation prior to sedation appointment	Behavioral assessment Dental examination and needs Medical and dental history Physical examination, including airway Informed consent with risks and benefits Pre-operative counseling and written instructions for parents Consults, as needed Office policy and requests during sedation visit Financial considerations State and professional regulations/guidelines
Pre-sedation steps on day of sedation	Review of all of the above for completeness Matching temperamental factors with selection of drug(s) and dose(s) Drawing up drug(s) in presence of colleague/staff Drug administration method and considerations Clinical monitoring (or affixing monitors, as needed) during latency period between administration of drug and start of operative procedure Feedback to parents, as needed Safety interventions, as needed (e.g., emesis and decision to continue)
Intra-operative steps	Dental instruments, supplies, medicaments, nitrous oxide system readied and checked Emergency equipment, including positive pressure oxygen delivery system (i.e., bag-valve mask) readily available and checked Continued monitoring from last step or affixing monitors and beginning monitoring per AAP/AAPD guidelines Decision on need for immobilization of patient Adjusting airway initially and frequently during procedure and use of shoulder roll/device Administration of topical and local anesthetics never exceeding a minimal and appropriate dose for a child (e.g., no more than 4 mg/kg regardless of "…caine"). Sometimes this dictates how many sedation visits are needed. Use of rubber dam or its equivalent (e.g., Isolite system) Variable suction (i.e., high/low suction, appropriate tips, and back-up) and lighting Documentation of vitals, behavior, and incidents per sedation guidelines/state regulations
Post-operative steps	Appropriate monitoring per guidelines/state regulations Pre-operative counseling and written instructions for parents Discharge only after criteria are attained per guidelines Complete and appropriate documentation of procedure per guidelines Follow-up phone call with parents in evening

Monitoring and Monitors

Monitoring means to warn or alert. Monitoring implies the possibility that both a) clinical assessment of the patient is done by a clinician (i.e., observation of skin coloring) and b) monitoring tools aid in assisting the clinician in making decisions about the patient's state and need for intervention. Several monitors are used in clinical dentistry, and they can be broadly categorized as electronic and non-electronic (e.g., pulse oximeter and precordial stethoscope, respectively). Some of the electronic monitors measure the same parameter as non-electronic monitors (e.g., heart rate). Automated blood pressure machines can determine the systolic and diastolic blood pressure as an isolated event or in repeated, regularly timed intervals. Likewise, a manual blood pressure cuff can determine the same parameters of blood pressure, but usually requires another tool (i.e., stethoscope) and a clinician's sense of hearing and sound discrimination.

Auscultation

Stethoscopes have been available for decades and can assist in obtaining heart, respiratory, gastrointestinal, joint, and cardiovascular anomalies (e.g., arteriovenous malformations) sounds. They are particularly useful for monitoring airway and heart sounds during sedation. Optimizing and highlighting the specific sound of either the airway or the heart is greatly dependent on the placement of the stethoscope's bell on the chest wall.

To maximize airway versus heart sounds, one can imagine a triangle on a child's chest with a line connecting the two nipples, representing the base of the triangle (see Figure 10-2). The right and left sides of the triangle run from the corresponding right and left nipple to the notch or soft depression on the neck, just superior to the manubrium bone of the chest cage. In a supine patient, placement of the stethoscope bell at the notch will cause breathing sounds to be loud and dominant, compared to the faint sounds of the heart. As the stethoscope bell is moved along the imaginary line connecting the notch to the left nipple, the breathing sounds fade and the heart sounds begin to dominate. Airway sounds are more important during sedation, as they transmit information on the function and patency of the upper airway, as well as secondary anatomical structures and sounds (e.g., esophagus and vomiting, respectively). Thus, during sedations, the bell should be placed toward the apex of the triangle. It should be gently but firmly attached to the body either with adhesive tape or 3M Double-Stick Discs® (3M Medical Device Division, St. Paul, MN).

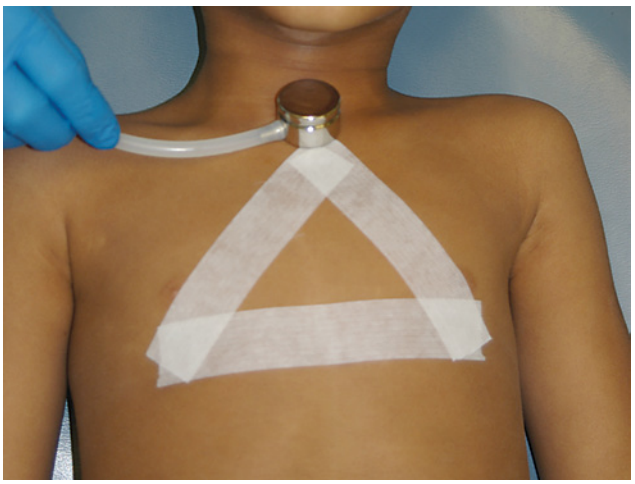

Figure 10-2. Photograph showing a triangle on the chest and the placement of the stethoscope bell for maximizing airway sounds.

When listening through a stethoscope, competing sounds come from various sources, including handpiece noise, a metal rubber dam frame touching the stethoscope bell and conducting sounds when the handpiece contacts the frame, and ambient room noise (e.g., talking or music). These sounds can often be comparatively loud and drown out the airway sounds, increasing the need for additional monitoring.

Blood Pressure Cuffs

The use of blood pressure cuffs (BPCs) has a long history in medicine and dentistry. BPCs can be used manually or electronically. An inflatable bladder is embedded in the manual BPC. There is a pressure gauge inside the bladder, as well as a valve-controlled bulb, which inflates and deflates the bladder, connected to the cuff by a flexible rubber tube. Manual use of a BPC may be very helpful in emergency situations to gain a quick insight into the approximate systolic pressure of the patient. For example, a very quick but imprecise measure of systolic blood pressure can be obtained by inflating the cuff with a valve-controlled bulb, and then rapidly decreasing the pressure in the cuff until the needle, which had been traveling in at a smooth, constant rate from higher to lower pressures, begins to "bounce." This technique gives the clinician a rapid means of determining the general range of systolic pressure.

Automated BPCs indirectly indicate the systolic and diastolic blood pressures, as well as the heart rate at discrete but modifiable intervals. The automated BPCs also use a bladder- and transducer-embedded cuff, a rubber tube connecting the cuff to the frame of the blood pressure apparatus, which contains a pump and microchip to control the inflation and deflation of the

cuff as well as perform various blood pressure and heart rate parameters.

With many automated units, a typical cycle of determining blood pressure involves periods of inflation and deflation of the cuff to obtain blood pressure parameters and variable inactive periods of time between measurements. A cycle for sampling blood pressure can be varied over a wide range of time periods (e.g., every 3–90 minutes).

Functionally, the bladder is inflated over a few seconds to a pressure that essentially occludes blood flow in arteries. Normally, the initial pressure is internally set close to 150 mm Hg, but if vibrations are detected, the pressure is increased until such vibrations cease. The bladder is then deflated in small steps of pressure change, during which the transducer monitors oscillatory signals emanating from the arteries through the bladder. When the first increase in the size of oscillatory signals per step of decreasing pressure change is repeatedly detected, the BPC reports this pressure value as the systolic blood pressure. The cuff continues to deflate in pressure steps and the pulse pressure in the limb initially increases, then declines, until finally no further change in oscillatory signals is detected. The bladder pressure at that point represents the diastolic blood pressure. Control of this cycle is done electronically through an algorithm which also determines and reports mean arterial pressure in some units, which is approximately two-thirds of systolic blood pressure. The pulsating oscillatory signals detected can also be used to calculate heart rate.

There are a few factors that can cause artifact information with both manual and automated BPCs, including a) different width-sized cuffs, with oversized cuffs tending to cause erroneously low pressure readings and undersized cuffs causing erroneously high blood pressure readings; b) air leaks anywhere within the system; and c) patient movement. The latter is clinically significant. Movements or attempts to dislodge the cuff by an uncooperative child may result in constant recycling at high pressures. Eventually the inflated, high pressure cuff begins to cause distal pain in the occluded limb. Under normal circumstances, most automated BPCs require less than 30 seconds to determine blood pressure. However, with a struggling child, the prolonged inflation pressure of the cuff (often greater than a minute or so) causes pain and can aggravate disruptive behaviors.

In dosages designed to produce minimal and moderate sedation, most sedative agents do not cause significant clinical changes in blood pressure in the unprovoked, resting child. And in general, the blood pressure and heart rate vary with age (the younger the child, the lower the resting blood pressure and the higher the heart rate).

Pulse Oximetry

The principle of pulse oximetry is based on the red and infrared light absorption characteristics of oxygenated and deoxygenated hemoglobin. Oxygenated and deoxygenated hemoglobin absorbs light of different wavelengths. Using a microchip processor, pulse oximetry takes advantage of the principle that there is a difference in light absorption of the two different states of hemoglobin, depending on the amount of oxygen being carried on the hemoglobin molecule. Hence, the microchip can discern the ratio of the two wavelengths of light and calculate the percent of oxygen saturation (SaO_2) of blood flowing within a tissue bed.

The primary disadvantage of pulse oximetry is that it measures oxyhemoglobin saturation rather than arterial oxygen tension (PaO_2). The PaO_2 and the SaO_2 are not linearly related, but rather are related by the oxyhemoglobin dissociation curve (Figure 10-3).The "S" shape of the oxyhemoglobin dissociation curve is important for physiologic uptake and delivery of oxygen in the body. In the lungs, hemoglobin is rapidly and almost totally saturated over a wide range of PaO_2 (the flat portion of the curve), while at the tissues a large amount of oxygen is unloaded as desaturation occurs over a relatively small drop in PaO_2 (the steep portion of the curve). An understanding of the relationship between PaO_2 and SaO_2 is essential for those using pulse oximetry clinically (Anderson and Vann 1988).

Changes in oxygenation are not detected until the PaO_2 falls to the point where oxyhemoglobin desaturation occurs (the 70–80 mm Hg range), where the steep portion of the oxyhemoglobin dissociation curve is

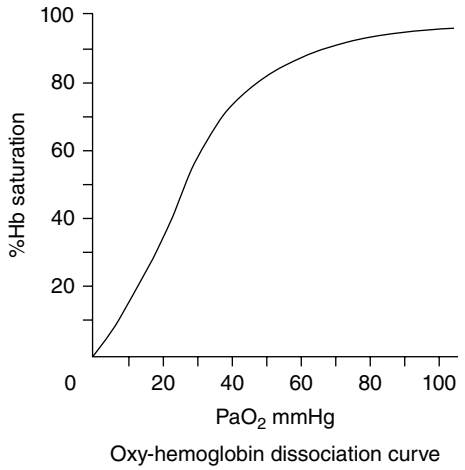

Figure 10-3. The oxyhemoglobin dissociation curve reveals the nonlinear relationship between PaO_2 (partial pressure of oxygen in blood) and oxyhemoglobin saturation (SaO_2). (Anderson J.,A., Vann, W.,F. Jr. (1988). Respiratory monitoring during pediatric sedation: pulse oximetry and capnography. *Pediatric Dentistry*, 10, 94–101.) Reproduced with permission from AAPD.

rapidly approached. When one is breathing room air, the normal PaO_2 is in the 90–100 mm Hg range, which corresponds to a SaO_2 of 96-100%. Because a PaO_2 of 60 mm Hg corresponds to a SaO_2 of approximately 90%, the PaO_2 must fall from approximately 100% to 90%. Patients undergoing dental sedation or general anesthesia often receive supplemental oxygen (with or without nitrous oxide), thus the PaO_2 may range from 150 to above 600 mm Hg. The PaO_2 must fall drastically before any change will be detected in the SaO_2. Large decreases in oxygenation may occur without any change detected by pulse oximetry. Only when the PaO_2 falls to less than 70 mm Hg will a significant desaturation occur and be detected by pulse oximetry. The pulse oximeter will not warn of downward trends in PaO_2 over the wide range of oxygen tensions above this level.

To summarize, when oxyhemoglobin desaturation begins to occur, serious respiratory depression may be present. Furthermore, more rapid desaturation may be imminent as the steep portion of the curve is approached. Therefore, during pediatric sedation, even a small change in saturation (e.g., 99–96%) must be noted quickly and evaluated before further desaturation occurs.

The pulse oximeter unit consists of an oxisensor attached by a lead or cable to the pulse oximetry unit, which houses the electronic motherboard. The oxisensors come in various shapes and attachment modes. In brief, the oxisensor (the probe that attaches to the patient) contains two LED diodes and a photodiode; the LED units emit light in the red and infrared wavelengths range and the photodiode detects light transmitted through a tissue bed. Oxygenated hemoglobin absorbs more infrared wavelengths of light, allowing more red light to pass through, while deoxygenated hemoglobin absorbs proportionately more red wavelengths with more infrared transmitted through the tissue.

Another unique aspect of the diodes is that they send alternative signals around 450 times per second. Because the tissue bed expands slightly during pulsatile (arterial) periods, the light travels over a slightly longer distance throughout the pulse and the amount of light collected per unit time changes. Simultaneously, the oxisensor determines the change in light transmitted at a very high frequency due to the arterial pulse passing through tissue bed (plethysmography). Thus, pulse oximeters theoretically measure only arterial saturation of hemoglobin. The oximeter's processor determines the balance between the two detected wavelengths of light at a very high rate, using an algorithmic function, which makes it possible for monitors to display a representation of pulse pressure waves.

The clinician needs to be aware that certain clinical conditions and situations can cause false signals unrelated to hemoglobin saturation. Any interference with information processing of the signal can produce an erroneous reading. These are: motion artifact; crying that may involve a Valsalva's maneuver (airway is momentarily closed while muscular efforts are made to compress air in the lungs—grunting); cold limbs or tissue bed; cessation of a prolonged crying bout; some nail polishes; profound tissue pigmentation in some black persons, some hemoglobinopathies (e.g., methemoglobinemia); improperly attached oxisensor to tissue bed or re-used oxisensors; or any condition that reduces blood flow into the tissue bed.

Clinically, it is important to attach the oxisensor probe to accessible, well-perfused tissue. The toe next to the great toe seems best suited in the young, active toddler. The oxisensor can be wrapped or placed on that toe and the great toe, second (on which the oxisensor is placed), and middle toe secured together as a unit using adhesive tape. It is also wise to tape the oxisensor cable onto the plantar surface of the foot; otherwise its movement can either dislodge of the oxisensor or cause electromagnetic (motion) artifacts. Fingers are also useful sensor sites in the older child or adult, but most uncooperative toddlers will tend to remove the oxisensor, especially if they struggle or do not want the probe on their finger. The ear lobe is another convenient site in older children.

Since 1985, almost every article on sedation of the pediatric dental patient published reports the use of pulse oximeters. Generally, most reports indicate oxygen saturation to be very stable during sedations, with only an occasional desaturation episode. Unfortunately, these desaturation episodes can be erroneously associated with the sedative agent, including questionable attribution of the agent's purported effects on airway compromise. Other conditions have been shown to account for what appears to be temporary "desaturations" that are of no clinical significance.

Capnography

Capnography is one of the least understood monitoring techniques in dentistry. When used properly, it is the only monitor on the market that indicates some degree of the airway patency. Capnographs measure expired carbon dioxide concentrations. Normal carbon dioxide concentrations in children range from 33 to 40 mm Hg. However, usually it is not the absolute carbon dioxide concentration that is important during lighter stages of sedation, but the fact that some exchange of air can be "visualized" on the monitor.

Capnographs can be classified as either main- or side-stream units. The main-stream is used with intubated patients, whereas the side-stream units are appropriate

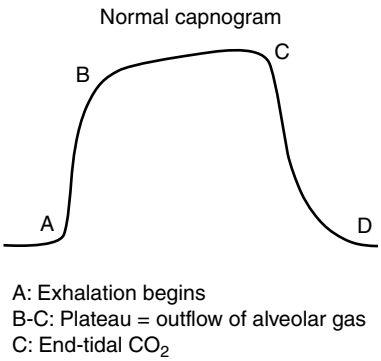

Figure 10-4. Capnography produces a waveform by the continuous analysis of respired gas for CO_2. The presence of the waveform implies exhalation of gases from the lungs. The end-tidal CO_2 (point C) corresponds to alveolar gas which may correlate closely with the $PaCO_2$. (Anderson J.A., Vann, W.F. Jr. (1988). Respiratory monitoring during pediatric sedation: pulse oximetry and capnography. *Pediatric Dentistry*, 10, 94–101.) Reproduced with permission from AAPD.

for sedated, non-intubated patients. For side-stream units, air is vacuumed or sucked through a port that is either inserted into the nostrils or placed in close approximation to the nostril or mouth. Sucked air is delivered to a chamber inside the capnograph, where the concentration of carbon dioxide can be determined by infrared absorption technology. The amount of infrared absorption in the test chamber is compared to a standardized chamber containing a known amount of carbon dioxide. The microchip processor determines and displays the carbon dioxide concentration. Capnographs can display single excursions representing the concentration of expired carbon dioxide during the expiratory cycle of breathing, and some can display trended data in which each excursion is compressed over time and appears as a single vertical line.

The expired carbon dioxide curve is displayed on a capnograph, as shown in Figure 10-4. During normal circumstances, the beginning rise in the curve represents the first portion of gases, including the dead space, exiting the lungs during the initial phases of expiration. As the expiratory process continues, gases from deeper portions of the lungs containing greater concentrations of carbon dioxide exit and the height of the curve rises dramatically at first, then continues at a fairly constant rate. As the expiratory process stops and inspiration begins, the concentration of carbon dioxide dramatically drops back to baseline. The expired carbon dioxide concentration displayed on a capnograph represents the greatest concentration (i.e., the final height) achieved during that expiration (end-tidal CO_2). It represents gas coming from the alveoli and has been shown to correlate closely with the $PaCO_2$ (partial pressure of CO_2 in arterial blood). During normal breathing, that concentration is typically 40 mm Hg pressure. A child who is breathing normally but primarily moving expired gas through the mouth tends to have a waveform that is less square in shape, and the height (and displayed concentration value of carbon dioxide) is greatly reduced. Crying results in a waveform with multiple "blips" whose height is small. The height and shape of the waveform will be affected in various ways, depending on the condition of the patient during monitoring.

Importantly, most capnographs have an alarm to indicate an obstruction anywhere along the sampling route, including the airway. Mucous blockage is one possible clinical situation causing the alarm mechanism to indicate an obstruction. Crying is a clinical event that causes most of the expired air to exit via the mouth; thus, the capnograph will detected a lower concentration of expired carbon dioxide (i.e., the majority was shunted through the mouth, leaving proportionately less to be sucked into the port). This phenomenon is also true of predominant mouth breathers. Additionally, many capnographs can electronically filter out the wavelength associated with nitrous oxide absorption; hence, the sampling tube can be placed under a nitrous hood.

Monitoring on Day of Procedure

Common sense, standard protocol, and sedation guidelines will require patient monitoring on the day of the procedure. Vital signs should be obtained routinely before administration of a sedative agent(s) unless behavior interferes with their acquisition. If behavior does prevent obtaining vital signs, a note indicating such should be placed in the patient's chart.

Monitoring should occur pre-operatively after the administration of the sedative(s), but may only involve clinical assessment of the patient (i.e., continual observation of the patient). However, if the patient becomes noticeably sedated (e.g., more quiet, peaceful, or even closes the eyes), then more monitors need to be used depending on the level of sedation noted (e.g., pulse oximeter). The patient should be closely monitored until the intra-operative phase begins.

The patient needs to be monitored intra-operatively, as indicated by sedation guidelines. The type and number of monitors required intra-operatively should be dependent on the patient's depth of sedation and could include a stethoscope, pulse oximeter, blood pressure cuff, capnograph, EKG, or other tools. Table 10-5 indicates the monitors that may be recommended according to the behaviors of the patient. The recording frequency of the monitored parameters will also depend on the depth of sedation attained.

Monitoring of the patient should continue after the procedure is completed and during the post-operative

Table 10-5. Patient behavior intra-operatively and recommended monitors.

Behavior	Clinical signs	Pre-cordial stethoscope	Pulse oximetry	Blood pressure cuff	Capnograph
Screaming or yelling	Little tears Controlled breathing Struggling against wrap	Take earpiece out of ear Replace when patient quiets	Keep it stabilized on foot Set upper heart rate limits to > 230 bpm	Place on limb but do not inflate.	Not needed Use if patient becomes quiet
Mild crying	Tearing variable; eyelids open/some ptosis Sobbing, but controlled Little or no struggling	Same as above, but be ready to insert earpiece if child becomes quiet	Same as above	Place on limb and obtain blood pressure occasionally	Same as above
Quiet and responsive	Eyes closed; opens when requested or mildly stimulated Breathing within normal limits Occasional sobbing	Earpiece in and listening Attentive to gurgling or snoring (adjust head tilt)	Same as above Heightened awareness for incidence of desaturation (pitch)	Place on limb and obtain blood pressure every 5 minutes, unless its function upsets patient (then obtain occasionally).	Place probe Monitor RR
Quiet and non-responsive	Eyes closed or partial ptosis with possible divergent eyes; does not open upon command Breathing shallow, subtle super-inspiration may occur and intermittent or infrequent in rate	Same as above Maximal focus on airway sounds	Same as above Heightened awareness for incidence of desaturation (pitch)	Place on limb and obtain blood pressure every 5 minutes.	Be aware of frequency of breathing, expired CO_2 concentration and apnea

phase until the patient meets discharge criteria and is released from the dentist's care. Again, the type of monitoring required will depend on the patient's behavior and depth of sedation during this phase. A child should never leave the office until discharge criteria are met, as per sedation guidelines.

Detailed record-keeping before, during, and after sedation procedures is extremely important and carries significant medico-legal implications for the practitioner. Information on the type of documentation that is needed can be found in sedation guidelines. For example, written and signed informed consent documents should be a part of the patient's record. Also important are consultation documents, pre- and post-operative instructions for parents, detailed progress notes of the procedure, and a time-based record of the sedation. The American Academy of Pediatric Dentistry's website (www.aapd.org) has a sedation record that is detailed and consistent with all requirements of the sedation guidelines. It is advisable to visit the website and download a copy of the sedation record as a template for sedations performed by the practitioner.

Practitioner and Staff Training

Practitioner competency and staff training are essential to safe sedation practices. Unfortunately, there are few regulations or processes that guarantee practitioner competency and staff training specifically related to sedation procedures. The Commission on Dental Accreditation (CODA) has language related to sedation for advanced programs of some dental specialties in the United States, but the accreditation process allows institutions liberty in interpreting and instituting such training (http://www.ada.org/115.aspx). There is, therefore, considerable variability among training programs, despite advocacy for improving and somewhat standardizing sedation training (Wilson and Nathan 2011). Likewise, although state boards of dentistry regulate sedation practices, the degree of consistency among the states' rules and regulations are variable. Nonetheless, recent language changes in CODA standards for advanced programs in Pediatric Dentistry reflect increased experiences for trainees, but not necessarily the scope and quality of such experiences. CODA does not address training of individuals once they graduate from a program. However, other options are available to the practicing dentist.

The American Dental Association (ADA) has guidelines on the teaching of pharmacological management of patients, including dentists seeking continuing education (http://www.ada.org/sections/about/pdfs/anesthesia_guidelines.pdf). Practitioners should be aware of such guidelines and take precautions not to provide sedation in their practices unless their training meets or exceeds these guidelines. Practitioners should also have training in advanced cardiac life support or its equivalent

(e.g., Pediatric Advanced Life Support) before sedating patients, especially those in the pediatric age group.

Practitioners who provide sedation services to pediatric patients should train or provide training options for their staff. The training should meet minimum objectives and criteria, not unlike that offered by ADA guidelines to practitioners. The American Academy of Pediatric Dentistry currently offers a didactic course on sedation for office staff.

Finally, dentists and their staff should enroll in emergency management courses on a regular basis to obtain a review and recognition of emergencies and basic skill sets associated with lifesaving procedures such as airway management. Basic and advanced life support knowledge and skills tend to dissipate quickly after course completion; therefore, emergency drills and practice should occur on a frequent basis (Wik et al 2002). Interestingly, high-fidelity human simulation training has become very popular and is highly recommended for those performing emergency procedures (Tipa and Bobirnac 2010).

Sedation Guidelines

The history for the development of sedation guidelines for children and dentistry has been published (Creedon 1986; Wilson et al. 1996). Since the first publication of sedation guidelines for children and dentistry in 1985, there have been several revisions. The latest revision of the sedation guidelines, entitled "Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures," was published jointly by the American Academy of Pediatrics and the American Academy of Pediatric Dentistry (2006).

The current guidelines are designed for any medical or dental procedures involving sedation and children, regardless of the setting. The well-referenced guidelines address prominent issues surrounding sedation of children and can best be summarized in the abstract of the guidelines, which states:

> The safe sedation of children for procedures requires a systematic approach that includes the following: no administration of sedating medication without the safety net of medical supervision, careful presedation evaluation for underlying medical or surgical conditions that would place the child at increased risk from sedating medications, appropriate fasting for elective procedures and a balance between depth of sedation and risk for those who are unable to fast because of the urgent nature of the procedure, a focused airway examination for large tonsils or anatomic airway abnormalities that might increase the potential for airway obstruction, a clear understanding of the pharmacokinetic and pharmacodynamic effects of the medications used for sedation as well as an appreciation for drug interactions, appropriate training and skills in airway management to allow rescue of the patient, age- and size-appropriate equipment for airway management and venous access, appropriate medications and reversal agents, sufficient numbers of people to both carry out the procedure and monitor the patient, appropriate physiologic monitoring during and after the procedure, a properly equipped and staffed recovery area, recovery to pre-sedation level of consciousness before discharge from medical supervision, and appropriate discharge instructions.

One of the key concepts of safety in the guidelines is that of "rescue." Rescue is defined as the necessary skills of a practitioner to a) recognize various levels of sedation and b) provide appropriate cardiopulmonary support. Furthermore, rescue interventions require specific training and skills. An important skill that must be maintained by every individual who sedates children is that of successfully performing bag-valve-mask ventilation in a child who becomes apneic or develops airway obstruction.

Indirect evidence suggests that the impact of guidelines is favorable in terms of outcomes and that adverse events are rare, especially in hospitals (Cravero et al. 2006). Adverse events, including death, have occurred at a higher rate in dental offices than in other venues, such as hospitals (Cote et al. 2000), but when cases are available for review, it is obvious that most of the adverse events occurred when general tenets of guidelines were not followed(Chika et al. 2012; Krippaehne and Montgomery 1992). Sedation guidelines do not ensure that adverse events will not occur if faithfully followed. However, it is highly recommended that dentists who sedate patients, especially children, should be intimately familiar with sedation guidelines and incorporate the guideline recommendations into their practice and protocols to maximize favorable outcomes and safety.

Emergency Management

Any discussion of sedation and its safety must include the topic of emergency management (see Chapter Fifteen). Not only do sedation guidelines stress the importance of recognition of emergencies and the knowledge and skills to perform emergency management interventions, but common sense dictates a strong respect for factors contributing to the likelihood that emergencies will occur as the depth of sedation increases or as therapeutic management boundaries are violated.

Sufficient data is available to understand that the respiratory system is most likely the first system that will fail during a sedation mishap (Cote el al. 2000a). If the significantly compromised respiratory system is not adequately addressed, the natural progression of events that rapidly follows involves the cardiovascular system and the collapse of the CNS and autonomic nervous system. This fact points to the need for appreciating and adhering to some very basic tenets of patient management, including knowledge of pharmacokinetics and pharmacodynamics of drugs, not exceeding recommended therapeutic doses of drugs, focusing on patient monitoring and airway competency, and intimate knowledge of and skill sets in managing a compromised airway.

Summary

Sedation can be a valuable and effective aid in children's behavior management during dental procedures. However, the risks for adverse outcomes, including death and brain damage ,associated with sedation are daunting and carry profound and significant implications for any clinician who performs sedations. Thus, any consideration for implementing sedation as part of the possibilities in behavior management armamentaria must include both competency in training and in-depth knowledge in the fields of pharmacology, behavior, emotional and physiological functioning, monitoring, and emergency management principles and skills. An equally strong familiarity with and adherence to sedation guidelines and state rules and regulations is essential for promoting safety during sedation.

References

AAPD Reference Manual. (2006). Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures. *Pediatric Dentistry*, 32, 167–183.

Anderson J.A., and Vann, W.F. Jr. (1988). Respiratory monitoring during pediatric sedation: pulse oximetry and capnography. *Pediatric Dentistry*, 10, 94–101.

Arnrup, K. et al. (2007). Temperamental reactivity and negative emotionality in uncooperative children referred to specialized paediatric dentistry compared to children in ordinary dental care. *International Journal of Paediatric Dentistry*, 17, 419–429.

Arnrup, K. et al. (2003). Treatment outcome in subgroups of uncooperative child dental patients: an exploratory study. *International Journal of Paediatric Dentistry*, 13, 304–19.

Blount, R.L. et al.(2006). Pediatric procedural pain. *Behavior Modification*, 30, 24–49.

Caldwell-Andrews, A.A. and Kain, Z.N. (2006). Psychological predictors of postoperative sleep in children undergoing outpatient surgery. *Paediatric Anaesthesia*, 16, 144–51.

Casamassimo, P.S., Wilson, S., and Gross, L. (2002). Effects of changing U.S. parenting styles on dental practice: perceptions of Diplomates of the American Board of Pediatric Dentistry. *Pediatric Dentistry*, 24, 18–22.

Chicka, M.C. et al. (2012). Adverse Events during Pediatric Dental Anesthesia and Sedation: A Review of Closed Malpractice Insurance Claims. *Pediatric Dentistry*, 34, 231–8.

Cote, C.J. et al. (2000a). Adverse sedation events in pediatrics: a critical incident analysis of contributing factors. *Pediatrics*, 105, 805–14.

Cote, C.J. et al. (2000.) Adverse sedation events in pediatrics: analysis of medications used for sedation. *Pediatrics*, 106, 633–44.

Cravero, J.P. et al. (2006). Incidence and nature of adverse events during pediatric sedation/anesthesia for procedures outside the operating room: report from the Pediatric Sedation Research Consortium. *Pediatrics*, 118, 1087–96.

Creedon, R.L. (1986). Guidelines for the elective use of conscious sedation, deep sedation, and general anesthesia in pediatric patients. *Anesthesia Progress*, 33, 189–90.

Fortier, M.A. et al. (2010). Beyond pain: predictors of postoperative maladaptive behavior change in children. *Paediatric Anaesthesia*, 20, 445–53.

Fortier, M.A. et al. (2009). Children's desire for perioperative information. *Anesthesia Analgesia*, 109, 1085–90.

Guidelines for the elective use of conscious sedation, deep sedation, and general anesthesia in pediatric patients. (1985). *Pediatric Dentistry*, 7, 334–337.

Houpt, M. (2000). Project USAP—use of sedative agents by pediatric dentists: a 15-year follow-up survey. *Pediatric Dentistry*, 24, 289–94.

Houpt, M. (1993). Project USAP—the use of sedative agents in pediatric dentistry: 1991 update. *Pediatric Dentistry*, 15, 36–40.

Houpt, M. (1989). Report of project USAP: the use of sedative agents in pediatric dentistry. *ASDC Journal of Dentistry for Children*, 56, 302–9.

Jensen, B. and Stjernqvist, K. (2002). Temperament and acceptance of dental treatment under sedation in preschool children. *Acta Odontologica Scandinavic*, 60, 231–236.

Klingberg, G. and Broberg, A.G. (2007). Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *International Journal of Paediatric Dentistry*, 17, 391–406.

Klingberg, G. and Broberg, A.G. (1998). Temperament and child dental fear. *Pediatric Dentistry*, 20, 237–43.

Krippaehne, J.A. and Montgomery, M.T. (1992). Morbidity and mortality from pharmacosedation and general anesthesia in the dental office. *Journal of Oral Maxillofacial Surgery*, 50, 691–698; discussion 698–9.

Lee, L.W. and White-Traut, R.C. (1996). The role of temperament in pediatric pain response. *Issues in Comprehensive Pediatric Nursing*, 19, 49–63.

Levy, R.L. et al. (2010). Cognitive-behavioral therapy for children with functional abdominal pain and their parents decreases pain and other symptoms. *American Journal of Gastroenterology*, 105, 946–956.

Lochary, M.E. et al. (1993). Temperament as a predictor of behavior for conscious sedation in dentistry. *Pediatric Dentistry*, 15, 348–352.

Lopez, U., Habre, W., Van der Linden, W., et al. (2008). Intra-operative awareness in children and post-traumatic stress disorder. *Anaesthesia*, 63, 474–481.

Quinonez, R. et al. (1997). Temperament and trait anxiety as predictors of child behavior prior to general anesthesia for dental surgery. *Pediatric Dentistry*, 19, 427–431.

Radis, F.G. et al. (1994). Temperament as a predictor of behavior during initial dental examination in children. *Pediatric Dentistry*, 16, 121–127.

Schor, E.L. (2003). Family pediatrics: report of the Task Force on the Family. *Pediatrics*, 111, (6 Pt 2), 1541–1571.

Thomas, A. and Chess, S. (1963). *Behavior Individuality in Early Childhood*. Brunner-Mazel, New York.

Tipa, R.O. and Bobirnac, G. (2010). Importance of basic life support training for first and second year medical students—a personal statement. *Journal of Medicine and Life*, 3, 465–467.

Tripi, P.A. et al. (2004). Assessment of risk factors for emergence distress and postoperative behavioural changes in children following general anaesthesia. *Paediatric Anaesthesia*, 14, 235–240.

Wik, L. et al. (2002). Retention of basic life support skills 6 months after training with an automated voice advisory manikin system without instructor involvement. *Resuscitation*, 52, 273–279.

Wilson, S. and Nathan, J.E. (2011). A survey study of sedation training in advanced pediatric dentistry programs: thoughts of program directors and students. *Pediatric Dentistry*, 33, 353–360.

Wilson, S. et al. (1996). A history of sedation guidelines: where we are headed in the future. *Pediatric Dentistry*, 18, 194–199.

Interventional Studies Designed to Minimize Anxiety, Stress, and Pain in Other Settings

Blount, R.L. et al. (2006). Pediatric procedural pain. *Behavior Modification*, 30, 24–49.

Esteve, R. and Marquina-Aponte, V. (2012). Children's pain perspectives. *Child Care Health Development*, 38, 441–452.

Hechler, T. et al. (2010). The pain provocation technique for adolescents with chronic pain: preliminary evidence for its effectiveness. *Pain Medicine*, 11, 897–910.

Hermann, C. et al. (2007). The assessment of pain coping and pain-related cognitions in children and adolescents: current methods and further development. *Journal of Pain*, 8, 802–813.

Levy, R.L. et al. (2010). Cognitive-behavioral therapy for children with functional abdominal pain and their parents decreases pain and other symptoms. *American Journal of Gastroenterology*, 105, 946–956.

Lopez, U. et al. (2008). Intra-operative awareness in children and post-traumatic stress disorder. *Anaesthesia*, 63, 474–481.

Piira, T. et al. (2002). Cognitive-behavioural predictors of children's tolerance of laboratory-induced pain: implications for clinical assessment and future directions. *Behavior Research and Therapy*, 40, 571–584.

Zelikovsky, N. et al. (2000). Cognitive behavioral and behavioral interventions help young children cope during a voiding cystourethrogram. *Journal of Pediatric Psychology*, 25, 535–543.

Chapter 11

Nitrous Oxide/Oxygen Inhalation Sedation in Children

Dimitris Emmanouil

Ari Kupietzky

Nitrous oxide (N_2O) is an invaluable tool in managing the mild to moderately anxious child. Its ease of administration, wide margin of safety, analgesic and anxiolytic effects, and, most of all, its rapid reversibility make it an ideal drug for use in children (Paterson-Tahmassebi 2003; Houpt 2004). The American Academy of Pediatric Dentistry (AAPD), among other organizations, recognizes nitrous oxide/oxygen inhalation sedation as a safe and effective technique to reduce anxiety, produce analgesia, and enhance effective communication between a patient and health care provider (AAPD 2012). However, clinicians should not make the mistake of thinking that N_2O sedation by itself controls behavior. Nitrous oxide serves as an adjunct to behavior management.

Nitrous oxide is now widely accepted as a behavior management technique in pediatric dentistry. Wilson and Alcaino's (2011) recent international survey, based on 311 replies, revealed that at least 56% of the respondents used nitrous oxide in their practices. Similar numbers were found in a survey of AAPD members by Wilson in 1996 (66.3%) and Houpt in 2002 (61%). Thus, in contrast to earlier studies, N_2O is used by more practitioners, and more frequently than before. Its utilization is likely to continue, and it will probably increase. The results from a survey conducted by the Academy of General Dentistry demonstrate that about 74% of American dentists used nitrous oxide/oxygen sedation (Lynch 2007). Adair et al. (2004), who surveyed behavior management teaching techniques in pediatric dentistry advanced education programs, reported that all US dental schools taught N_2O sedation.

$N_2$0 Historic Milestones

Over the past 200 years, nitrous oxide has been regarded as an asphyxiant, a useless agent, and an anesthetic panacea (Hogue et al. 1971). This has created a colorful history for the drug. Since its applicability to dental practice is still a topic for debate, especially in non-western nations, background knowledge of this agent can be considered relevant for the clinician.

Not long after Joseph Priestley synthesized nitrous oxide in 1772, Sir Humphrey Davy reported on the pleasurable and unusual sensations following the inhalation of nitrous oxide and coined the term "laughing gas." Davy further suggested that the euphoria associated with nitrous oxide inhalation would be of great benefit in the practice of dentistry (Raper 1945). Some dentists took this advice, and in the early 1840s Wells made practical use of nitrous oxide. He had his own tooth extracted while inhaling N_2O that was used for clinical anesthesia (Archer 1944).

Although the analgesic properties of N_2O were recognized for some time, the risk of asphyxia when using it as the sole anesthetic agent prevented its use for lengthy operations. However, in 1868, Chicago surgeon Edmund W. Andrews published the results of a large survey which suggested that the anesthetic use of ether and chloroform would be safer by combining these agents with 70% N_2O and 30% oxygen. This extended the anesthetic time for longer operations, and the notion of balanced anesthesia was born. At about the same time, gas machines were introduced, making anesthesia more convenient. Dentistry took advantage of this progress. Before the turn of the century, a limited number of

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

dentists were beginning to use nitrous oxide and oxygen for cavity preparations.

Throughout the first half of the twentieth century, the primary interest in nitrous oxide was in its analgesic properties (Langa 1968). Most discussions concerning nitrous oxide stressed the analgesic and anesthetic properties for extractions. Dental offices remained dependent upon nitrous oxide for pain control until the introduction of local anesthesia. The feeling of euphoria caused by nitrous oxide, which was so sought-after during the "laughing gas parties" 100 years earlier, were either ignored or considered a minor benefit during dental procedures.

Since the prevalent attitude among dentists in the early twentieth century was that young children were not suitable patients, few references have suggested using nitrous oxide for the child patient. However, in 1925, physician John S. Lundy specifically described the use of nitrous oxide as an induction agent to prepare children for extractions. Shortly thereafter, Leonard N. Ray, a dentist, acknowledged that many children dreaded the thought of the dentist and dental extractions (1929). Hence, he advocated the use of nitrous oxide and recommended initiating induction with 90% nitrous oxide and 10% oxygen for 30 seconds. He felt that this enabled children to move quickly toward surgical anesthesia. After induction, the oxygen was lowered to 7% and nitrous oxide was increased to 93% for the duration of the procedure. With this approach, he contended that the necessary dentistry for children could "go on unhampered in a way that would be impossible with a local anesthetic." Concomitant with the nitrous oxide, Ray used behavior management. Suggestion, demonstration, and encouragement were necessary so that children would accept the nasal mask.

Sporadic reports concerning nitrous oxide use in dentistry for children continued to appear, but these remained focused on the anesthetic benefits. As late as 1972, Amian reported on his fifteen years of experience with nitrous oxide and indicated that nitrous oxide analgesia was used routinely for cavity preparations in children. He found that in more than 50,000 applications, usually using 60% nitrous oxide and 40% oxygen, adequate analgesia was provided for cavity preparation. He also noted that the euphoric state was a major benefit to patients. The following year, Sorenson and Roth (1973) emphasized the value of inhalation sedation to reduce children's fears, particularly the fear of injections. They de-emphasized the analgesic effect of nitrous oxide-oxygen, which is associated with concentrations of nitrous oxide exceeding 40%, and emphasized the sedative/tranquilizing/euphoric benefits of dilute concentrations; that is, less than 40% of nitrous oxide (Allen 1984; McCarthy 1969).

It may be because of the history, but for many years there has been some confusion regarding the terms nitrous oxide inhalation sedation and anesthetic nitrous oxide. As a consequence, anesthesiologists were opposed to the use of N_2O by dentists. This is unfortunate because it delayed the widespread use of the agent by dentists. Although N_2O now is routinely used in dentistry and considered a safe drug, in medicine it is frequently combined with other general anesthetic agents to produce a balanced anesthesia.

Physiology and Pharmacology

Nitrous oxide is a non-irritating, colorless gas with a faint sweet taste and odor. It is a true general anesthetic, but the least potent of all anesthetic gases in use today. It is an effective analgesic/anxiolytic agent which causes central nervous system (CNS) depression and euphoria with little effect on the respiratory system. Nitrous oxide has rapid uptake, as it is absorbed quickly from the alveoli and held in a simple solution in the serum. It is dissolved and transported in blood; it does not combine with hemoglobin, and it does not undergo biotransformation.

It is relatively insoluble, passing down a gradient into other tissues and cells in the body, such as the CNS. It is excreted quickly from the lungs. Elimination of nitrous oxide occurs by means of expiration in a manner that is precisely the reverse of uptake and distribution, and nitrous oxide's low solubility allows it to be removed rapidly (Emmanouil and Quock, 2007).

Cardiovascular Effects

N_2O causes minor depression in cardiac output while peripheral resistance is slightly increased, thereby maintaining normal blood pressure. This is of particular advantage in treating patients with cerebrovascular system disorders. There are no changes in the heart rate (pulse) or blood pressure. N_2O is transported through the blood stream in a free gaseous state. Total saturation in the blood occurs within 3–5 minutes. Total circulation time for one breath of nitrous oxide/oxygen is 3–5 minutes. Any noted changes in respiratory rate are related more to the relaxation of the patient than to the nitrous oxide itself.

CNS Effects

Nitrous oxide has multiple mechanisms of action that underlie its varied pharmacological properties. Subanesthetic concentrations of N_2O produce only analgesic and anxiolytic effects without unconsciousness (Dundee et al. 1960). The anesthetic effect of N_2O appears to be caused by inhibition of NMDA glutamate

receptors, removing its excitatory influence on the nervous system.

Analgesia and Anxiolysis

Analgesic N_2O has a long history of use in obstetrics for labor-pain relief (Rosen 2002). Nitrous oxide is also used for self-administered analgesia in cancer patients (Parlow et al. 2005) to alleviate pain and discomfort associated with a number of medical procedures, and in emergency medicine departments for procedures such as treatment of lacerations and orthopedic procedures (Baskett 1970). It is essential to make a clear distinction between the high anaesthetic concentrations of nitrous oxide which produce unconsciousness and the much lower doses that are associated with consciousness and its psychotropic actions; i.e., analgesia, anxiolysis, and euphoria. There is evidence that the relaxation and relief from anxiety during inhalation of N_2O is a specific anxiolytic effect that is independent of the analgesic action of N_2O. The mechanisms involved are not yet completely understood. However, there is sufficient evidence to suggest that nitrous oxide's analgesic and anxiolytic actions are parallel to those of opioids and benzodiazepines, respectively (Emmanouil and Quock 2007).

Anesthesia

Nitrous oxide has a well-known role in medical history because it was the first drug used for surgical anesthesia. Despite its limited anesthetic potency, N_2O is the most widely used general anesthetic agent. With a minimum alveolar concentration of 104% at 1 atm in humans, N_2O by itself would require high-volume percentage and hyperbaric conditions to achieve anesthesia (Hornbein et al. 1982). Therefore, due to its low potency, in clinical practice N_2O is generally used to reduce the minimum alveolar concentration of a second inhalation agent for anesthesia and increase the rate of induction (i.e., the second gas effect), and to provide or augment the analgesic component of general anesthesia. General anesthetics like N_2O have long been hypothesized to act in a nonspecific manner on neuronal membranes, alter membrane fluidity, and/or influence ion channels. However, a great deal of work is required before the molecular and neural pathways involved in mediating nitrous oxide anesthesia are fully determined (Emmanouil and Quock 2007; Sanders et al. 2008). It is suggested that a common property of NMDA receptor antagonism may underlie the similar pharmacological profiles of N_2O and ketamine, an intravenous dissociative anesthetic. The two drugs, in fact, produce synergistic neurotoxicity when used together (Jevtovic-Todorovic et al. 2000).

Nitrous Oxide in Pediatric Dentistry: Rationale and Objectives

Dentistry generates more stress than most other professions, primarily because of the working conditions of the dental practice (Bodner 2008). In particular, the specialty of pediatric dentistry can feature crying children, clashes with parents, and children's small mouths and teeth, which contribute to a stressful environment. The use of N_2O sedation can reduce some of these stresses in the dental office—it helps produce a relaxed atmosphere and it can benefit everyone in the pediatric dental treatment triangle.

The administration of nitrous oxide has major advantages not common to other sedation agents used in dentistry for children. These include: rapid onset, rapid withdrawal, and convenient dosage adjustment to maintain a tranquil and sedated state.

In modern dentistry, children do not often experience real physical pain. Although many procedures are less than pleasurable, children usually fail to recognize shades of gray—only the polarity of black or white, pain or no pain. However, pain, with its physiological and psychological components, can be somewhat difficult to define in the clinical setting. As a result, minor discomforts can be magnified and interpreted as pain. Nitrous oxide can modify these discomforts by the diminution or elimination of pain and anxiety in a conscious patient. It is well recognized for these analgesia/anxiolysis properties.

Like children, adults have fears and anxieties, but they are contained by previous experiences. A child lacking the experiences of an adult has an emotional overflow when placed in an anxious or stressful situation. Due to a lack of experience, the child acts out primary feelings. This reaction or emotional outburst to stress or anxiety is usually in the form of fight-or-flight behavior. Children reacting this way may need assistance in controlling their emotions. Nitrous oxide, as an adjunct to behavior management, can help many children learn to cope with the stressful environment.

Emotions and pain thresholds are interwoven. When a child patient is fearful, anxious, or apprehensive, there is a lower pain threshold. Minor things may irritate and upset the patient. If minimizing pain during treatment is one of the objectives, then reducing the child patient's level of anxiety is critical. There is a positive association between anticipatory anxiety and procedural pain. Interventions designed to reduce task-specific anticipatory anxiety may help reduce pain responses in children and adolescents (Tsao et al. 2004). When N_2O sedation eliminates or reduces fear or anxiety, it raises the pain reaction threshold and reduces fatigue (Weinstein et al. 1986). Both pain sensitivity and pain reaction are altered.

Table 11-1. Objectives of nitrous oxide/oxygen inhalation sedation.

1. Reduce or eliminate anxiety.
2. Reduce untoward movement and negative reaction to dental treatment.
3. Enhance communication and patient cooperation.
4. Raise the pain reaction threshold.
5. Increase tolerance for longer appointments.
6. Reduce gagging.

Table 11-2. Effects of N_2O in relation to its concentration.

100% will produce anoxia.
80% will produce hypoxia with hallucinations and bizarre dreams; may cause respiratory, cardiovascular, kidney or liver damage.
65% can cause patients to enter the excitement stage.
35% usually provides maximum analgesia with maintenance and cooperation of the patient.
25% is an analgesic equipotent to 10 mg morphine sulphate.

Additionally, the pain threshold can be raised with attention and distraction tasks. When the placebo effect of distraction is combined with the sedative properties of nitrous oxide, the injection experience is much more easily accomplished.

Studies have reported on the effects of N_2O from the child's perspective. Children described dreaming or being on a "space-ride" (Hogue et al. 1971). Berger et al. (1972) reported that some children described a "floating, warm, and tingling sensation" with nitrous oxide. In yet another study, children indicated a preference for music in conjunction with nitrous oxide during dental treatment (Anderson 1980). Langa (1968) described the child under N_2O sedation as being in "suspended animation"; i.e., the child's body does not move, head and extremities remain relaxed, and sudden movements commonly associated with children are eliminated. With the child in a relaxed state, a dentist can provide optimum treatment for a child with minimum trauma for both dentist and patient. Following the foregoing rationale for the use of nitrous oxide/oxygen sedation, many pediatric dentists adopted the technique for managing their child patients. The objectives for nitrous oxide usage are shown in Table 11-1.

Stages of Anesthesia

Four stages of general anesthesia were recognized in Guedel's classification: (1) induction (also referred to as analgesia), (2) excitement, (3) surgical anesthesia, and (4) overdose (Guedel 1937). The first stage begins with the induction of anesthesia and ends with a patient's loss of consciousness. Patients still feel pain in this stage. In 1968, Langa introduced a term to represent N_2O inhalation sedation: relative analgesia (RA). Langa (1968) proposed that there were three planes of analgesia in the first stage. The planes vary from moderate to total analgesia and are dependent on the concentration of nitrous oxide in the mixture and the signs and symptoms shown by patients (Table 11-2). During N_2O inhalation sedation, the patient always remains at the first stage of anesthesia.

In Plane One (5-25% N_2O) the patient appears normal, relaxed, and awake, and may feel slight tingling in toes, fingers, tongue, or lips, and may giggle. Vital signs remain normal. There are no definite clinical manifestations.

In Plane Two, or relative analgesia (20-55% N_2O), the patient may have a dreamy look, eyes appearing "glassy" (occasionally with tears), reactions are slowed and the voice may sound "throaty." The patient will feel warm and drowsy, may drift in and out of the surrounding environment, and may hear pleasant ringing in the ears. Partial amnesia may occur. Vital signs remain normal. Pain is reduced or eliminated, but touch and pressure are still perceived. The patient is less aware of surroundings; sounds and smells are dulled. The term psychotropic analgesic nitrous oxide (PAN) was introduced by Gillman and Lichtigfeld (1994) to describe Plane Two of analgesia. This term clearly distinguishes the concentrations of nitrous oxide used for anxiolysis/analgesia from the much higher doses used for anesthesia, wherein the patient is totally unconscious.

In Plane Three (55-70% N_2O), the patient becomes angry, with a hard stare; the pupils usually are centrally fixed and dilated, the mouth tends to close frequently, and the patient is unaware of his surroundings and may hallucinate. When patients are in Plane Three, Roberts (1990) reported that they may experience sensations of flying, falling, or uncontrolled spinning, or the chest may feel heavy, and the patient will no longer cooperate.

Plane Two provides adequate N_2O sedation and allows dentist-child communication, although some clinicians prefer the dream period, usually characterized by closed eyes and difficulty with speech. Figure 11-1 portrays a patient's appearance in Plane Two. Plane One is usually of short duration, while Plane Two can be maintained for several hours. Children in Plane Two usually respond to questions by moving the head rather than speaking. Facial features are relaxed and the jaw usually sags, remaining open without mouth props. The eyes are usually closed but will open in response to questions. The arms are heavy and will stay where placed, and the hands are open. The legs often slide off the side of the chair. All vital signs are stable. There is no significant risk of losing protective reflexes, and the child is able to return to pre-procedure mobility. The

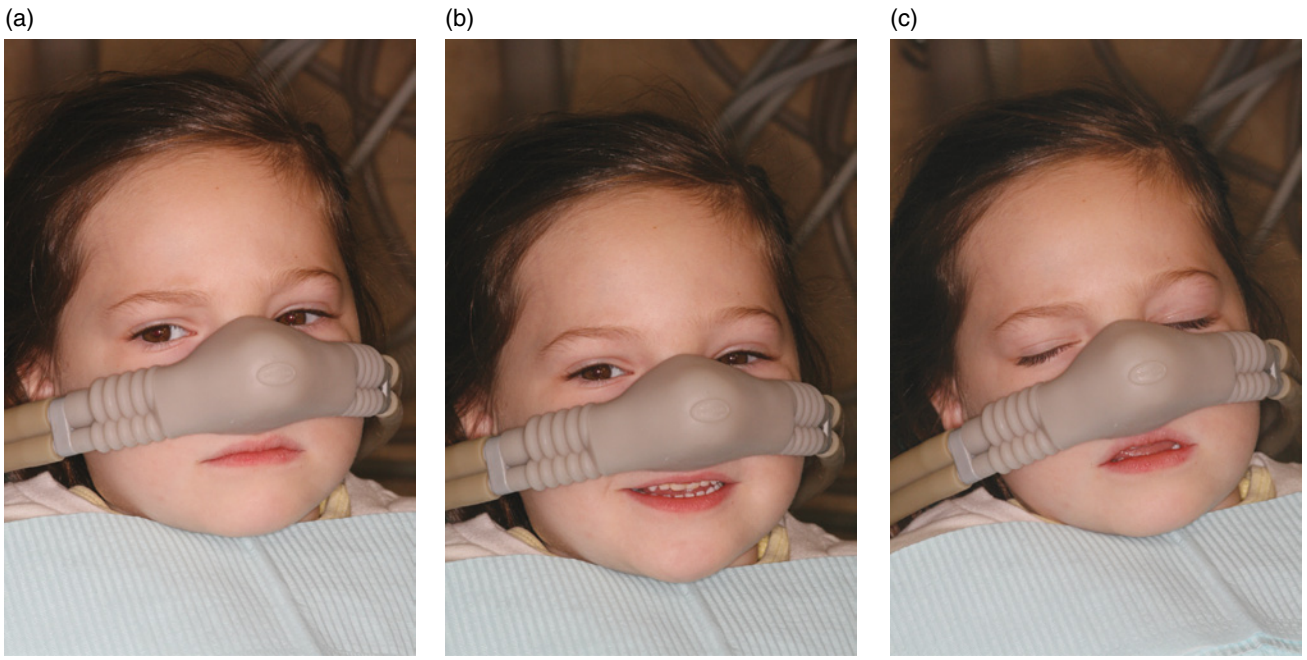

Figure 11-1. A patient's appearance in Plane Two. Facial features are relaxed and the jaw usually sags, remaining open without mouth props. The eyes are usually closed but will open in response to questions. Courtesy of Dr. Ari Kupietzky.

Table 11-3. Clinical tips to evaluate level of N_2O inhalation sedation.

Eyes are very indicative of the sedation level.
Reduced activity of the eyes indicative of desirable level of sedation.
Increased activity of the eyes may indicate that sedation is too light.
Fixed, hard stare of the eyes: sedation is too deep, N_2O % needs to be decreased.
Arms and legs crossed: the patient is not relaxed yet, increase N_2O %.
Patient talks too much: sedation is too light due to mouth breathing. Do not increase; just try to get patient to stop talking. Use of a rubber dam will prevent this situation.
Patient answers rapidly: sedation is too light.
Patient answers slowly and deliberately: good sedation.
Patient does not answer: may be tired and asleep. If used in combination with another sedative agent, stimulate patient and check verbally.
Perspiration appears on the face: reassure patient that this is expected and will pass.
Paraesthesia of extremities: reassure patient that this is normal and will dissipate after treatment.
Paraesthesia of lips, tongue, or oral tissues: profound depth; time for injection of local anesthetic.

objective of the sedation should be to reach, but not pass, this plane. This is the desirable sedation level when performing N_2O sedation.

For some patients, the feeling of "losing control" may be troubling. Others may be claustrophobic and unable to tolerate the nasal hood, finding it confining and unpleasant (Stach 1995). A patient's experience after nitrous oxide is believed to be similar to a posthypnotic state. During N_2O there is an enhancement of suggestibility and imaginative ability that may be utilized while managing the child's behavior and dental experience. This can be advantageous. Suggestions, such as "fixing teeth is fun," made while a patient is experiencing N_2O sedation might make subsequent visits easier and more readily accepted (Whalley and Brooks 2009). Another beneficial suggestion is to instruct ways to improve oral hygiene.

Individual biovariability accounts for different reactions to various concentrations of N_2O. Some individuals experience several symptoms, while others experience only a few. Symptoms are intense for some and insignificant for others. Sometimes signs are obvious; at other times, they are subtle. Titration allows for the biovariablility of any patient that may be associated with the administration of the substance. Titrating nitrous oxide/oxygen and careful observation of patient responses are keys to successful administration.

Clinicians must know what signs and symptoms to look for when administering and monitoring N_2O sedation(Table 11-3).. Keeping a constant vigil is imperative because pleasant sensations may quickly change and become unpleasant. Knowledge of the appropriate technique and associated physical, physiologic, and psychological changes minimizes negative patient experiences.

Case 11.1

Donna, age five, was a healthy child requiring four quadrants of restorative dentistry. At the initial examination the child appeared cooperative, but the dentist recognized her apprehension. Despite this observation, the dentist elected to treat Donna through behavior shaping, a non-pharmacological approach. Performing dentistry quadrant by quadrant, the dentist achieved good patient cooperation at the first and second restorative dentistry appointments. At the third visit, the child cried during the injection but eventually calmed down. When the time arrived for the fourth and final restorative treatment, Donna's parent forcibly brought her to the office. The child cried continuously and hysterically refused the injection.

Case 11.1, Discussion: While the ultimate goal is to increase patient comfort through relaxation (Clark and Brunick 2007), another important goal is for nitrous oxide/oxygen to serve as an adjunct to behavior management. It is not for all patients, and before selecting a management method for any pediatric patient, careful behavior observation is needed. After observing the child during the examination visit, the dentist has to anticipate future cooperation and balance this evaluation against treatment requirements. In Donna's case, where minor apprehension was observed at the examination visit, one or two restorative appointments likely would not have created a problem. However, sitting for four restorative visits is a different matter, and the child failed to tolerate the protracted series of appointments. There is no formula for precisely predicting such problems, and the ability to detect them in advance is usually gained by experience. Choosing the proper behavioral strategy in this type of case can be difficult. Nonetheless, whenever a dentist begins treating an apprehensive but cooperative and likeable child who becomes a behavior problem, the behavior management approach is open to question.

In hindsight, the negative outcome of Donna's case should not have occurred. If her perceived apprehension had been addressed, it likely would have created an improved end result. A pharmacological adjunct would benefit the child, helping her with a difficult initiation to dentistry. Donna is the ideal candidate for nitrous oxide/oxygen inhalation sedation. She was communicative and in control of herself. N_2O offers a reasonable adjunctive therapy for Donna's behavior management. This is the type of situation that Musselman and McClure referred to as a "preventive medication" (1975) in the original behavior management book. It is given to a child who is unnecessarily strained by the dental situation and who could become a more difficult management problem. Providing comfort with N_2O at an initial dental visit impacts children's later experiences, resulting in improved behaviors and less anxiety at subsequent visits. This effect can be seen even if N_2O is not administered at later visits (Nathan et al. 1988; Collado, 2006).

Administration Technique

Before the first operative appointment, an introductory explanation must be given to the parent. It is important to state that the child's feelings of anxiety or fear are not unique, but are observed in many children coming for the first operative visit. A brief explanation, such as the one following, assures a parent that the drug has no lingering effects and is routinely used safely.

> Dentist: Mrs. Jones, Donna is such a nice girl. I have noticed that most children feel nervous at the first few visits. As we explained earlier, our goal is to help Donna become a good dental patient without fears. To make the visit more acceptable to her, we are going to use nitrous oxide, which is commonly known as "laughing gas." As she breathes in the gas she will feel less nervous. The nitrous oxide will make the injection of local anesthesia easier. Donna will have the feeling of a relatively shorter session. When it is used with proper technique it helps children enjoy dentistry. Its effects will be gone at the end of the appointment, so you shouldn't worry after the appointment.

Additionally, parents may be given a nitrous oxide parent information pamphlet and the opportunity to ask questions regarding the procedure. Informed consent for the procedure and for the N_2O sedation must be obtained and filed in the patient's chart. The patient's record should also include the indication for use of N_2O sedation. Indeed, as for other pharmacologic agents, documentation is very important. A written record detailing the concentration of nitrous oxide administered, monitored patient variables, the duration of the procedure, post-treatment oxygenation procedure, and any complications encountered (or lack thereof) should be entered in the patient chart.

Critical to beginning the nitrous oxide-oxygen procedure is the acceptance of the nasal mask by the child; hence, this treatment is not advised for the resistant pediatric patient. At the outset it is important to check that the child does not have a cold and can breathe through the nose. There are many techniques to introduce the nasal mask. In all instances, however, clinicians must use child management techniques with explanations adjusted for the child's level of comprehension. The introduction should be brief and presented in a

Figure 11-2. "See? I look like an airplane pilot!" or "I look funny with my funny nose!" Courtesy of Dr. Ari Kupietzky.

matter-of-fact manner. Elaborating unnecessarily may build apprehension and create undesirable responses. Usually, behavior shaping (TSD) is employed. The child must be told in advance what is being done and why.

Tell

- Plant positive suggestions.
- "Donna, because you have so many teeth to fix and I don't want to hurt you, I am going to use my magic air. It is something special, and I only use it for my favorite children. It will make you feel funny. Some children even laugh at it."
- Thus the suggestion of an extraordinary and pleasant experience is established.
- Explain the nasal mask.
- "To do this, I use a little, funny nose."
- The dentist places a nasal mask on herself and says,
- "See? I look like an airplane pilot!" or "I look funny with my funny nose!" (Figure 11-2).
- Explain the immediate effect of the mask.
- "Through the special nose, you will be able to smell yummy flavors."

Show

The child is shown the nasal mask. At this point, the child should not be offered a choice. Avoid asking, "Would you like to wear this nose?"

The next move is to have the apprehensive child place a nasal mask over her nose (Figure 11-3). ("Let me show you how funny it looks." "Donna, I have another funny

Figure 11-3. The next move is to have the apprehensive child place a nasal mask over the nose. Courtesy of Dr. Ari Kupietzky.

Figure 11-4. The child is given a mirror and the nasal mask is gently placed on her nose. Courtesy of Dr. Ari Kupietzky.

nose for you. It is smaller because your nose isn't as big as mine." "To do this, I need you to wear this clown nose." Let the child hold the nasal mask on the nose.)

Do

- Begin by repeating the plan.
- "Since you have so many teeth to fix and I don't want to hurt you, I am going to use my magic air. It is something special, and I only use it for my favorite children. It will make you feel funny. Some children even laugh at it."
- Place the mask on the child. There should be a gas flow through the mask before it is placed.

Figure 11-5. Some dentists prefer to have the child begin by breathing through the mouth. The child is told not to breathe through the nose, and to keep the mouth opened. Courtesy of Dr. Ari Kupietzky.

- "Try it on, it smells nice."
- The child is given a mirror and the nasal mask is gently placed on her nose. Since the child is holding the mirror with both hands, she is less likely to remove the mask (Figure 11-4).
- "Hold this mirror in your hands so you can see how funny you look."

Some dentists prefer to have the child begin by breathing through the mouth. In their preferred method, the child is told not to breathe through his nose, and to keep his mouth open (Figure 11-5). "Don't close your mouth. Keep it open. And don't breathe from your nose yet. Wait until I tell you." "I can make it smell like chocolate chip cookies or strawberries. Which smell do you like?"

Some dentists prefer to use scented nasal masks or a little dab of flavoring that can be placed on the mask beforehand to provide a more pleasant smell. However, with power of suggestion, many children will attest that the funny gas smelled like chocolates or strawberries, according to their choice. The child breathes through the mouth and looks at herself through the mirror.

Determining the Tidal Volume and Gas Flow

Tidal volume is the amount of air moved into or out of the lungs during quiet breathing. The goal is to match the gas flow with the tidal volume. For a child four years of age, approximately 20 kgs. (40 lbs.), the tidal volume will be near 4 liters. To verify this, the sedation procedure begins by flowing 4 liters of oxygen through the system. Total liters flow per minute (L/min) is adjusted depending on the size and age of the child. The reservoir bag should be approximately 2/3 full. When the patient breathes in, the bag moves and collapses slightly, but not fully. When expiration occurs, the bag distends, but not fully. Tidal volumes have to be tailored to individual patients. To assist in determining the starting point, Table 11-4 provides data for children up to age ten. Note that as children get older, the respiration rate decreases. Conversely, as children get older and larger, the tidal volume increases.

Table 11-4. Respiratory data for children.

Weight (Kg)	Age (Yrs)	Respiration Rate/ minute	Minute Volume (ml)
13.6	2–3	30	2700
20.0	4	30	4000
28.0	6	27	5000
26.0	8	22	5300
43.0	10	20	5700

Adapted from Stephen et al. 1970, Elements of pediatric anesthesia, Charles C. Thomas, Springfield, Ill.

Titrating Gases for Sedation

Children need to be instructed to breathe properly. After three or four breaths, the child is instructed to close the mouth once and breathe once through the nose. Afterward, the child is told to breathe twice, and then three times. Increasingly, the child will switch over to breathing exclusively through the nose—a gradual introduction of the gas has occurred.

Observing the movement of the reservoir bag is essential for monitoring breathing. A fully distended bag hampers monitoring. Therefore, if the bag is distended, the clinician needs to start by checking the child's breathing. Instruct the child to breathe deeply and demonstrate what is meant. "I would like you to breathe more: breathe in as hard as you can."

If the bag does not move, lower the volume of gas in-flowing. Check for a snug fit of the nasal mask to ensure a closed circuit. An improper fit allows gas leakage to contaminate the clinician's immediate environment (breathing zone). Escaping gas influences the movement of the reservoir bag, but it also can irritate a child's eyes. A further check should be made for any kinks in the gas lines that might obstruct the gas flow. Once the volume of gas flow has been established (about 2–3 minutes of oxygen), titration of gases for sedation commences.

Young children often have to be instructed to breathe properly. Rapid, shallow breathing (tachypnea) may not provide the alveolar ventilation required for uptake of a gas mixture. In these cases, the dentist can demonstrate the breathing technique. Most children imitate the modeling. Repeated instructions are made to keep the mouth closed, thus encouraging nasal breathing. It may be necessary to place a finger on the lips of very young children to teach them to breathe properly through the nasal mask. The use of the rubber dam also helps with proper breathing. Once the dam is in place, mouth breathing is difficult and nasal breathing is easier.

There are two methods to initially administer nitrous oxide to children: the standard titration technique and the rapid induction technique.

Standard Titration Technique

The standard titration technique (also known as slow titration technique or slow induction technique) is used by many dentists for adults and older children. The technique begins slowly with 100% oxygen. After 2–3 minutes, gases are adjusted to approximately 20% nitrous oxide and 80% oxygen. Every 1–2 minutes, the gas ratio is altered. The nitrous level is increased about 10% and the oxygen flow is lowered concomitantly. The total gas flow, which was established at the outset, is maintained. Often gas is titrated close to a 1:1 ratio for the injection and rubber dam procedures, and then decreased to about a 30% nitrous oxide level during restorative procedures. Success with the standard titration technique is dependent, to a large degree, on the patient properly describing the effects of the gas. If used for younger children, they have to be guided throughout the process. The child is told, "Soon the magic air will make you feel funny, and you will probably laugh, too. Don't forget to breathe through your nose and not through your toes!"

After about a half minute, the child is asked, "Are your arms getting tired? You sure hold that well." Following the usual affirmative response, the child is told to lower her arms and the assistant is instructed to secure the nasal mask. "Soon you will feel funny. You remember why I am doing this—so I don't hurt you when I fix your teeth. You know, you are doing this better than most four-year-old children. We all like you here (positive verbal reinforcement). Pretty soon you are going to start to feel funny. Your legs and feet might tickle or feel heavy. You might feel as if you are flying in an airplane. You will feel really good."

Maintaining a constant and almost monotonous voice contact lulls the patient into a state of security. Try not to use specific terms about how the patient will feel, especially with older children. The power of suggestion can lead them to respond positively and create a false perception of the N_2O effectiveness. On the other hand, if a child makes non-coherent comments or show signs of loss of control or agitation, this could be indicative of an overdose. Lower the concentration: do not increase it under this circumstance.

At the end of the procedure, 100% oxygen should be delivered for at least 3–5 minutes. This is specifically important while treating children (AAPD guideline), as they de-saturate rapidly. As nitrous oxide is thirty-four times more soluble than nitrogen in blood, diffusion hypoxia may occur. The patient may be discharged when she has returned to normal (pre-sedation) levels of consciousness and has regained normal speech and gait (Jastak and Orendruff 1975).

Rapid Induction Technique

An alternative method for nitrous oxide administration is the rapid induction technique. This technique can be divided into four phases, and is described in Table 11-5 (Simon and Vogelsberg 1975). Similar to the standard titration technique, rapid induction begins for our four-year-old patient with about 4 liters of oxygen. However, after 1–2 minutes, the gas is delivered in a 1:1 ratio: half nitrous oxide and half oxygen. It is maintained at this level for 5–10 minutes, and once injections have been given and a rubber dam placed, the nitrous oxide level is decreased and the oxygen is increased. The patient is maintained on a 25%-35% nitrous level, using the pre-established volume of gas. Similar to the slow titration, 100% oxygen is administered at the end of the procedure for about 3–5 minutes. Because the administration is much more rapid, the patient's signs are watched closely. These can involve body movements, eye signs, or even slurring of speech. If there is concern that the sedation is too deep, the nitrous oxide is lowered. This technique is most appropriate for the very young child or the highly anxious patient, as it allows the clinician to deal with the behavior much more quickly.

Regardless of the technique that is used, two opinions are found regarding changes in N_2O concentration during treatment. One approach (which is part of the AAPD

Table 11-5. Phases of inhalation sedation with dosages.

Phase	Dosage
Introduction	3–5 liters oxygen
Injection	2 liters nitrous oxide : 2 liters oxygen (50%)
Maintenance	1–2 liters nitrous oxide : 3 liters oxygen (25–40%)
Withdrawal	3–5 liters oxygen

guidelines) is that it may be decreased during easier procedures (e.g., restorations) and increased during more stimulating ones (e.g., extraction, injection of local anesthetic). Opponents of this technique opine that frequent changes in N_2O concentrations may cause unnecessary nausea and result in vomiting; the sensation is likened to a roller coaster ride. These clinicians keep the N_2O concentration steady throughout all types of dental procedures.

Generally, during nitrous oxide/oxygen analgesia/anxiolysis, the concentration of nitrous oxide should not routinely exceed 50%. At concentrations greater than 50%, N_2O may cause deep sedation, which generally has been found to be associated with an increased risk of adverse events (Hoffman et al. 2002, Babl et al. 2008). In addition, during N_2O sedation without any additional sedative agent, the AAPD guideline requires only that continual clinical observation of the patient's responsiveness, color, and respiratory rate and rhythm be performed. However, if higher concentrations are used, the patient may experience minimal or moderate sedation, which requires monitoring with pulse oximetry, blood pressure cuff, and precordial stethoscope or capnograph.

For safety reasons, the dentist should always be accompanied by assisting personnel. At least one staff member must be present in the treatment room at all times during the administration of nitrous oxide, and the patient should never be left unattended.

Generally, the nitrous oxide should not be used without local anesthesia. However, to avoid any local anesthesia discomfort, some clinicians take advantage of nitrous oxide analgesic properties and perform minor procedures, like class I cavity restorations, without local anesthesia (Hammond and Full 1984). The downside of avoiding local anesthesia is that the operative procedure may or may not be pain-free. As with other pharmacotherapeutic and nonpharmacotherapeutic techniques, the key to success is the avoidance of pain. Some dentists will try to avoid the injection of local anesthesia when confronted with a resistant child or parent. However, with nitrous oxide sedation and good injection technique, the small amount of discomfort from the injection becomes subclinical and the use of local anesthetic is highly recommended.

Adverse Effects

When administered by trained personnel on carefully selected patients with appropriate equipment and technique, nitrous oxide is a safe and effective agent for providing pharmacological guidance of behavior in children with relatively few adverse effects. This was recently documented in a large French survey series of 7,571 children receiving demand valve 50% N_2O in which a low rate of major adverse events was reported (0.3%). All adverse events were resolved within minutes, and none of the patients needed any airway intervention (Gall et al. 2001). The safety of 50% N_2O for procedural sedation also has been demonstrated in studies encompassing thousands of patients (Hennequin et al. 2004; Onody et al. 2006).

Headache and disorientation can occur occasionally. They result from acute hypoxia, a rapid release of nitrous oxide from the blood stream into the alveoli. These adverse effects can be avoided by administering 100% oxygen after discontinuing the nitrous oxide at the end of treatment.

The most common, though infrequent, complication found to occur with the administration of nitrous oxide to children is vomiting. For this reason, some practitioners instruct patients to refrain from eating prior to the dental appointment. There are conflicting views on the need for this, and also on the length of fasting time prior to a procedure. Although the frequency of vomiting during N_2O is very low, there are dentists who require fasting for all children undergoing N_2O sedation. They argue that since the foremost adverse reaction associated with N_2O sedation is vomiting, a complete fast should be enforced. Dentists who oppose fasting for the use of N_2O sedation may reason that the incidence of vomiting is very low and, in the event of such an occurrence, no life-threatening risks exist since the patient is not deeply sedated and remains in control of all reflexes, unlike the deeply sedated child. Aspiration of vomitus is unlikely when the protective airway reflexes are intact. Consequently, pulmonary aspiration is highly unlikely to occur.

Several studies have looked at this issue. Babl et al. (2005) examined the relationship between fasting status and adverse events during procedural sedation with nitrous oxide in the emergency department (ED). Preprocedural fasting is difficult to obtain in the ED, since procedures are unscheduled and non-elective. Although in this study 71.1% of patients studied did not meet fasting guidelines for solids, no serious adverse events and no episodes of aspiration were found. The study concluded that N_2O is a safe agent for procedural analgesia and sedation, without serious adverse events and with a low rate of temporary, mild adverse events. No association between pre-procedural fasting and emesis was found.

In earlier investigations, there were mixed opinions on the frequency of vomiting. Hogue et al. (1971) reported no ill effects administering between 5% and 40% N_2O; however, Houck and Ripa (1971) found that 10% of the children vomited while receiving maintenance concentrations between 30%–60% N_2O. These latter investigators recommended that dentists ask the following in

health questionnaires to screen for patients who might be potentially high-risk candidates for vomiting.

- Has your child vomited during previous dental treatments?
- Does your child experience motion sickness—car, airplane?
- Does your child have influenza or any gastrointestinal infections?

For patients with a history of vomiting or car sickness, an antiemetic may be prescribed.

More recently, a cross-over design by Kupietzky et al. (2008) assessed the relationship between fasting status and vomiting with N_2O sedation. The average time between eating and treatment in the fasting sessions was 6 hours, and 1 hour in the non-fasting group. A rapid induction method of constant, non-fluctuating concentration/flow of 50% N_2O was used. Vomiting occurred in only one subject, immediately after cessation of treatment resulting in a frequency of 1% of subjects or 0.5% of sessions. No other differences were found between fasting and non-fasting subjects.

In addition to the low frequency of vomiting occurring during nitrous administration, there are other reasons not to require preprocedural fasting. A child fasting may be agitated and will be less cooperative during dental treatment, thus defeating the purpose of N_2O sedation use. Unfed children are often cranky, sometimes combative, and occasionally dehydrated (Gleghorn 1997). Parents accompanying a fasting child will also be less cooperative. A hungry child is irritable and therefore more difficult to sedate. Consequently, the dentist may decide to use a higher N_2O sedation concentration to overcome this child's disruptive behavior. The higher dose may result in over-sedation, which in itself can cause of vomiting. Another paradox to be considered is that patients treated on an empty stomach are more susceptible to nausea and vomiting.

Clinical Tip: There are times when a child has been undergoing a lengthy procedure and becomes fidgety. This could be a signal that nausea and vomiting is an impending problem. It also could mean that the patient is slipping into the Excitement Stage. Because the child is fidgeting, the clinician may consider increasing the nitrous oxide level. This is not an uncommon response. But the correct thing *is lower the nitrous oxide level.*

Nausea and vomiting that occur during N_2O sedation are usually associated with the following causes: oversedation (N_2O concentration too high for patient, Malamed 2009); the "roller coaster" effect of sharp increases and decreases in concentrations of N_2O administered (Clark and Brunick 2007); sedation length—the longer the patient has N_2O, the greater the incidence of nausea and vomiting (Zier and Liu 2011); and a prior history of nausea and vomiting.

The AAPD guideline on use of nitrous oxide for pediatric dental patients states that "Fasting is not required for patients undergoing nitrous oxide analgesia/anxiolysis. The practitioner, however, may recommend that only a light meal be consumed in the 2 hours prior to the administration of nitrous oxide."

Contraindications

Nitrous oxide/oxygen sedation cannot be used to control all forms of child behavior, especially those that are hysterical or defiant. No positive effect will be obtained treating the crying, hysterical child with whom the dentist cannot communicate. Forcing a nasal mask on a child in this circumstance only escalates the torment. Truly defiant children will not accept a nasal hood gracefully or cooperate adequately for nasal inhalation of nitrous oxide.

Nitrous oxide sedation should not be used when any condition is present which might lead to nasal blockage and prevent a child from sufficiently inhaling the nitrous: the common cold, upper respiratory infections (URI) or bronchitis, allergies, or hay fever. Patients with blocked Eustachian tubes can experience ear pain due to distention of the tympanic membrane. Administering nitrous oxide to a child with a middle ear infection may result in a ruptured eardrum. Nitrous oxide is forty times more soluble in blood than nitrogen. This allows it to rapidly diffuse into closed gas spaces within the body, exerting pressure effects locally. Related to this cavity expanding phenomenon, nitrous oxide can prove problematic in those patients with bowel obstruction, since it may lead to expansion of gas with readily apparent adverse consequences. Other areas of trapped gas may not be so clinically apparent; patients who have undergone recent retinal surgery may have intraocular gas that may expand during N_2O administration, leading to intraocular hypertension and irreversible loss of vision (Lockwood and Yang 2008).

Although nitrous oxide can be safely administered to most asthmatics and those with other forms of chronic obstructive pulmonary disease (COPD), there is a small subset of these patients in whom its use is not prudent. Those patients with severe pulmonary disease who use hypoxic drive (lack of oxygen) to stimulate breathing, rather than the normal mechanisms mediated by carbon dioxide accumulation, reflect a relative contraindication to the use of nitrous oxide. This is due to the fact that: (1) the patients are usually more sensitive to the sedative effects of nitrous oxide, and (2) supplemental oxygen is also administered with nitrous oxide, increasing the

patient's oxygen uptake and thereby removing the stimulus to breathe. Generally, those patients with bronchial asthma can receive nitrous oxide because it is nonirritating to the bronchial and pulmonary tissues. Increased stress can lead to an asthmatic attack; therefore, nitrous sedation can be helpful.

Nitrous oxide also can have a disproportionately stronger effect on special patients taking tranquilizers, analgesics, antidepressants, or antipsychotic drugs, or those who have a depressed level of consciousness. Other potential adverse events, such as myeloneuropathy associated with N_2O administration to a vitamin B12-deficient patient, may be rarer still, yet clinicians offering N_2O sedation should be aware of this potentially serious complication (Flippo and Holder 1993).

The increased risk of spontaneous abortions and malformations in humans is controversial, although animal studies show various risk potentials (fetotoxicity at 450–1,000 ppm in rats) . No association has been found between trace levels of waste nitrous oxide in scavenged locations and adverse health effects to personnel. Reduced fertility has been reported for those who do not use scavenging equipment and who are exposed to nitrous oxide more than 3 hours per week (Rowland et al. 1992). Still, it is advised that females should not administer nitrous oxide during the first trimester of pregnancy.

In an effort to reduce occupational health hazards associated with nitrous oxide, the AAPD recommends that exposure to ambient nitrous oxide be minimized through the use of effective scavenging systems, and periodic evaluation and maintenance of the delivery and scavenging systems (AAPD 2012). Scavenging significantly reduces ambient N_20 levels in the dentist's breathing zone, but not to the level (25 ppm) recommended by The National Institute for Occupational Safety and Health (NIOSH). Supplemental oral evacuation should be employed in conjunction with the scavenging system during dental procedures or when patient behaviors, such as increased talking or crying, can result in increased environmental nitrous oxide exposure to staff (Henry et al. 1992).

Safety

The most important safety consideration is the prevention of hypoxia. Safety features have been designed to prevent hypoxia by ensuring a minimal oxygen flow, thus limiting the amount of nitrous oxide that can be administered. Donaldson et al. (2012) reviewed the twelve safety features used to ensure the safety and efficacy of N_2O sedation. The authors discussed examples of safety feature failures, as well as steps to help prevent negative outcomes.

Nitrous oxide/oxygen delivery systems typically are limited to a maximum of 70% nitrous oxide and 30% oxygen delivery, which ensures that the patient is receiving at least 9% more oxygen than found in ambient air. Other safety features stop the delivery of nitrous oxide if oxygen flow stops. The pin-index safety system prevents the accidental attachment of a non-oxygen tank to the oxygen attachment portal, and diameter index systems help ensure that the appropriate gas flows through the appropriate tubing. Although these safety features are in place, dentists have reported incidents of hypoxia involving incorrect equipment installation or equipment damage. If a safety feature failure is suspected during administration of N_2O sedation, the clinician should remove the face mask from the patient immediately.

If the patient's oxygen saturation drops by 2% or more from baseline measurement, nitrous oxide should be discontinued and the cylinder used must be checked for potential failure.

Scavenging of waste gas ideally should be done with the aid of an ejector run by compressed air, and not through the vacuum system of the dental unit. This ejector should have a capacity of scavenging 25 liters per minute.

Summary

Nitrous oxide may be considered to be the most popular form of sedation among pediatric dentists. It has earned this place due to its excellent safety record and ease of use. It provides rapid onset and offset of sedation. Because of its unique inhalation application, it has been allocated to this chapter, separate from other pharmacologic agents. The mechanisms of its action have been discussed and its practical administration described in detail.

References

Adair S.M. et al. (2004). Survey of Behavior Management Techniques in Advanced Education Programs. *Pediatric Dentistry*, 26, 151–158.

Allen G.D. (1984). Dental anesthesia and analgesia (local and general), 3rd ed. Williams and Wilkins, Baltimore.

American Academy of Pediatric Dentistry (2012). Guideline on use of nitrous oxide for pediatric dental patients. Reference Manual. *Pediatric Dentistry*, 34, 190–193.

American Society of Anesthesiologists. (2002). Practice guidelines for sedation and analgesia by nonanesthesiologists: An updated report by the American Society of Anesthesiologists task force on sedation and analgesia by nonanesthesiologists. *Anesthesiology*, 96, 1,004–1,017.

Amian, B. (1972). Nitrous oxide analgesia—a method for the restorative treatment of patients. Case report. *Quintessence International*, 3, 25–7.

Anderson, W. (1980). The effectiveness of audio-nitrous oxide-oxygen psychosedation on dental behavior of a child. *Journal of Pedodontics*, 5, 3–21.

Archer, W.H. (1944). Life and letters of Horace Wells: discoverer of anesthesia. *Journal of the American College of Dentistry*, 11, 81.

Babl, F.E. et al. (2005). Preprocedural fasting state and adverse events in children receiving nitrous oxide for procedural sedation and analgesia. *Pediatric Emergency Care*, 21, 736–743.

Babl F.E. et al. (2008). High-concentration nitrous oxide for procedural sedation in children: adverse events and depth of sedation. *Pediatrics*. Mar; 121(3):528–32.

Baskett, P.J. (1970). Use of Entonox in the ambulance service. *British Medical Journal*, 2, 41–43.

Berger, D., Allen, G., Everett, G. (1972). An assessment of the analgesic effects of nitrous oxide on the primary dentition. *Journal of Dentistry for Children*, 39, 265–268.

Bodner, S. (2008). Stress Management in the Difficult Patient Encounter. *Dental Clinics of North America*, 52, 579–603.

Clark, M.J. and Brunick, A. (2007). *Handbook of Nitrous Oxide and Oxygen Sedation*, 3rd ed. CV Mosby Co, St. Louis, Mo., USA.

Collado, V. et al. (2006). Modification of behavior with 50% nitrous oxide/oxygen conscious sedation over repeated visits for dental treatment: a 3-year prospective study. *Journal Clinical Psychopharmacology*, 26, 474–481.

Donaldson, M., Donaldson, D., Quarnstrom, F.C. (2012). Nitrous oxide-oxygen administration: when safety features no longer are safe. *Journal of the American Dental Association*, 143, 134–43.

Dundee, J.W. and Moore, J. (1960). Alterations in response to somatic pain associated with anaesthesia. IV. The effect of subanaesthetic concentrations of inhalation agents. *British Journal of Anaesthesiology*, 32, 453–459.

Emmanouil, D.E. and Quock, R.M. (2007). Advances in understanding the actions of nitrous oxide. *Anesthesia Progress*, 54, 9–18.

Flippo, T.S. and Holder, W.D. Jr. (1993). Neurologic degeneration associated with nitrous oxide anesthesia in patients with vitamin B12 deficiency. *Archives Surgery*, 128, 1,391–1,395.

Gall, O. et al. (2001). Adverse events of premixed nitrous oxide and oxygen for procedural sedation in children. *Lancet*, 358, 1,514–1,515.

Gillman, M.A. and Lichtigfeld, F.J. (1994). Opioid properties of psychotropic analgesic nitrous oxide (laughing gas). Perspectives in Biology and Medicine, 38, 125–138.

Gleghorn, E. (1997). Preoperative fasting: You don't have to be cruel to be kind. *Journal of Pediatrics*, 131, 12–13.

Guedel, A.E. (1937). *Inhalation Anesthesia*. McMillan Co, New York, NY, USA.

Hammond, N.I. and Full, C.A. (1984). Nitrous oxide analgesia and children's perception of pain. *Pediatric Dentistry*. Dec;6(4), 238–42.

Hennequin, M. et al. (2004). A prospective multicentric trial for effectiveness and tolerance of a N_2O/O_2 premix as a sedative drug. *Journal Clinical Psychopharmacology*, 24, 552–554.

Henry, R.J. et al. (1992). The effects of various dental procedures and patient behaviors upon nitrous oxide scavenger effectiveness. *Pediatric Dentistry*, 14, 19–25.

Hoffman, G.M. et al. (2002). Risk reduction in pediatric procedural sedation by application of an American Academy of Pediatrics/American Society of Anesthesiologists process model. *Pediatrics*, 109, 236–243.

Hogue, D., Ternisky, M., Iranpour, B. (1971). The response of nitrous oxide analgesia in children. *Journal of Dentistry for Children*, 38, 129–135.

Hornbein, T.F. et al. (1982). The minimum alveolar concentration of nitrous oxide in man. *Anesthesia Analgesia*, 61, 553–556.

Houck, W.R. and Ripa, L.W. (1971). Vomiting frequency in children administered nitrous oxide-oxygen in analgesic doses. *Journal of Dentistry for Children*, 38, 129–134.

Houpt, M. (2002). Project USAP 2000—use of sedative agents by pediatric dentists: a 15-year follow-up survey. *Pediatric Dentistry*, 24, 289–294.

Houpt, M.I., Limb, R., Livingston, R.L. (2004). Clinical effects of nitrous oxide conscious sedation in children. *Pediatric Dentistry*, 26, 29–36.

Jastak, J.T. and Orendruff, D. (1975). Recovery from nitrous sedation. *Anesthesia Progress*, 22, 113–116.

Jevtovic-Todorovic, V., Benshoff, N., Olney, J.W. (2000). Ketamine potentiates cerebrocortical damage induced by the common anaesthetic agent nitrous oxide in adult rats. *British Journal of Pharmacology*, 130, 1,692–1,698.

Kupietzky, A. et al. (2008). Fasting state and episodes of vomiting in children receiving nitrous oxide for dental treatment. *Pediatric Dentistry*, 30, 414–419.

Langa, H. (1968). *Relative analgesia in dental practice: inhalation analgesia with nitrous oxide*. W.B. Saunders, Philadelphia, PA., USA.

Lockwood, A.J. and Yang, Y.F. (2008). Nitrous oxide inhalation anaesthesia in the presence of intraocular gas can cause irreversible blindness. *British Dental Journal*, 204, 247–248.

Lundy, J.S. (1925). Anesthesia by nitrous oxide, ethylene, carbon dioxide and oxygen for dental operations on children. Dental Cosmos, 67, 906–909.

Lynch K. (2007). Sedation modifications: how will the proposed guidelines affect your practice? *AGD Impact*, 35, 48–54.

Malamed, S.F. (2009). *Sedation: A Guide to Patient Management*, 5 ed. CV Mosby Co, St. Louis, Mo., USA.

McCarthy, F.M. (1969). The safety of nitrous oxide analgesia. *Journal of the Michigan Dental Association*, 51, 178–179.

Musselman, R.J. and McClure, D.B. (1975). In: Wright, G.Z. *Behavior Management in Dentistry for Children*. Chapter 8 "Pharmacotherapseutic approaches to behavior management."146-177, W.B. Saunders Co., Philedalphia.

Nathan, J.E. et al. (1988). The effects of nitrous oxide on anxious young pediatric patients across sequential visits: a double-blind study. *Journal of Dentistry for Children*, 53, 220–230.

Onody, P., Gil, P., Hennequin, M. (2006). Safety of inhalation of a 50% nitrous oxide/oxygen premix: a prospective survey of 35,828 administrations. *Drug Safety*, 29, 633–640.

Parlow, J.L. et al. (2005). Self-administered nitrous oxide for the management of incident pain in terminally ill patients: a blinded case series. *Palliative Medicine*, 19, 3–8.

Paterson, S.A. and Tahmassebi, J.F. (2003). Pediatric dentistry in the new millennium: 3. Use of inhalation sedation in pediatric dentistry. *Dental Update*, 30, 350–6, 358.

Raper, H.R. (1945). *Man Against Pain: The Epic of Anesthesia*. Prentice-Hall; New York, NY, USA.

Ray, L.N. (1929). Nitrous oxide and oxygen—a preference for extraction of children's teeth. Digest (Dental), 35, 744–745.

Roberts, G.J. (1990). Inhalation sedation (relative analgesia) with oxygen/nitrous oxide gas mixture: 1. Principles. *Dental Update*, 17, 139–146.

Rosen, M.A. (2002). Nitrous oxide for relief of labor pain: a systematic review. *American Journal of Obstetrics and Gynecology*, 186, 110– 126.

Rowland, A.S. et al. (1992). Reduced fertility among women employed as dental assistants exposed to high levels of nitrous oxide. *New England Journal of Medicine*. Oct 1;327(14), 993–7.

Sanders, R.D., Weimann, J., Maze, M. (2008). Biologic Effects of Nitrous Oxide: A Mechanistic and Toxicologic Review. *Anesthesiology*, 109, 707–722.

Simon, J.F. Jr. and Vogelsberg, G.M. (1975). In: Wright, G.Z. *Behavior Management in Dentistry for Children*. Chapter 9 "Use of nitrous oxide-oxygen inhalation sedation for children," 177–196. W.B. Saunders Co., Philadelphia.

Sorenson, H.W and Roth, G.I. (1973). A case for N_2O/oxygen inhalation sedation: an aid in the elimination of the child's fear of the needle. *Dental Clinics of North America*, 17, 51–66.

Stach, D.J. (1995). Nitrous oxide sedation: Understanding the benefit and risks. *American Journal of Dentistry*, 8, 47–50.

Tsao, J.C. et al. (2004). Role of anticipatory anxiety and anxiety sensitivity in children's and adolescents' laboratory pain responses. *Journal of Pediatric Psychology*, 29, 379–388.

Weinstein, P., Domoto, P.K., Holleman, E. (1986). The use of nitrous oxide in the treatment of children: results of a controlled study. *Journal of the American Dental Association*, 112, 325–31.

Whalley, M.G. and Brooks, G.B. (2009). Enhancement of suggestibility and imaginative ability with nitrous oxide. *Psychopharmacology* (Berl), 203, 745–52.

Wilson, S. and Alcaino, E.A. (2011). Survey on sedation in paediatric dentistry: a global perspective. *International Journal of Paediatric Dentistry*, 21, 321–332.

Wilson, S. (1996). A survey of the American Academy membership: nitrous oxide sedation. *Pediatric Dentistry*, 18, 287–293.

Zier, J.L. and Liu, M. (2011). Safety of high-concentration nitrous oxide by nasal mask for pediatric procedural sedation: experience with 7,802 cases. *Pediatric Emergency Care*, 27, 1,107–1,112.

Chapter 12

Minimal and Moderate Sedation Agents

Stephen Wilson

Sedation usually implies a modification of the level of consciousness of an individual, ideally resulting in a state of lessened anxiety or fear, relaxation, and sometimes favorable mood enhancement. The change in consciousness can be induced through non-pharmacological or pharmacological intervention. This chapter will focus solely on pharmacologically-mediated changes in consciousness.

Sedative medications alter the level of consciousness of an individual. The level of consciousness is represented as a continuum ranging from full wakefulness to complete coma and is dependent, to a degree, on the number and dose of pharmacological agents administered to the individual. Hence, the level or depth of sedation is often referred to as an indirect, continuous index of the patient's level of consciousness at any given point in time.

There are many ways to define levels or depths of sedation. Nonetheless, definitions of sedation are found in sedation guidelines offered by various professional organizations (American Dental Association 2007; American Academy of Pediatric Dentistry 2006; American Society of Anesthesiologists 2002). The most frequently used guidelines for sedation of the pediatric patient in any setting including dentistry is that of the current American Academy of Pediatrics/American Academy of Pediatric Dentistry (AAP/AAPD). Three different levels of sedation are defined in those guidelines:

Minimal (old terminology of "anxiolysis"): a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

Moderate (old terminology "conscious sedation" or "sedation/analgesia"): a drug-induced depression of consciousness during which patients respond purposefully to verbal commands (e.g., "open your eyes," either alone or accompanied by light tactile stimulation—a light tap on the shoulder or face, not a sternal rub). For older patients, this level of sedation implies an interactive state; for younger patients, age-appropriate behaviors (e.g., crying) occur and are expected. Reflex withdrawal, although a normal response to a painful stimulus, is not considered to be the only age-appropriate purposeful response—it must be accompanied by another response, such as pushing away the painful stimulus so as to confirm a higher cognitive function. With moderate sedation, no intervention is required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained. However, in the case of procedures that may themselves cause airway obstruction (e.g., dental or endoscopic), the practitioner must recognize an obstruction and assist the patient in opening the airway. If the patient is not making spontaneous efforts to open his airway and relieve the obstruction, then he should be considered to be deeply sedated.

Deep: a drug-induced depression of consciousness during which patients cannot be easily aroused, but respond purposefully (see discussion of reflex withdrawal above) after repeated verbal or painful stimulation (e.g., purposefully pushing away the noxious stimuli). The ability to independently maintain ventilator function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained. A state of deep sedation may be accompanied by partial or complete loss of protective airway reflexes.

In this chapter, the focus is on minimal and moderate sedation. However, it is important to remember that any sedative drug and its dose can produce variable levels of sedation. It is therefore impossible and inappropriate to refer to any one drug as a "drug that produces minimal sedation." Indeed, it may produce a state of minimal sedation in most children, but others may respond either in a less (hypo-responder) or a more (hyper-responder) exaggerated fashion than expected.

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

A major theme and important concept in the AAP/AAPD sedation guidelines is that of rescue. Rescue, as used in the guidelines, refers to a practitioner's knowledge, training, and skills in providing competent management for the patient who is in the process of or could potentially drift into a compromised condition. Ultimately, any practitioner who sedates a child for a procedure must be able to recognize any compromised state of the child and act immediately to stabilize the patient and prevent a disastrous outcome. The most frequently occurring compromised state resulting from sedation in children is respiratory depression. Therefore, practitioners must be efficient and effective in basic airway management skills, including the use of positive pressure oxygen with a bag-valve-mask. It is, therefore, essential that specialty training programs provide appropriate experiences for trainees before they are allowed to sedate children. Training may best be obtained by dedicated anesthesiology rotations in which trainees are frequently and directly exposed to compromised respiratory conditions and mentored by highly trained, skilled professionals.

Drugs

Drugs have been used to sedate children for dental procedures for well over a century. Isolated reports reviewing drugs as "premedications" for children during dental procedures can be found in the literature of the 1950s and 1960s. The same drugs, other than alcohol, paralleling that era were also used in medicine for various conditions with barbiturates dominating for almost the first half of the 20th century (Lopez-Munoz et al. 2005). Other notable drugs of that time were chloral hydrate, opiums (primarily morphine), and bromides.

In 1952, Ruble conducted a classic review of that era's agents. He described the current literature of the primary and popular drugs, including barbiturates, bromides, and morphine. Interestingly, as described in his review, the issues and challenges of the 1950s remain consistent with those of today. The premedication was indicated for the "nervous and highly apprehensive child." Concern revolved around the depth of sedation, dose, and route of administration. Family guidance at home, school, and in the dental office, or the lack thereof, resulted in the "happy" versus "maladjusted" individual. It was noted that a "screaming, violent child" made relatively simple procedures difficult and time-consuming for the dental team, and that sedation was "helpful to the child and the dentist." Other studies and written opinions of the day addressed these issues as well (Aduss et al. 1961; Album 1955; Buckman 1956; Lampshire 1950).

There have been eleven surveys over the past four decades identifying several agents used to sedate children for dental procedures. They are listed with the references at the end of the chapter. The more common agents identified were nitrous oxide, chloral hydrate, meperidine, midazolam (and other benzodiazepines), and hydroxyzine (and other antihistamines). Agents such as morphine, alphaprodine, barbiturates, and chlorpromazine have been mentioned as well (Brandt and Bugg 1984; Doring 1985; Lambert et al. 1988; Myers and Shoaf 1977; Riekman and Ross 1981; Roberts et al. 1992). The more common agents fall into four categories: hypnotics, benzodiazepines, antihistamines, and inhalation agents. This chapter will focus on the oral route for these agents.

Hypnotics

Hypnotics are drugs that promote drowsiness and sleep, and are generally classified as barbiturates and non-barbiturate types. Barbiturates such as pentobarbital were popular decades ago. However, because of their potential to create paradoxical reactions, they are no longer favored as sedating agents for children.

Chloral Hydrate

For decades, the most common hypnotic agent used in pediatric dentistry has been chloral hydrate. Although chloral hydrate can be and has been used as a single agent (Anderson 1960; Czaarnecki and Binns 1963), most recent studies have investigated chloral hydrate in combination with one or more additional agents. More than twenty-five of these studies have been included in the reference list at the end of this chapter.

Characteristics

Chloral hydrate was discovered in 1832 by Justus Liebig and was introduced in medicine as an anesthetic and hypnotic drug in 1869 (Stetson 1962). It acts by depressing the central nervous system. Its mechanism of action is not well understood, but it is thought to involve the GABA receptor complex (Lu and Greco 2006). As a hypnotic, therapeutic doses of chloral hydrate can cause sleepiness, drowsiness, or, in some cases, hyperactivity. Care must be exercised whenever using chloral hydrate in combination with other agents, as the depth of sedation may increase and respiratory depression can occur. A unique effect of chloral hydrate is the potential inhibition of the tongue's genioglossal muscle (Hershenson et al. 1984). Children with large tonsils (see Chapter Ten) and adenoid tissue may not be appropriate chloral hydrate recipients because of the increased likelihood of upper airway blockage, especially when the patient is prone.

Chloral hydrate is an oily substance and a noted irritant to mucosal tissue. Hence, it should not be used in patients who have conditions involving gastritis, esophagitis, or oral lesions. Care must also be taken to avoid

contact of chloral hydrate with the conjunctiva of eyes, which may occur when orally administering chloral hydrate when the patient coughs or spits. Rapid administration of chloral hydrate in children using a needleless syringe with splashing against the posterior portion of the mouth should also be avoided. Chloral hydrate in higher doses has also been associated with cardiac dysrhythmias; therefore, its use should be avoided in patients with certain cardiac conditions.

Chloral hydrate has no analgesic properties. It has an unpleasant taste and usually requires a flavoring vehicle when orally administered. The formulation and production of the oral solution of chloral hydrate in the United States was ceased in April 2012, but it remains available in other countries. Other formulations of chloral hydrate (e.g., capsules) are still available in the United States, however, and oral solutions of chloral hydrate can be formulated by local pharmacists, should they elect to do so.

Case 12.1

Four-year-old Jessica was scheduled to receive quadrant restorative dentistry under minimal sedation. Her mother was given a plastic syringe filled with 5 cc of choral hydrate syrup and instructed to administer the drug to her daughter. After a couple of minutes the mother called for assistance. Jessica had refused to swallow the medicine—she spit it out and onto her mother, all the time screaming hysterically and kicking.

***Case 12.1, Discussion*:** One of the very challenging aspects of using minimal-sedation oral sedatives is the administration of the drug. The majority of patients undergoing minimal sedation are uncooperative, and at many times exhibit defiant behavior. Failure to ingest the prescribed dose of medication will inevitably result in a less-than-optimal sedation session. In many instances, parents have difficulty administering the syrup. When the dentist is faced with a situation similar to the one described above—when he is unsure of how much of the drug has been consumed—it may be hazardous to administer more of the drug in order to continue with the appointment.

The dentist should first offer the parent the option of giving their child the drug, explaining why the child must swallow the entire dose. The child may be coaxed by the parent into taking the relatively small amount of syrup, followed by a minute amount of water. A cup or syringe should be offered. Some children will be more willing to drink the syrup from a cup rather than a syringe. However, in many instances the parent will fail.

(a)

(b)

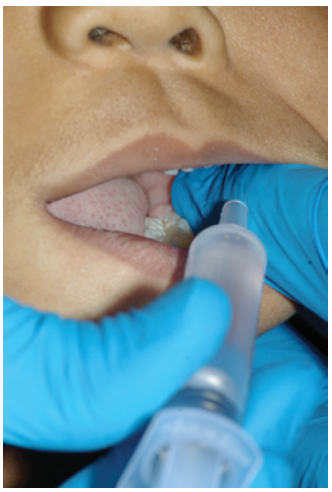

Figure 12-1. The dentist embraces the child's head (a) and slowly dribbles the solution down and off the finger or thumb of the non-dominant hand that is strategically placed on the retromolar pad of the patient (b). This usually stimulates the swallowing reflex and gives the child a chance to coordinate breathing and swallowing.

Even if this result is anticipated, it may be wise to allow the parent to fail, as this will facilitate consent to the drug's administration by the dentist.

Once consent to administer the drug is given, stand the child in front of the sitting dentist. The child's head is tilted backward. The parent restrains the child's hands. The dentist embraces the child's head and slowly dribbles the solution down and off the finger or thumb of the non-dominant hand that is strategically placed on the retromolar pad of the patient (Figure 12-1). This usually stimulates the swallowing reflex and gives the child a chance to coordinate breathing and swallowing. Sometimes the child refuses to swallow and a pool of solution begins to form in the oro-pharynx; at that time,

the parent is instructed to pinch off the nose briefly to either cause swallowing or expectoration (usually the former). Too often children have a very difficult time coughing and managing their airway reflexes when too much solution is shot into the mouth (usually by a parent) or too rapidly administered by the doctor.

This technique is especially important when administering chloral hydrate, due to is mucosal irritation. It is always possible to induce a partial laryngospasm if chloral hydrate is shot off the back pharyngeal wall and bounces down around the epiglottis and laryngeal structures.

Clinical Perspective

Typically, children exhibit slight disinhibition or excitement within the first 15–25 minutes following oral administration of chloral hydrate or a combination of agents dominated by chloral hydrate. Sometimes the disinhibition is exhibited as talkativeness, exploratory hyperactivity in the environment, social interaction, and general silliness, but it can show itself as occasionally frank agitation. This phase is usually followed by drowsiness or sleepiness and can result in sleep itself. The latter phase is not sufficiently established to the point that one can begin patient separation from the parent to start dental procedures, but does require careful monitoring clinically and with electronic monitors (e.g., pulse oximetry), depending on the growing depth of sedation.

Parents are generally dismissed before the procedure starts. Separation from the parent should not begin until approximately 45 minutes after its administration, at which time sufficient blood levels of the active metabolite begin to prevail. The working time (depending on whether other drugs are "on-board", the patient's level of natural fatigue, and the child characteristics such as temperament and cognitive development) is usually 60 minutes or more.

It should be noted that clinical technique and protocol are very important throughout the entire treatment. Many clinicians use oral premedication sedation together with nitrous oxide sedation; details of its administration and use have been described in the preceding chapter. Following the placement of the nasal mask, begin with slow, deliberate movements to open the airway. Point the chin of a supine patient toward the ceiling. The clinician can distract the child with chatter using a low voice if the child is awake. Following proper titration of nitrous oxide concentration and flow, gently open the mouth slightly, insert a mouth prop, and slowly open the mouth wider. After reviewing and confirming the planned treatment, topical and local anesthesia are administered. Chapter Eight describes in detail the administration of local anesthesia. If the child becomes agitated during the injection, the clinician should "re-settle" the child once local anesthetic is administered.

A rubber dam or a comparable method (e.g., Isolite, but not cotton roll isolation or no isolation) should always be used for sedations. Generally, one can cut teeth dry or use a very light water spray that is rapidly suctioned from the mouth with high-speed suction. (Note: the high-speed suction should initially be activated at some distance from the patient and slowly brought closer so as to not startle the patient.) The same is true for the overhead lamp. Activate it away from the patient's face and slowly adjust it to illuminate the mouth. Tooth preparation can begin once adequate anesthesia is obtained. When working efficiently the restorative phase can be completed quickly, although occasionally a child may become agitated and need to be re-settled. If this sequence of events is followed, and the patient begins the procedure in a non-agitated state, it usually results in a good sedation outcome. This procedure can also be followed with other sedatives.

One of the earlier chloral hydrate studies was that of Anderson in 1960. He used chloral hydrate alone when providing dental care to children. Anderson advocated the use of chloral hydrate to "make a difficult, emotional patient easy to work on" and to help with patient tolerance. He indicated that up to 5 teaspoons (1200 mgs) was necessary for some three- to four-year-old patients 30 minutes before dental treatment. He reported on 300 patients' sedations, indicating that often local anesthesia was unnecessary and all dental treatment could be accomplished in one appointment. Other studies using chloral hydrate as the single agent or with nitrous oxide have also been reported (Barr et al. 1977; Houpt et al. 1985; Moore et al. 1984). Most of the studies indicate that chloral hydrate produces good to excellent sedations. However, chloral hydrate currently is rarely used as a single agent for children during dental procedures.

No fewer than twenty-five studies have documented the use of choral hydrate in combination with other sedatives, particularly antihistamines. These studies have been included in the references at the end of the chapter. The dosage range used in these studies for chloral hydrate and hydroxyzine is 40–75 mg/kg and 1.0 mgs to 2 mg/kg, respectively. There is some support to the expectation that the addition of hydroxyzine to chloral hydrate improves patient behavior, compared to chloral hydrate alone (Avalos-Arenas et al. 1998), but others have found no improvement (Needleman et al. 1995).

Promethazine has also been a popular agent as a sedative with antihistaminic properties that has been used with chloral hydrate (Dallman et al. 2001; Houpt et al. 1985; Lu and Lu 2006; Robbins 1967; Sams et al. 1993; Sams and Russell 1993; Wright and McAulay 1973). Its dose has been reported in these studies by body weight (1 mg/kg) and as a single bolus (12.5 mg). Blood pressure may be slightly lower in this combination compared to

Table 12-1. Chloral Hydrate.

Usually one's sedation goals are the first two depths of sedation of the AAPD guidelines (i.e., minimal and moderate sedation). However, in small uncooperative children the optimal level of sedation is that of very light sleep from which one can be easily aroused with minimal verbal or tactile stimulation. The therapeutic dose range that usually produces this type of effect when used alone in the majority of children is 30–50 mg/kg of body weight. This dose also can cause hypotonicity of the tongue muscles, causing it to fall backward against the posterior oro-pharyngeal structures. Appropriate patient monitoring (pulse oximetry and capnography) is necessary due to possible airway compromise, which may be caused by hypotonicity of glossal muscles; deep sleep and/or some respiratory depression may occur.

Drug	Mechanism of Action	Dose (Oral)	Characteristics	Warnings	Sedation considerations (Timing)	Reversible
Chloral hydrate (Sedative-hypnotic) Contraindications: Hypersensitivity Hepatic or renal impairment Severe cardiac disease Gastritis Esophagitis Gastric ulcers	Central nervous system depressant effects are primarily due to its active metabolite trichloroethanol, mechanism unknown.	20–50 mg/kg Max: 1 Gram	Oily Not palatable Irritability Sleep/drowsiness	Airway blockage: Respiratory obstruction may occur in children with tonsillar and adenoidal hypertrophy, obstructive sleep apnea. Mucosal irritant Laryngospasms Respiratory depressant Cardiac arrhythmias	Onset: 20–45 min Separation time: 45 min Work: 1–1.5 hours	No

midazolam or chloral hydrate and meperidine (Dallman et al. 2001; Sams and Russell 1993), but the effect is not perceived as clinically significant.

Chloral hydrate has also been used in combination with meperidine and hydroxyzine. This combination has been anecdotally known as a "triple" combination. It is still taught in advanced pediatric dentistry training programs and has remained fairly popular (Wilson and Nathan 2011). Generally, when compared to other sedatives or drug combinations, this combination tends to cause improved behavior, interpreted as increased quiet and decreased crying behaviors (Chowdhury and Vargas 2005; Hasty et al. 1991; Nathan and West 1987; Wilson et al. 2000). However, this is not always the case, as dose differences or other similar "triple" combinations have shown no improvement in behavior or equivalent outcomes (Poorman et al. 1990; Sheroan et al. 2006). It is possible that the dose of chloral hydrate used may make a significant difference in the behavioral outcomes, with a higher dose mediating a greater likelihood of quiet/sleep behaviors. Nonetheless, with a greater likelihood of quiet/sleep behaviors comes a higher risk of airway or respiratory compromise.

There may be an increased risk of respiratory compromise manifested as apnea and/or oxygen desaturation when the triple combination involves chloral hydrate at a dose of 50 mg/kg (Croswell et al. 1995; Leelataweedwud and Vann 2001; Leelataweewud et al. 2000; Rohlfing et al. 1998; Sheroan et al. 2006). It is possible that less respiratory compromise may result by lowering the dose of chloral hydrate and increasing that of meperidine or substituting midazolam for chloral hydrate in the triple combination (Chowdhury and Vargas 2005; Sheroan et al. 2006). A summary of the characteristics, mechanism of action and dosage of chloral hydrate is presented in Table 12-1.

Meperidine

Meperidine has been the most commonly used narcotic in pediatric dentistry, although it is rarely used alone (Cathers et al. 2005; McKee et al. 1990; Song and Webb 2003). At least eighteen studies, have documented meperidine combined with other sedative agents such as midazolam, hydroxyzine or promethazine, and chloral hydrate with hydroxyzine. These studies are included with the references at the end of this chapter. One of the primary reasons to use meperidine in combination with another sedative agent is its analgesic properties, as most other agents with which it is combined, such as midazolam, usually lack such properties. Additionally, meperidine can slightly potentiate the sedative effect of another agent (Chowdhury and Vargas 2005; Nathan and Vargas 2002; Wilson et al. 2000), and in many cases gives the impression of altering the mood of the patient.

Table 12-2. Meperidine (Demerol, Pethidine).

A major drawback to this agent is its likelihood to cause respiratory depression and hypotension. This is particularly true when administered parenterally, with a lessened risk anticipated when delivered via the oral route. Its use in combination with other sedatives should be carefully assessed because of the additive or synergistic properties of sedative agents.
Narcotics, including Demerol, should be used with caution with local anesthetics. The threshold level for seizures is apparently lowered when both are used in combination.

Drug	Mechanism of Action	Dose	Characteristics	Warnings	Sedation considerations (timing)	Reversible
Meperidine (Narcotic) Contraindications: Hypersensitivity MAO inhibitors used within fourteen days	Binds to opiate receptors in the CNS, causing inhibition of ascending pain pathways, altering the perception of and response to pain; produces generalized CNS depression.	1–2 mg/kg Max: 50 mgs	Clear Non-palatable Analgesia Euphoria Dysphoria	Respiratory depression Hypotension	Onset: 30 min Separation time: 30 min Work: 1 hour	Yes (Narcan)

Meperidine is often administered orally, but due to its bitter taste, it requires some masking with a flavoring agent. The submucosal route is another popular means of administering meperidine (Cathers et al. 2005; Chen et al. 2006; Lochary et al. 1993; Roberts et al. 1992; Song and Webb 2003). One study evaluated the behavior of children receiving dental care under sedation with meperidine administered orally versus submucosally. There were no differences in behavior based on the route of administration (Song and Webb 2003).

Generally, the onset of meperidine effects is quicker when administered submucosally, compared to oral administrations. One drawback of submucosal administration is that it can elicit a hyperemic effect often resulting in a "wheal" and itchiness over the facial area where the injection was given. These effects are indirectly triggered by histamine release from mast cells in addition to the vascular effects directly caused by exposure to meperidine (Flacke et al. 1985; Flacke et al. 1987; Levy et al. 1989). Another possible side effect of administering meperidine submucosally is that injection into a large venous complex, just distal to the maxillary tuberosity, can potentially cause rapid onset of hypotension. Considering these cautions, it seems more prudent to administer meperidine in therapeutic doses via the oral route, which tends to eliminate the submucosal effects. Another serious concern is potential interaction between local anesthetics and some narcotics, including meperidine. Excessive use of either or both can result in seizures and/or death (Moore and Goodson 1985). A summary of the characteristics, mechanism of action and dosage of meperidine is presented in Table 12-2.

Benzodiazepines

Benzodiazepines are a large class of drugs that tend to have a fairly wide margin of safety when used alone and in therapeutic doses. They have several properties which are beneficial to many conditions and generally cause, to relative degrees, anti-anxiety, sedative-hypnotic and anti-convulsant activity, skeletal muscle relaxation, and amnestic effects. Their mechanism of action is associated with activation of the GABA receptor complex, which, when activated, has a generalized inhibitory effect. Thus, benzodiazepines indirectly tend to increase the inhibitory action of GABA. Although there are many benzodiazepines on the market, the most frequently reported benzodiazepines used for sedating children for dental procedures are midazolam, diazepam, and triazolam.

Midazolam

Midazolam is purportedly the most popular sedative agent and benzodiazepine for children undergoing dental and medical procedures (Bhatnagaret et al. 2012; Isik et al. 2008; Wilson and Nathan 2011). It was first used as a sedative for dental treatment in the early 1990s (Roelofse and de Joubert 1990) and has been used in medicine since the early 1980s (Haas et al. 1996). When its popularity rose in dentistry, midazolam was reviewed, noting its development, characteristics, metabolism, use in studies, and adverse events (Kupietzky and Houpt 1993).

Clinical Perspective

The sequence of behavioral events that occurs after the oral administration of midazolam is as follows. Slight but perceptible changes in attitude and even activity can

be seen within 5 minutes. In 10–15 minutes, significant relaxation occurs and increased socialization is noticeable. Sometimes the child is overcome by a more quiet but friendly mood, especially if they were initially shy or withdrawn. Somewhere between 15–20 minutes after the child has received midazolam, separation of the child from the parent can take place. If nitrous oxide is to be used as a co-medication, begin to place the nitrous oxide hood over the patient's nose, again using conversation as a distraction.

As mentioned previously with chloral hydrate, the same protocol is used for settling the child and starting restorative care. Unfortunately, the working time for midazolam is only 20–40 minutes. So midazolam, when used alone, can be used only for short dental procedures. Occasionally, frank agitation and paradoxical excitement will occur in a small fraction of patients, resulting in an inconsolable, unmanageable child, even in the arms of the parent. This response usually occurs immediately following or during a painful procedure. Anecdotally, this type of response has been referred to as the "angry child syndrome."

Midazolam has been used alone during dental procedures with approximately two-thirds of the patients reportedly accepting dental treatment successfully (Erlandsson et al. 2001). Others have demonstrated midazolam's improvement in patient attitude, behavior, and general procedural outcome compared to a placebo or pre-sedation behavior (Gallardo et al. 1994; Mazaheri et al. 2008; Wan et al. 2006).

Midazolam has been used in combination with meperidine, hydroxyzine, ketamine, chloral hydrate, tramadol, fentanyl, sufentanil, nalbuphine, droperidol, and acetaminophen (Cagiran et al. 2010; Heard et al. 2010; Milnes et al. 2000; Myers et al. 2004; Nathan and Vargas 2002; Padmanabhan et al. 2009; Reeves et al. 1996). Few of these studies are alike in protocol or study design; thus, it is almost impossible to determine what combination is consistently superior, if any. Nonetheless, when another agent is added to midazolam, the combination usually results in a slight improvement of behaviors compared to midazolam alone (Al-Zahrani et al. 2009; Cagiran et al. 2010; Nathan and Vargas 2002; Shapira et al. 2004), but not always. The improved behavior may be a function of doses (Musial et al. 2003).

Midazolam is typically administered orally to small children for dental procedures. However, the intranasal route of administration has also received attention from researchers. The most recent investigations reported are those of Bahetwar et al. (2011), Heard et al. (2010), Johnson et al. (2010) and Wood et al. (2010). Earlier studies have been included in the list of references. Other routes of administration include intramuscular (Capp et al. 2010; Lam et al. 2005), submucosal (Myers et al. 2004), and intravenous (Arya and Damle 2002). The dose range for midazolam given parenterally (i.e., via any route other than oral and rectal) is much less compared to that of the oral route (e.g., 0.2–0.3 mg/kg versus 0.5–1.0 mg/kg, respectively). As with other agents, including midazolam, a child's temperament has been shown to be associated with pharmacological outcomes. Shy or withdrawn children tend to have less favorable outcomes (Arnrup et al. 2003; Isik et al. 2010; Jensen and Stjernqvist 2002; Lochary et al. 1993; Primosch and Guelmann 2005). Usually, the first dramatic physiological change, manifested as a higher heart rate and disruptive behaviors, is followed by a quiet, favorable mood. Midazolam lacks analgesic properties; hence, when analgesics are used in combination with midazolam, the behavioral outcomes generally improve (Nathan and Vargas 2002). A summary of the characteristics, mechanism of action and dosage of midazolam is presented in Table 12-3.

Other Benzodiazepines

Diazepam is a commonly used agent in pediatric dentistry, and it is likely that triazolam is used more frequently than is reported. Diazepam produces good skeletal muscle relaxation and anti-anxiety effects. It has a long onset time, usually approaching one hour after its administration before a patient is ready for dental procedures. It also has a good hour of working time, and an even longer period is required before it is fully metabolized and eliminated from the body. Therefore, time to discharge may be prolonged with diazepam, and it may not be very useful in small children in a busy office setting.

There are at least eleven reports of diazepam used as a single agent, as well as with other sedatives. For the reader's convenience these reports are listed in the references. Several studies have evaluated the effects of diazepam administered rectally in children for dental procedures (Flaitz et al. 1985; Jensen and Schroder 1998; Jensen et al. 1999; Lowey and Halfpenny 1993; de Roelofse and van der Bijl 1993). Most of the studies are older, suggesting that rectal administration is not as popular as it has been in the past. Additionally, some of the studies indicated that midazolam was better than diazepam when administered rectally. One interesting study evaluated the amnestic effect of diazepam administered orally (Jensen and Schroder 1998). Apparently, the amount of amnesia was significantly reduced in the subset of patients who exhibited behavior management problems. Others have had similar results (Sullivan et al. 2001). Further study needs to elucidate whether or not there is an association between disruptive behaviors in young children and amnesia with diazepam and other benzodiazepines.

Diazepam also has been used in combination with ketamine (Okamoto et al. 1992; Reinemer et al. 1996;

Table 12-3. Midazolam (Versed, Dormicum).

The major risks associated with high doses are hypoventilation and associated hypoxemia. There are interactive effects when used in patients who are on other types of drugs, such as erythromycin (producing unconsciousness), and thus should be used very cautiously under such circumstances.
In therapeutic doses, its effect on the cardiovascular system is negligible; however, higher doses produce decreased blood pressure and cardiac output.
Occasionally in children, the expected sedation does not occur, but rather, a paradoxical hyperactivity occurs and is called the "angry child syndrome."

Drug	Mechanism of Action	Dose	Characteristics	Warnings	Sedation considerations (timing)	Reversible
Midazolam (Anticonvulsant hypnotic sedative) Contraindications: Hypersensitivity Cross-sensitivity with other benzodiazepines may occur.	Depresses all levels of the CNS, including the limbic and reticular formation, by binding to the benzodiazepine site on the gamma-aminobutyric acid (GABA) receptor complex and modulating GABA, which is a major inhibitory neurotransmitter in the brain.	0.3–1.0 mg/kg Max: 15 mgs (2–5 years) 20 mgs (older child)	Clear Non-palatable Relaxation Anterograde amnesia	Angry child syndrome (AC/Sxd) Respiratory depression Loss of head-righting reflex Serious respiratory adverse events occur most often when midazolam is used in combination with other CNS depressants.	Onset: 10 min Separation time: 10 min Work: 20 min	Yes (Flumazenil)

Sullivan et al. 2001). In these studies, the dose of ketamine was varied between 4–10 mg/kg, given orally. The lower dose was the least successful, and the higher doses were not significantly different from one another; however, a high rate of vomiting was frequently associated with ketamine (Reinemer et al. 1996; Sullivan et al. 2001). A summary of the characteristics, mechanism of action and dosage of diazepam is presented in Table 12-4.

Several studies involved children for dental procedures using triazolam. These were done early in the late 1990s and early 2000s. One study evaluated triazolam versus chloral hydrate and hydroxyzine, primarily in preschoolers. The doses were 0.2 mg/kg for triazolam and 40 mg/kg and 25 mgs for chloral hydrate and hydroxyzine, respectively. There were no significant differences in behavior or physiology between the two regimens and the authors suggested that triazolam was just as effective as the more traditional regimen of chloral hydrate and hydroxyzine (Meyer et al. 1990). Interestingly, a report comparing triazolam (0.3 mg/kg) to a placebo in a well-controlled study showed little improvement with triazolam over the placebo (Raadal et al. 1999). Also noteworthy is that triazolam can potentially produce ataxia and visual disturbances in young children as the dose increases from 0.005 to 0.03 mg/kg (Coldwell et al. 1999). Similar findings were reported in slightly older children with triazolam when administered sublingually (Tweedy et al. 2001).

Other non-benzodiazepine like sedative agents have been used for dental procedures in children, including zolpidem (Ambien®), a sleeping aid for adults (Bhatnagar et al. 2012; Koirala et al. 2006). Zolpidem activates a portion of the GABA complex to aid in initiating sleep and can be reversed by Flumazenil. At least two articles have indicated that zolpidem is not a preferred agent in children when compared to other, more commonly used agents (e.g., midazolam).

Antihistamines

Antihistamines are one of the most frequently used adjuncts, second to nitrous oxide, when combined with other sedative agents during sedations for pediatric patients undergoing dental procedures. They also are very popular for mild sedation when used alone and tend to be relatively safe for children (Faytrouny et al. 2007; Shapira et al. 1992). Antihistamines are noted to have antiemetic, drying, and mild sedative properties.

Many studies indicate that the addition of hydroxyzine to another sedative may or may not always improve behavior (Avalos-Arenas et al. 1998; Cathers et al. 2005; da Costa, et al. 2007; Lima et al. 2003; Shapira et al. 2004). This inconsistency in showing a beneficial effect

Table 12-4. Diazepam (Valium).

In therapeutic doses, the effect on the cardiovascular system is negligible; however, higher doses produce decreases in blood pressure and cardiac output. Respiratory depression occurs with increased dosages (or repeated doses) or when diazepam is used in combination with other sedative agents (e.g., opioids); otherwise, there is little respiratory effect. Occasionally in children, the expected sedation does not occur, but rather, a paradoxical hyperactivity occurs. This may be accompanied with rage, hostility, and nightmares.

Drug	Mechanism of Action	Dose	Characteristics	Warnings	Sedation considerations (timing)	Reversibility
Diazepam (Anticonvulsant hypnotic sedative) Contraindications: Hypersensitivity Possible cross-sensitivity with other benzodiazepines. Glaucoma Sleep apnea	Depresses all levels of the CNS, including the limbic and reticular formation, by binding to the benzodiazepine site on the gamma-aminobutyric acid (GABA) receptor complex and modulating GABA, which is a major inhibitory neurotransmitter in the brain.	0.25 mg/kg 1 mg per year of age up to 10 mgs; Max: 10 mgs (Varies with age)	Non-palatable Relaxation Anterograde amnesia Sedation	Respiratory depression Possible hypotension Avoid grapefruit juice Psychiatric and paradoxical reactions, including hyperactive or aggressive behavior, hallucinations, and psychoses, have been reported with benzodiazepines, particularly in adolescent/pediatric or elderly patients.	Onset: 1 hour Separation time: 1 hour Work: >1 hour	Yes (Flumazenil)

Table 12-5. Hydroxyzine (Atarax or Vistaril).

Drug	Mechanism of Action	Dose	Characteristics	Warnings	Sedation considerations (timing)	Reversibility
Hydroxyzine (Antianxiety Antiemetic Antihistamine Sedative) Contraindications: Hypersensitivity Early pregnancy	Competes with histamine for H_1-receptor sites on effector cells in the GI tract, blood vessels, and respiratory tract.	1–2 mg/kg Max: 50 mg/day	Palatable Sleep/drowsiness Antihistamine Bronchodilator Antiemetic Dry mouth	Pregnancy Hypotension Potentiates other CNS depressants Sedative effects of CNS depressants or ethanol are potentiated.	Onset: 30 min Separation time: 30 min Work: 30–45 min	No

associated with the mix of hydroxyzine with other agents may be due to differences in methodology (e.g., dose). Nonetheless, it remains a popular drug combination for sedating children, most likely because of its antiemetic properties and slight sedative effects, whether it is truly beneficial or not.

Promethazine has also been a very popular agent used in combination with other agents (Bui et al. 2002; Campbell et al. 1998; Houpt et al. 1985; Myers and Shoaf 1977; Sams et al. 1993; Singh et al. 2002; Song and Webb 2003), but it has not been shown definitively to be more or less effective than hydroxyzine. Furthermore, promethazine has been associated with respiratory depression in children less than two years of age, resulting in an FDA-issued a warning against its use in very young children. Summaries of the characteristics, mechanisms of action, and dosages of hydroxyzine and promethazine are presented in Tables 12-5 and 12-6, respectively.

Diphenhydramine administered orally has not been studied as a sedative agent for children undergoing

Table 12-6. Promethazine (Phenergan).

Should not be used in children younger than two years of age due to the possibility of respiratory depression.

Drug	Mechanism of Action	Dose	Characteristics	Warnings	Sedation considerations (timing)	Reversibility
Promethazine (Antiemetic Sedative) Contraindications: Hypersensitivity > 2 years of age Asthma	Phenothiazine derivative; blocks postsynaptic mesolimbic dopaminergic receptors in the brain; exhibits a strong alpha-adrenergic blocking effect and depresses the release of hypothalamic and hypophyseal hormones; competes with histamine for the H_1-receptor.	0.5–1 mg/kg Max: 50 mgs	Palatable Sleep/drowsiness Antihistamine Antiemetic Dry mouth	Not recommended in children younger than 2 years of age Treatment of lower respiratory tract symptoms, including asthma. Lowers seizure threshold Hypotension	Onset: 20–30 min Separation time: 30 min Work: 30–45 min	No

dental procedures. It has been used as an adjunct to other agents in medical settings (Cengiz et al. 2006; Roach et al. 2010). There has been some controversy over whether diphenhydramine may affect child performance (Kay 2000); however, some evidence suggests that it does not (Bender et al. 2001).

Summary

Clinicians want to know and understand the best evidenced-based information when delivering oral health care to their patients. This orientation applies not only to a plethora of practice issues such as restorative materials and techniques, special treatments (e.g., Endodontics), dental equipment, and practice management, but also to patient management and, in particular, the management of challenging groups such as geriatric and pediatric patients. The clinician's desires and goals for maximizing the delivery of efficient, quality care in a friendly and supportive fashion often requires the use of pharmacological techniques to successfully manage challenging patients. Thus, clinicians strive to find compelling evidence for the "best" pharmacological agents to aid them in meeting their goals.

Unfortunately, the amount of sound, scientifically-derived data suggesting a ranking of agents to meet particular patient needs and challenges is woefully small. Issues such as study design with blinding and randomization, allocation of patients to groups, dose-response effects, and even the selection of a common outcome metric become exceedingly difficult to control in clinical situations. Even though many decades of clinical studies have investigated sedative agents and their effects on the behavior and physiology of patients, we remain at the entrance to a deep, poorly appreciated cavern of knowledge into which we enter daily, seeking the answer to the question of "what is the best and safest sedative agent(s) for my patient and his specific needs?"

Delving into the obscure body of knowledge on sedative agents, a recent study using a meta-analysis attempted to determine which sedative agents are effective for behavior management in children who are receiving dental care (Lourenco-Matharu et al. 2012). The investigators used multiple electronic databases and hand-searched many journals. They looked for blinded, randomized, and well-controlled sedation studies involving children ranging in age from infancy to sixteen years. Study designs using crossover procedures were excluded due to the possibility of differential patient responses at future visits depending on prior experiences in an initial visit. Only thirty-six studies involving a total of slightly more than 2,000 patients met their criteria. Many of the studies had the potential for high risk of bias, and at least twenty-eight different sedatives were used with or without nitrous oxide. The doses, administration mode, and timing factors varied widely. Essentially they found weak evidence for midazolam as an effective agent when sedating children for dental treatment, and they found that nitrous oxide may improve patient behavior when used with other sedatives. They concluded that there is a need for further study using tightly controlled study designs and possible comparison to a standard which they interpreted at this point to be midazolam and nitrous oxide.

It is the impression of this author that such inquiry will require a major paradigm shift. Essential to any shift would be better use of electronic technology, agreement

on effective, interactive behavior management principles, and support of pooled data development. Greater use of multiple site modalities such as private practice, teaching programs, and hospital collaborates is also critical to effecting change. Otherwise, for now, the "magic bullet" will continue to be general anesthesia.

References

Al-Zahrani, A.M., Wyne, A.H., Sheta, S.A. (2009). Comparison of oral midazolam with a combination of oral midazolam and nitrous oxide-oxygen inhalation in the effectiveness of dental sedation for young children. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 27, 9–16.

Album, M.M. (1955). Premedication for Difficult Children. *ASDC Journal of Dentistry for Children*, 22, 48–56.

American Acedemy of Pediaitric Dentistry. Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures. (2006). *Pediatric Dentistry*, 32, 167–183.

American Dental Association. Guidelines for the Use of Sedation and General Anesthesia by Dentists. (2007). American Dental Association. Available at:http://www.ada.org/sections/about/pdfs/anesthesia_guidelines.pdf.

Anderson, J.L. (1960). Use of Chloral Hydrate in Dentistry. *North-West Dentistry*, 89, 33–35.

Arnrup, K. et al. (2003). Treatment outcome in subgroups of uncooperative child dental patients: an exploratory study. *International Journal of Paediatric Dentistry*, 13, 304–319.

Arya, V.S. and Damle, S.G. (2002). Comparative evaluation of Midazolam and Propofol as intravenous sedative agents in the management of unco-operative children. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 20, 6–8.

Avalos-Arenas, V. et al. (1998). Is chloral hydrate/hydroxyzine a good option for paediatric dental outpatient sedation? *Current Medical Research and Opinion*, 14, 219–226.

Bahetwar, S.K. et al. (2011). A comparative evaluation of intranasal midazolam, ketamine and their combination for sedation of young uncooperative pediatric dental patients: a triple blind randomized crossover trial. *Journal of Clinical Pediatric Dentistry*, 35, 415–420.

Barr, E.S., Wynn, R.L., Spedding, R.H. (1977). Oral premedication for the problem child: placebo and chloral hydrate. *Journal of Pedodontics*, 1, 272–280.

Bender, B.G., McCormick, D.R., Milgrom, H. (2001). Children's school performance is not impaired by short-term administration of diphenhydramine or loratadine. *Journal of Pediatrics*, 138, 656–660.

Bhatnagar, S., Das, U.M., Bhatnagar, G. (2012). Comparison of oral midazolam with oral tramadol, triclofos and zolpidem in the sedation of pediatric dental patients: an in vivo study. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 30, 109–114.

Bowers D.F. and Hibbard, E.D. (1972). Technique for Behavior Management—A Survey. *ASDC Journal of Dentistry for Children*, 39, 368–372 (34–38).

Brandt, S.K. and Bugg, J.L., Jr. (1984). Problems of medication with the pediatric patient. *Dental Clinics of North America* 28, 563–579.

Buckman, N. (1956). Balanced Premedication in Pedodontics. *Journal of Dentistry for Children*, 23, 111–153.

Bui, T., Redden, R.J., Murphy, S. (2002). A comparison study between ketamine and ketamine-promethazine combination for oral sedation in pediatric dental patients. *Anesthesia Progress*, 49, 14–18.

Cagiran, E. et al. (2010). Comparison of oral midazolam and midazolam-ketamine as sedative agents in paediatric dentistry. *European Journal Paediatric Dentistry*, 11, 19–22.

Campbell, R.L. et al. (1998). Comparison of oral chloral hydrate with intramuscular ketamine, meperidine, and promethazine for pediatric sedation—preliminary report. *Anesthesia Progress*, 45, 46–50.

Capp, P.L. et al. (2010). Special care dentistry: Midazolam conscious sedation for patients with neurological diseases. *European Journal Paediatric Dentistry*, 11, 162–164.

Cathers, J.W. et al. (2005). A comparison of two meperidine/hydroxyzine sedation regimens for the uncooperative pediatric dental patient. *Pediatric Dentistry*, 27, 395–400.

Cengiz, M., Baysal, Z., Ganidagli, S. (2006). Oral sedation with midazolam and diphenhydramine compared with midazolam alone in children undergoing magnetic resonance imaging. *Paediatric Anaesthesia*, 16, 621–626.

Chen, J.W., Seybold, S.V., Yazdi, H. (2006). Assessment of the effects of 2 sedation regimens on cardiopulmonary parameters in pediatric dental patients: a retrospective study. *Pediatric Dentistry*, 28, 350–356.

Chowdhury, J. and Vargas, K.G. (2005). Comparison of chloral hydrate, meperidine, and hydroxyzine to midazolam regimens for oral sedation of pediatric dental patients. *Pediatric Dentistry*, 27, 191–197.

Coldwell, S.E. et al. (1999). Side effects of triazolam in children. *Pediatric Dentistry*, 21, 18–25.

Croswell, R.J. et al. (1995). A comparison of conventional versus electronic monitoring of sedated pediatric dental patients. *Pediatric Dentistry*, 17, 332–339.

Czaarnecki, E.S. and Binns, W.H. (1963). The Use of chloral hydrate for the Apprehensive Child. *Pennsylvania Dental Journal*, 30, 40–42.

da Costa, L.R., da Costa, P.S., Lima, A.R. (2007). A randomized double-blinded trial of chloral hydrate with or without hydroxyzine versus placebo for pediatric dental sedation. *Brazilian Dental Journal*, 18, 334–340.

Doring, K.R. (1985). Evaluation of an alphaprodine-hydroxyzine combination as a sedative agent in the treatment of the pediatric dental patient. *Journal of the American Dental Association*, 111, 567–576.

Erlandsson, A.L. et al. (2001). Conscious sedation by oral administration of midazolam in paediatric dental treatment. *Swedish Dental Journal*, 25, 97–104.

Faytrouny, M., Okte, Z., Kucukyavuz, Z. (2007). Comparison of two different dosages of hydroxyzine for sedation in the paediatric dental patient. *International Journal of Paediatric Dentistry*, 17, 378–382.

Flacke, J.W. et al. (1985). Comparison of morphine, meperidine, fentanyl, and sufentanil in balanced anesthesia: a double-blind study. *Anesthesia and Analgesia*, 64, 897–910.

Flacke, J.W. et al. (1987). Histamine release by four narcotics: a double-blind study in humans. *Anesthesia and Analgesia*, 66, 723–730.

Flaitz, C.M., Nowak, A.J., Hicks, M.J. (1985). Double-blind comparison of rectally administered diazepam to placebo for pediatric sedation: the cardiovascular response. *Anesthesia Progress*, 32, 232–236.

Gallardo, F., Cornejo, G., Borie, R. (1994). Oral midazolam as premedication for the apprehensive child before dental treatment. *Journal of Clinical Pediatric Dentistry*, 18, 123–127.

Gladney, M., Stanley, R.T., Hendricks, S.E. (1994). Anxiolytic activity of chloral hydrate and hydroxyzine. *Pediatric Dentistry*, 16, 183–189.

Haas, D.A. et al. (1996). A pilot study of the efficacy of oral midazolam for sedation in pediatric dental patients. *Anesthesia Progress*, 43, 1–8.

Hasty, M.F. et al. (1991). Conscious sedation of pediatric dental patients: an investigation of chloral hydrate, hydroxyzine pamoate, and meperidine vs. chloral hydrate and hydroxyzine pamoate. *Pediatric Dentistry*, 13, 10–19.

Hershenson, M. et al. (1984). The effect of chloral hydrate on genioglossus and diaphragmatic activity. *Pediatric Research*, 18, 516–519.

Houpt, M. (1989). Report of project USAP: the use of sedative agents in pediatric dentistry. *ASDC Journal of Dentistry for Children*, 56, 302–309.

Houpt, M. (2002). Project USAP 2000—use of sedative agents by pediatric dentists: a 15-year follow-up survey. *Pediatric Dentistry*, 24, 289–294.

Houpt, M.I. et al. (1996). Effects of nitrous oxide on diazepam sedation of young children. *Pediatric Dentistry*, 18, 236–241.

Houpt, M.I., Limb, R., Livingston, R.L. (2004). Clinical effects of nitrous oxide conscious sedation in children. *Pediatric Dentistry*, 26, 29–36.

Houpt, M.I. et al. (1985a). Assessing chloral hydrate dosage for young children. *ASDC Journal of Dentistry for Children*, 52, 364–369.

Houpt, M.I. et al. (1985b). Comparison of chloral hydrate with and without promethazine in the sedation of young children. *Pediatric Dentistry*, 7, 41–46.

Isik, B., Baygin, O., Bodur, H. (2008). Premedication with melatonin vs midazolam in anxious children. *Paediatric Anaesthesia*, 18, 635–641.

Isik, B. et al. (2010). The effects of temperament and behaviour problems on sedation failure in anxious children after midazolam premedication. *European Journal of Anaesthesiology*, 27, 336–340.

Jensen, B. and Schroder, U. (1998). Acceptance of dental care following early extractions under rectal sedation with diazepam in preschool children. *Acta Odontologica Scandinavica*, 56, 229–232.

Jensen, B., Schroder, U., Mansson, U. (1999). Rectal sedation with diazepam or midazolam during extractions of traumatized primary incisors: a prospective, randomized, double-blind trial in Swedish children aged 1.5–3.5 years. *Acta Odontologica Scandinavica*, 57, 190–194.

Jensen, B. and Stjernqvist, K. (2002). Temperament and acceptance of dental treatment under sedation in preschool children. *Acta Odontologica Scandinavica*, 60, 231–236.

Kay, G.G. (2000). The effects of antihistamines on cognition and performance. *Journal of Allergy and Clinical Immunology*, 105(6 Pt 2), S622-627.

Koirala, B. et al. (2006). A comparative evaluation of newer sedatives in conscious sedation. *Journal of Clinical Pediatric Dentistry*, 30, 273–276.

Kupietzky, A. and Houpt, M.I. (1993). Midazolam: a review of its use for conscious sedation of children. *Pediatric Dentistry*, 15, 237–241.

Lam, C. et al. (2005). Midazolam premedication in children: a pilot study comparing intramuscular and intranasal administration. *Anesthesia Progress*, 52, 56–61.

Lambert, L.A. et al. (1988). Nonlinear dose-response characteristics of alphaprodine sedation in preschool children. *Pediatric Dentistry*, 10, 30–33.

Lampshire, E.L. (1950). Premedication for Children. *Journal of the American Dental Association*, 41, 407–409.

Leelataweewud, P. et al. (2000). The physiological effects of supplemental oxygen versus nitrous oxide/oxygen during conscious sedation of pediatric dental patients. *Pediatric Dentistry*, 22, 125–133.

Levy, J.H. et al. (1989). Wheal and flare responses to opioids in humans. *Anesthesiology*, 70, 756–760.

Lima, A.R., da Costa, L.R., da Costa, P.S. (2003). A randomized, controlled, crossover trial of oral midazolam and hydroxyzine for pediatric dental sedation. *Pesqui Odontologica Brasileira*, 17, 206–211.

Lochary, M.E. et al. (1993). Temperament as a predictor of behavior for conscious sedation in dentistry. *Pediatric Dentistry*, 15, 348–352.

Lopez-Munoz, F., Ucha-Udabe, R., Alamo, C. (2005). The history of barbiturates a century after their clinical introduction. *Neuropsychiatric Disease and Treatment*, 1, 329–343.

Lourenco-Matharu, L., Ashley, P.F., Furness, S. (2012). Sedation of children undergoing dental treatment. *Cochrane Database System Review*, 3, CD003877.

Lowey, M.N. and Halfpenny, W. (1993). Observations on the use of rectally administered diazepam for sedating children before treatment of maxillofacial injuries: report of nine cases. *International Journal of Paediatric Dentistry*, 3, 89–93.

Lu, D.P. and Lu, W.I. (2006). Practical oral sedation in dentistry. Part II–Clinical application of various oral sedatives and discussion. *Compendium of Continuing Education in Dentistry*, 27, 500–507; quiz 508, 518.

Lu, J. and Greco, M.A. (2006). Sleep circuitry and the hypnotic mechanism of GABAA drugs. *Journal of Clinical Sleep Medicine*, 2, S19-26.

Mazaheri, R. et al. (2008). Assessment of intranasal midazolam administration with a dose of 0.5 mg/kg in behavior management of uncooperative children. *Journal of Clinical Pediatric Dentistry*, 32, 95–99.

McKee, K.C. et al. (1990). Dose-responsive characteristics of meperidine sedation in preschool children. *Pediatric Dentistry*, 12, 222–227.

Meyer, M.L., Mourino, A.P., Farrington, F.H. (1990). Comparison of triazolam to a chloral hydrate/hydroxyzine combination in the sedation of pediatric dental patients. *Pediatric Dentistry*, 12, 283–287.

Milnes, A.R., Maupome, G., Cannon, J. (2000). Intravenous sedation in pediatric dentistry using midazolam, nalbuphine and droperidol. *Pediatric Dentistry*, 22, 113–119.

Minnis, R. (1979). Psychological effects of conscious sedation. *Anesthesia Progress*, 26, 150–153.

Moody, E.J. et al. (1989). Stereospecific reversal of nitrous oxide analgesia by naloxone. *Life Science*, 44, 703–709.

Moore P.A. (2004). Sedative-Hypnotics, Antianxiety Drugs, and Centrally Acting Muscle Relaxants. In D.F. Yagiela J.A., Neidle E.A. (Ed.), *Pharmacology and Therapeutics for Dentistry* (5th Edition ed.): Elsevier Mosby, St. Louis, Missouri.

Moore, P.A. and Goodson, J.M. (1985). Risk appraisal of narcotic sedation for children. *Anesthesia Progress*, 32, 129–139.

Moore, P.A. et al. (1984). Sedation in pediatric dentistry: a practical assessment procedure. *Journal of the American Dental Association*, 109, 564–569.

Musial, K.M. et al. (2003). Comparison of the efficacy of oral midazolam alone versus midazolam and meperidine in the pediatric dental patient. *Pediatric Dentistry*, 25, 468–474.

Myers, D.R. and Shoaf, H.K. (1977). The intramuscular use of a combination of meperidine, promethazine and chlorpromazine for sedation of the child dental patient. *ASDC Journal of Dentistry for Children*, 44, 453–456.

Myers, G.R. et al. (2004). Effect of submucosal midazolam on behavior and physiologic response when combined with oral chloral hydrate and nitrous oxide sedation. *Pediatric Dentistry*, 26, 37–43.

Nathan, J.E. and Vargas, K.G. (2002). Oral midazolam with and without meperidine for management of the difficult young pediatric dental patient: a retrospective study. *Pediatric Dentistry*, 24, 129–138.

Nathan, J.E. and West, M.S. (1987). Comparison of chloral hydrate-hydroxyzine with and without meperidine for management of the difficult pediatric patient. *ASDC Journal of Dentistry for Children*, 54, 437–444.

Needleman, H.L., Joshi, A., Griffith, D.G. (1995). Conscious sedation of pediatric dental patients using chloral hydrate, hydroxyzine, and nitrous oxide–a retrospective study of 382 sedations. *Pediatric Dentistry*, 17, 424–431.

Okamoto, G.U., Duperon, D.F., Jedrychowski, J.R. (1992). Clinical evaluation of the effects of ketamine sedation on pediatric dental patients. *Journal of Clinical Pediatric Dentistry*, 16, 253–257.

Padmanabhan, M.Y. et al. (2009). A comparative evaluation of agents producing analgo-sedation in pediatric dental patients. *Journal of Clinical Pediatric Dentistry*, 34, 183–188.

Poorman, T.L., Farrington, F.H., Mourino, A.P. (1990). Comparison of a chloral hydrate/hydroxyzine combination with and without meperidine in the sedation of pediatric dental patients. *Pediatric Dentistry*, 12, 288–291.

Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists. (2002). *Anesthesiology*, 96, 1004–1017.

Primosch, R.E. and Guelmann, M. (2005). Comparison of drops versus spray administration of intranasal midazolam in two- and three-year-old children for dental sedation. *Pediatric Dentistry*, 27, 401–408.

Raadal, M. et al. (1999). A randomized clinical trial of triazolam in 3- to 5-year-olds. *Journal of Dental Research*, 78, 1197–1203.

Reeves, S.T. et al. (1996). A randomized double-blind trial of chloral hydrate/hydroxyzine versus midazolam/acetaminophen in the sedation of pediatric dental outpatients. *ASDC Journal of Dentistry for Children*, 63, 95–100.

Reinemer, H.C., Wilson, C.F., Webb, M.D. (1996). A comparison of two oral ketamine-diazepam regimens for sedating anxious pediatric dental patients. *Pediatric Dentistry*, 18, 294–300.

Riekman, G. and Ross, A.S. (1981). A sedation technique for the younger child. *Journal of the Canadian Dental Association*, 47, 789–791.

Roach, C.L. et al. (2010). Moderate sedation for echocardiography of preschoolers. *Pediatric Cardiology*, 31, 469–473.

Robbins, M.B. (1967). Chloral hydrate and promethazine as premedicants for the apprehensive child. *ASDC Journal of Dentistry for Children*, 34, 327–331.

Roberts, S.M. et al. (1992). Evaluation of morphine as compared to meperidine when administered to the moderately anxious pediatric dental patient. *Pediatric Dentistry*, 14, 306–313.

Roelofse, J.A. and de V Joubert, J.J. (1990). Arterial oxygen saturation in children receiving rectal midazolam as premedication for oral surgical procedures. *Anesthesia Progress*, 37, 286–289.

Roelofse, J.A. and van der Bijl, P. (1993). Comparison of rectal midazolam and diazepam for premedication in pediatric dental patients. *Journal of Oral and Maxillofacial Surgery*, 51, 525–529.

Rohlfing, G.K. et al. (1998). The effect of supplemental oxygen on apnea and oxygen saturation during pediatric conscious sedation. *Pediatric Dentistry*, 20, 8–16.

Ruble, J.W. (1952). An Appraisal of Drugs to Premedicate Children for Dental Procedures. *ASDC Journal of Dentistry for Children*, 19, 22–29.

Sams, D.R. et al. (1993). Behavioral assessments of two drug combinations for oral sedation. *Pediatric Dentistry*, 15, 186–190.

Sams, D.R. and Russell, C.M. (1993). Physiologic response and adverse reactions in pediatric dental patients sedated with promethazine and chloral hydrate or meperidine. *Pediatric Dentistry*, 15, 422–424.

Shapira, J. et al. (1992). Evaluation of the effect of nitrous oxide and hydroxyzine in controlling the behavior of the pediatric dental patient. *Pediatric Dentistry*, 14, 167–170.

Shapira, J. et al. (2004). Comparison of oral midazolam with and without hydroxyzine in the sedation of pediatric dental patients. *Pediatric Dentistry*, 26, 492–496.

Sheroan, M.M. et al. (2006). A prospective study of 2 sedation regimens in children: chloral hydrate, meperidine, and hydroxyzine versus midazolam, meperidine, and hydroxyzine. *Anesthesia Progress*, 53, 83–90.

Singh, N. et al. (2002). A comparative evaluation of oral midazolam with other sedatives as premedication in pediatric dentistry. *Journal of Clinical Pediatric Dentistry*, 26, 161–164.

Song, Y.U. and Webb, M.D. (2003). Comparison of the effect of orally versus submucosally administered meperidine on the behavior of pediatric dental patients: a retrospective study. *Anesthesia Progress*, 50, 129–133.

Stetson, J.B. and Jessup, G.S. (1962). Use of oral chloral hydrate mixtures for pediatric premedication. *Anesthesia and Analgesia*, 41, 203–215.

Sullivan, D.C., Wilson, C.F., Webb, M.D. (2001). A comparison of two oral ketamine-diazepam regimens for the sedation of anxious pediatric dental patients. *Pediatric Dentistry*, 23, 223–231.

Tafaro, S.T. et al. (1991). The evaluation of child behavior during dental examination and treatment using predmedication and placebo. *Pediatric Dentistry*, 13(6), 339–343.

Tweedy, C.M. et al. (2001). Pharmacokinetics and clinical effects of sublingual triazolam in pediatric dental patients. *Journal of Clinical Psychopharmacology*, 21, 268–272.

Wan, K., Jing, Q., Zhao, J.Z. (2006). Evaluation of oral midazolam as conscious sedation for pediatric patients in oral restoration. *Chinese Medical Sciences Journal*, 21, 163–166.

Wilson, S. et al. (2000). A retrospective study of chloral hydrate, meperidine, hydroxyzine, and midazolam regimens used to sedate children for dental care. *Pediatric Dentistry*, 22, 107–112.

Wilson, S. and Nathan, J.E. (2011). A survey study of sedation training in advanced pediatric dentistry programs: thoughts of program directors and students. *Pediatric Dentistry*, 33, 353–360.

Wood, M. (2010). The safety and efficacy of intranasal midazolam sedation combined with inhalation sedation with nitrous oxide and oxygen in paediatric dental patients as an alternative to general anaesthesia. *SAAD Digest*, 26, 12–22.

Wright, G.Z. and McAulay, D.J. (1973). Current premedicating trends in pedodontics. *ASDC Journal of Dentistry for Children*, 40, 185–187.

Additional Reading

Surveys Identifying Agents Used to Sedate Children for Dental Procedures

Acs, G., Musson, C.A., Burke, M.J. (1990). Current teaching of restraint and sedation in pediatric dentistry: a survey of program directors. *Pediatric Dentistry*, 12, 364–367.

Bowers, D.F. and Hibbard, E.D (1972). Techniques for Behavior Management—A Survey. *ASDC Journal of Dentistry for Children*, 39, 368–372.

Davis, M.J. (1988). Conscious sedation practices in pediatric dentistry: a survey of members of the American Board of Pediatric Dentistry College of Diplomates. *Pediatric Dentistry*, 10, 328–329.

Houpt, M. (1989). Report of project USAP: the use of sedative agents in pediatric dentistry. *ASDC Journal of Dentistry for Children*, 56, 302–309.

Houpt, M. (2002). Project USAP 2000—use of sedative agents by pediatric dentists: a 15-year follow-up survey. *Pediatric Dentistry*, 24, 289–294.

Waggoner, W.F. (1986). Conscious sedation in predoctoral pediatric dentistry programs. *Journal of Dental Education*, 50, 225–229.

Wilson, S. (1996). A survey of the American Academy of Pediatric Dentistry membership: nitrous oxide and sedation. *Pediatric Dentistry*, 18, 287–293.

Wilson, S. et al. (2001). Conscious sedation experiences in graduate pediatric dentistry programs. *Pediatric Dentistry*, 23, 307–314.

Wilson, S. and Nathan, J.E. (2011). A survey study of sedation training in advanced pediatric dentistry programs: thoughts of program directors and students. *Pediatric Dentistry*, 33, 353–360.

Recent Studies Investigating Chloral Hydrate in Combination With One or More Other Agents

Badalaty, M.M. et al. (1990). A comparison of chloral hydrate and diazepam sedation in young children. *Pediatric Dentistry*, 12, 33–37.

Campbell, R.L. et al. (1998). Comparison of oral chloral hydrate with intramuscular ketamine, meperidine, and promethazine for pediatric sedation—preliminary report. *Anesthesia Progress*, 45, 46–50.

Chowdhury, J. and Vargas, K.G. (2005). Comparison of chloral hydrate, meperidine, and hydroxyzine to midazolam regimens for oral sedation of pediatric dental patients. *Pediatric Dentistry*, 27, 191–197.

da Costa, L.R., da Costa, P.S., Lima, A.R. (2007). A randomized double-blinded trial of chloral hydrate with or without hydroxyzine versus placebo for pediatric dental sedation. *Brazilian Dental Journal*, 18, 334–340.

Davila, J.M. et al. (1994). Comparison of the sedative effectiveness of two pharmacological regimens. *ASDC Journal of Dentistry for Children*, 61, 276–281.

Fuhrer, C.T., 3rd et al. (2009). Effect on behavior of dental treatment rendered under conscious sedation and general anesthesia in pediatric patients. *Pediatric Dentistry*, 31, 492–497.

Haas, D.A. et al. (1996). A pilot study of the efficacy of oral midazolam for sedation in pediatric dental patients. *Anesthesia Progress*, 43, 1–8.

Hasty, M.F. et al. (1991). Conscious sedation of pediatric dental patients: an investigation of chloral hydrate, hydroxyzine pamoate, and meperidine vs. chloral hydrate and hydroxyzine pamoate. *Pediatric Dentistry*, 13, 10–19.

Houpt, M.I. et al. (1985). Comparison of chloral hydrate with and without promethazine in the sedation of young children. *Pediatric Dentistry*, 7, 41–46.

Kantovitz, K.R., Puppin-Rontani, R.M., Gaviao, M.B. (2007). Sedative effect of oral diazepam and chloral hydrate in the dental treatment of children. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 25, 69–75.

McCann, W. et al. (1996). The effects of nitrous oxide on behavior and physiological parameters during conscious sedation with a moderate dose of chloral hydrate and hydroxyzine. *Pediatric Dentistry*, 18, 35–41.

Meyer, M.L., Mourino, A.P., Farrington, F.H. (1990). Comparison of triazolam to a chloral hydrate/hydroxyzine combination in the sedation of pediatric dental patients. *Pediatric Dentistry*, 12, 283–287.

Moody, E.H., Jr., Mourino, A.P., Campbell, R.L. (1986). The therapeutic effectiveness of nitrous oxide and chloral hydrate administered orally, rectally, and combined with hydroxyzine for pediatric dentistry. *ASDC Journal of Dentistry for Children*, 53, 425–429.

Nathan, J.E. and West, M.S. (1987). Comparison of chloral hydrate-hydroxyzine with and without meperidine for management of the difficult pediatric patient. *ASDC Journal of Dentistry for Children*, 54, 437–444.

Needleman, H.L., Joshi, A., Griffith, D.G. (1995). Conscious sedation of pediatric dental patients using chloral hydrate, hydroxyzine, and nitrous oxide—a retrospective study of 382 sedations. *Pediatric Dentistry*, 17, 424–431.

Poorman, T.L., Farrington, F.H., Mourino, A.P. (1990). Comparison of a chloral hydrate/hydroxyzine combination with and without meperidine in the sedation of pediatric dental patients. *Pediatric Dentistry*, 12, 288–291.

Reeves, S.T. et al. (1996). A randomized double-blind trial of chloral hydrate/hydroxyzine versus midazolam/acetaminophen in the sedation of pediatric dental outpatients. *ASDC Journal of Dentistry for Children*, 63, 95–100.

Religa, Z.C. et al. (2002). Association between bispectral analysis and level of conscious sedation of pediatric dental patients. *Pediatric Dentistry*, 24, 221–226.

Sams, D.R. et al. (1993). Behavioral assessments of two drug combinations for oral sedation. *Pediatric Dentistry*, 15, 186–190.

Sanders, B.J. and Avery, D.R. (1997). The effect of sleep on conscious sedation: a follow-up study. *Journal of Clinical Pediatric Dentistry*, 21, 131–134.

Sanders, B.J., Potter, R.H., Avery, D.R. (1994). The effect of sleep on conscious sedation. *Journal of Clinical Pediatric Dentistry*, 18, 211–214.

Sheroan, M.M. et al. (2006). A prospective study of 2 sedation regimens in children: chloral hydrate, meperidine, and hydroxyzine versus midazolam, meperidine, and hydroxyzine. *Anesthesia Progress*, 53, 83–90.

Soares, F. et al. (2006). Interdisciplinary approach to endodontic therapy for uncooperative children in a dental school environment. *Journal of Dental Education*, 70, 1362–1365.

Tafaro, S.T. et al. (1991). The evaluation of child behavior during dental examination and treatment using predmedication and placebo. *Pediatric Dentistry*, 13, 339–343.

Torres-Perez, J. et al. (2007). Comparison of three conscious sedation regimens for pediatric dental patients. *Journal of Clinical Pediatric Dentistry*, 31, 183–186.

Wilson, S. (1992). Chloral hydrate and its effects on multiple physiological parameters in young children: a dose-response study. *Pediatric Dentistry*, 14, 171–177.

Wilson, S. (1993). Facial electromyography and chloral hydrate in the young dental patient. *Pediatric Dentistry*, 15, 343–347.

Wilson, S. et al. (2000). A retrospective study of chloral hydrate, meperidine, hydroxyzine, and midazolam regimens used to sedate children for dental care. *Pediatric Dentistry*, 22, 107–112.

Studies on the Use of Choral Hydrate in Combination With Other Sedatives

Avalos-Arenas, V. et al. (1998). Is chloral hydrate/hydroxyzine a good option for paediatric dental outpatient sedation? *Current Medical Research and Opinion*, 14, 219–226.

da Costa, L.R., da Costa, P.S., Lima, A.R. (2007). A randomized double-blinded trial of chloral hydrate with or without hydroxyzine versus placebo for pediatric dental sedation. *Brazilian Dental Journal* 18, 334–340.

Dallman, J.A., Ignelzi, M.A., Jr., Briskie, D.M. (2001). Comparing the safety, efficacy and recovery of intranasal midazolam vs. oral chloral hydrate and promethazine. *Pediatric Dentistry*, 23, 424–430.

Fishbaugh, D.F. et al. (1997). Relationship of tonsil size on an airway blockage maneuver in children during sedation. *Pediatric Dentistry*, 19, 277–281.

Gladney, M., Stanley, R.T., Hendricks, S.E. (1994). Anxiolytic activity of chloral hydrate and hydroxyzine. *Pediatric Dentistry*, 16, 183–189.

Houpt, M.I. et al. (1985). Comparison of chloral hydrate with and without promethazine in the sedation of young children. *Pediatric Dentistry*, 7, 41–46.

Lu, D.P. and Lu, W.I. (2006). Practical oral sedation in dentistry. Part II—Clinical application of various oral sedatives and discussion. *Compendium of Continuing Education in Dentistry*, 27, 500–507; quiz 508, 518.

McCann, W. et al. (1996). The effects of nitrous oxide on behavior and physiological parameters during conscious sedation with a moderate dose of chloral hydrate and hydroxyzine. *Pediatric Dentistry*, 18, 35–41.

Moody, E.H., Jr., Mourino, A.P., Campbell, R.L. (1986). The therapeutic effectiveness of nitrous oxide and chloral hydrate administered orally, rectally, and combined with hydroxyzine for pediatric dentistry. *ASDC Journal of Dentistry for Children*, 53, 425–429.

Needleman, H.L., Joshi, A., Griffith, D.G. (1995). Conscious sedation of pediatric dental patients using chloral hydrate, hydroxyzine, and nitrous oxide—a retrospective study of 382 sedations. *Pediatric Dentistry*, 17, 424–431.

Robbins, M.B. (1967). Chloral hydrate and promethazine as premedicants for the apprehensive child. *ASDC Journal of Dentistry for Children*, 34, 327–331.

Sams, D.R. et al. (1993). Behavioral assessments of two drug combinations for oral sedation. *Pediatric Dentistry*, 15, 186–190.

Sams, D.R. and Russell, C.M. (1993). Physiologic response and adverse reactions in pediatric dental patients sedated with promethazine and chloral hydrate or meperidine. *Pediatric Dentistry*, 15, 422–424.

Sanders, B.J., Potter, R.H., Avery, D.R. (1994). The effect of sleep on conscious sedation. *Journal of Clinical Pediatric Dentistry*, 18, 211–214.

Tafaro, S.T. et al. (1991). The evaluation of child behavior during dental examination and treatment using predmedication and placebo. *Pediatric Dentistry*, 13, 339–343.

Whitehead, B.G. et al. (1988). Monitoring of sedated pediatric dental patients. *ASDC Journal of Dentistry for Children*, 55, 329–333.

Wilson, S. et al. (1998). The effects of nitrous oxide on pediatric dental patients sedated with chloral hydrate and hydroxyzine. *Pediatric Dentistry*, 20, 253–258.

Wilson, S. et al. (1999). The effect of electronic dental anesthesia on behavior during local anesthetic injection in the young, sedated dental patient. *Pediatric Dentistry*, 21, 12–17.

Wilson, S., Tafaro, S.T., Vieth, R.F. (1990). Electromyography: its potential as an adjunct to other monitored parameters during conscious sedation in children receiving dental treatment. *Anesthesia Progress*, 37, 11–15.

Studies of Meperidine Alone and in Combination

Alfonzo-Echeverri, E.C. et al. (1993). Oral ketamine for pediatric outpatient dental surgery sedation. *Pediatric Dentistry*, 15, 182–185.

Campbell, R.L. et al. (1998). Comparison of oral chloral hydrate with intramuscular ketamine, meperidine, and promethazine for pediatric sedation—preliminary report. *Anesthesia Progress*, 45, 46–50.

Chen, J.W., Seybold, S.V., Yazdi, H. (2006). Assessment of the effects of 2 sedation regimens on cardiopulmonary parameters in pediatric dental patients: a retrospective study. *Pediatric Dentistry*, 28, 350–356.

Chowdhury, J. and Vargas, K.G. (2005). Comparison of chloral hydrate, meperidine, and hydroxyzine to midazolam regimens for oral sedation of pediatric dental patients. *Pediatric Dentistry*, 27, 191–197.

Croswell, R.J. et al. (1995). A comparison of conventional versus electronic monitoring of sedated pediatric dental patients. *Pediatric Dentistry*, 17, 332–339.

Haney, K.L., McWhorter, A.G., Seale, N.S. (1993). An assessment of the success of meperidine and promethazine sedation in medically compromised children. *ASDC Journal of Dentistry for Children*, 60, 288–294.

Hasty, M.F. et al. (1991). Conscious sedation of pediatric dental patients: an investigation of chloral hydrate, hydroxyzine pamoate, and meperidine vs. chloral hydrate and hydroxyzine pamoate. *Pediatric Dentistry*, 13, 10–19.

Lochary, M.E. et al. (1993). Temperament as a predictor of behavior for conscious sedation in dentistry. *Pediatric Dentistry*, 15, 348–352.

Martinez, D. and Wilson, S. (2006). Children sedated for dental care: a pilot study of the 24-hour postsedation period. *Pediatric Dentistry*, 28, 260–264.

Musial, K.M. et al. (2003). Comparison of the efficacy of oral midazolam alone versus midazolam and meperidine in the pediatric dental patient. *Pediatric Dentistry*, 25, 468–474.

Myers, D.R. and Shoaf, H.K. (1977). The intramuscular use of a combination of meperidine, promethazine and chlorpromazine for sedation of the child dental patient. *ASDC Journal of Dentistry for Children*, 44, 453–456.

Nathan, J.E. and Vargas, K.G. (2002). Oral midazolam with and without meperidine for management of the difficult young pediatric dental patient: a retrospective study. *Pediatric Dentistry*, 24, 129–138.

Nathan, J.E. and West, M.S. (1987). Comparison of chloral hydrate-hydroxyzine with and without meperidine for management of the difficult pediatric patient. *ASDC Journal of Dentistry for Children*, 54, 437–444.

Poorman, T.L., Farrington, F.H., Mourino, A.P. (1990). Comparison of a chloral hydrate/hydroxyzine combination with and without meperidine in the sedation of pediatric dental patients. *Pediatric Dentistry*, 12, 288–291.

Roberts, S.M. et al. (1992). Evaluation of morphine as compared to meperidine when administered to the moderately anxious pediatric dental patient. *Pediatric Dentistry*, 14, 306–313.

Sams, D.R. and Russell, C.M. (1993). Physiologic response and adverse reactions in pediatric dental patients sedated with promethazine and chloral hydrate or meperidine. *Pediatric Dentistry*, 15, 422–424.

Sheroan, M.M. et al. (2006). A prospective study of 2 sedation regimens in children: chloral hydrate, meperidine, and hydroxyzine versus midazolam, meperidine, and hydroxyzine. *Anesthesia Progress*, 53, 83–90.

Wilson, S. et al. (2000). A retrospective study of chloral hydrate, meperidine, hydroxyzine, and midazolam regimens used to sedate children for dental care. *Pediatric Dentistry*, 22, 107–112.

Midazolam: Intranasal Route of Administration

Abrams, R. et al. (1993). Safety and effectiveness of intranasal administration of sedative medications (ketamine, midazolam, or sufentanil) for urgent brief pediatric dental procedures. *Anesthesia Progress*, 40, 63–66.

Bahetwar, S.K. et al. (2011). A comparative evaluation of intranasal midazolam, ketamine and their combination for sedation of young uncooperative pediatric dental patients: a triple blind randomized crossover trial. *Journal of Clinical Pediatric Dentistry*, 35, 415–420.

Dallman, J.A., Ignelzi, M.A., Jr., Briskie, D.M. (2001). Comparing the safety, efficacy and recovery of intranasal midazolam vs. oral chloral hydrate and promethazine. *Pediatric Dentistry*, 23, 424–430.

Fuks, A.B. et al. (1994). Assessment of two doses of intranasal midazolam for sedation of young pediatric dental patients. *Pediatric Dentistry*, 16, 301–305.

Fukuta, O. et al. (1993). The sedative effect of intranasal midazolam administration in the dental treatment of patients with mental disabilities. Part 1. The effect of a 0.2 mg/kg dose. *Journal of Clinical Pediatric Dentistry*, 17, 231–237.

Fukuta, O. et al. (1994). The sedative effects of intranasal midazolam administration in the dental treatment of patients with mental disabilities. Part 2: optimal concentration of intranasal midazolam. *Journal of Clinical Pediatric Dentistry*, 18, 259–265.

Hartgraves, P.M. and Primosch, R.E. (1994). An evaluation of oral and nasal midazolam for pediatric dental sedation. *ASDC Journal of Dentistry for Children*, 61, 175–181.

Heard, C. et al. (2010). A comparison of four sedation techniques for pediatric dental surgery. *Paediatric Anaesthesia*, 20, 924–930.

Johnson, E. et al. (2010). The physiologic and behavioral effects of oral and intranasal midazolam in pediatric dental patients. *Pediatric Dentistry*, 32, 229–238.

Lam, C. et al. (2005). Midazolam premedication in children: a pilot study comparing intramuscular and intranasal administration. *Anesthesia Progress*, 52, 56–61.

Lee-Kim, S.J. et al. (2004). Nasal versus oral midazolam sedation for pediatric dental patients. *ASDC Journal of Dentistry for Children*, 71, 126–130.

Mazaheri, R. et al. (2008). Assessment of intranasal midazolam administration with a dose of 0.5 mg/kg in behavior management of uncooperative children. *Journal of Clinical Pediatric Dentistry*, 32, 95–99.

Primosch, R.E. and Guelmann, M. (2005). Comparison of drops versus spray administration of intranasal midazolam in two- and three-year-old children for dental sedation. *Pediatric Dentistry*, 27, 401–408.

Shapira, J. et al. (1996). The effectiveness of midazolam and hydroxyzine as sedative agents for young pediatric dental patients. *ASDC Journal of Dentistry for Children*, 63, 421–425.

Wood, M. (2010). The safety and efficacy of intranasal midazolam sedation combined with inhalation sedation with nitrous oxide and oxygen in paediatric dental patients as an alternative to general anaesthesia. *SAAD Digest*, 26, 12–22.

Reports of Diazepam Used as a Single Agent and With Other Sedatives

Badalaty, M.M. et al. (1990). A comparison of chloral hydrate and diazepam sedation in young children. *Pediatric Dentistry*, 12, 33–37.

Davila, J.M. et al. (1994). Comparison of the sedative effectiveness of two pharmacological regimens. *ASDC Journal of Dentistry for Children*, 61, 276–281.

Davila, J.M. et al. (1991). Chloral hydrate-diazepam: per os combination in treatment of disabled. *New York State Dental Journal*, 57, 45–47.

Hallonsten, A.L. (1988). The use of oral sedatives in dental care. *Acta Anaesthesiologica Scandinavica Suppl*, 88, 27–30.

Houpt, M.I. et al. (1996). Effects of nitrous oxide on diazepam sedation of young children. *Pediatric Dentistry*, 18, 236–241.

Jensen, B., Schroder, U., Mansson, U. (1999). Rectal sedation with diazepam or midazolam during extractions of traumatized primary incisors: a prospective, randomized, double-blind trial in Swedish children aged 1.5–3.5 years. *Acta Odontologica Scandinavica*, 57, 190–194.

Kantovitz, K.R., Puppin-Rontani, R.M., Gaviao, M.B. (2007). Sedative effect of oral diazepam and chloral hydrate in the dental treatment of children. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, 25, 69–75.

Lowey, M.N. and Halfpenny, W. (1993). Observations on the use of rectally administered diazepam for sedating children before treatment of maxillofacial injuries: report of nine cases. *International Journal of Paediatric Dentistry*, 3, 89–93.

Reinemer, H.C., Wilson, C.F., Webb, M.D. (1996). A comparison of two oral ketamine-diazepam regimens for sedating anxious pediatric dental patients. *Pediatric Dentistry*, 18, 294–300.

Roelofse, J.A. and van der Bijl, P. (1993). Comparison of rectal midazolam and diazepam for premedication in pediatric dental patients. *Journal of Oral and Maxillofacial Surgery*, 51, 525–529.

Sullivan, D.C., Wilson, C.F., Webb, M.D. (2001). A comparison of two oral ketamine-diazepam regimens for the sedation of anxious pediatric dental patients. *Pediatric Dentistry*, 23, 223–231.

Chapter 13

Working with a Dentist Anesthesiologist

Kenneth L. Reed

Amanda Jo Okundaye

Staying in the dental office is much more convenient for both dentists and patients than going to a hospital operating room. Anesthesia and dental services may be delivered in a dental office at significantly lower costs than in the hospital operating room. With health care dollars at a premium, health care "reform" well on its way in the United States, and more people paying out of pocket for dental services, hospital operating room use for otherwise healthy pediatric dental patients may decline. There now is a trend toward in-office deep sedation and general anesthetics in some geographical regions (Olabi et al. 2012). This chapter focuses on the reason for that trend, as well as how to work with a dentist anesthesiologist.

As has been described elsewhere in this text, the levels of sedation to anesthesia within medicine and dentistry are: minimal sedation, moderate sedation, deep sedation and general anesthesia. Both minimal sedation and moderate sedation are "conscious" techniques. A hallmark of a conscious technique is that the patient responds to verbal commands or light tactile stimulation. In the case of minimal sedation, the patient responds normally to verbal commands or light tactile stimulation. In the case of moderate sedation, the patient responds purposefully to verbal commands or light tactile stimulation. If minimal to moderate sedation fails, the next level is deep sedation or general anesthesia. For these levels, the pediatric dentist has to consider whether the patient will be treated in the dental office or in the hospital.

Educational Requirements for a Dentist Anesthesiologist?

Many years ago, there were no formal requirements for dentists to be able to administer any form of sedation or anesthesia. Likewise, there were no guidelines for dentists in the area of sedation and anesthesia. The "Guidelines for Teaching Pain Control and Sedation to Dentists and Dental Students" were first published in 1972 by the American Dental Association (ADA). In the 1985 update of the guidelines, the concept of "deep sedation" was introduced, and training required to perform this level of anesthesia was deemed to be the same as for general anesthesia (Peskin 1993). These documents have been updated many times since the original version and will continue to be updated as needed in the future.

The training to be licensed and permitted to administer minimal to moderate oral sedation may be obtained in almost all pediatric dental residencies or through a variety of continuing education courses. To be licensed and permitted to administer deep sedation or general anesthesia, the training may only be obtained in specific residencies today. The training requirements for deep sedation and anesthesia are the same. For dentists in the United States, the completion of a dental anesthesiology or oral and maxillofacial surgery residency is required in order to obtain a permit to administer general anesthesia. It is not possible to obtain training to administer deep sedation or general anesthesia in a continuing education course. Several pediatric dentists have also completed dental anesthesiology residencies, but the overwhelming majority of pediatric dentists have been trained only to the level of either minimal or moderate oral sedation.

Deep sedation and general anesthesia can be considered equal to one another. Both deep sedation and general anesthesia are "unconscious" techniques in which the patient does not respond to verbal command or light tactile stimulation. The only technical difference is that in deep sedation the patient does respond purposefully following repeated or painful stimulation, whereas in general anesthesia the patient cannot be aroused, even following painful stimulation. Pediatric dental patients

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

often have local anesthesia administered in addition to deep sedation or general anesthesia, which muddies the difference between the two.

Hospital-Based Versus Office-Based Treatment

When minimal to moderate oral sedation fails in the pediatric dental office, deep sedation or general anesthesia may be indicated. Many pediatric dentists currently take these patients to the hospital. Consequently, patients incur extremely high costs and dentists lose productive time in the office. Mass (1993) compared the costs for a typical one-hour dental case of office-based anesthesia versus hospital-based anesthesia. He found that in the early 1990s the hospital fee approximated $1,900 while the office-based case would typically cost $150. As of 2009, the Albany Medical Center stated that the cost of office-based anesthesia remained less than 10% of the cost of hospital-based anesthesia for dental procedures.

The spread between hospital-based anesthesia and dental office-based anesthesia pricing still exists today. Rashewsky and colleagues (2012) determined that the hospital operating room expense for a pediatric dental patient was 13.2 times the expense of office-based anesthesia. At Stony Brook Medicine, dental patients requiring treatment with general anesthesia received dental care in either an outpatient facility at the Stony Brook School of Dental Medicine or in the Stony Brook University Hospital ambulatory setting. Rashewsky examined the time and cost for ambulatory American Society of Anesthesiologists (ASA) Class I pediatric patients receiving full-mouth dental rehabilitation using general anesthesia in these two locations. They reviewed ninety-six patient records for ASA I patients aged 36–60 months. There were significant differences in cost, total anesthesia time, and recovery room time. The average total time (anesthesia end time minus anesthesia start time) to treat a child at Stony Brook University Hospital under general anesthesia was 222 ± 62.7 minutes, and recovery time (time of discharge minus anesthesia end time) was 157 ± 97.2 minutes; the average total cost was $7,303. At the Stony Brook School of Dental Medicine, the average total time was 175 ± 36.8 minutes, and recovery time was 25 ± 12.7 minutes; the average total cost was $414. This study provides evidence that ASA I pediatric patients can receive full-mouth dental rehabilitation using general anesthesia under the direction of dentist anesthesiologists in an office-based dental setting more quickly and at a lower cost than in a hospital operating room. This is very promising for patients with the least access to care, including patients with special needs and those without insurance (Rashewsky 2012). To some extent, the economic barrier is lowered.

So what are other advantages and disadvantages of treating pediatric dental patients in the hospital operating room versus the dental office? Having provided anesthesia services in both settings, the authors of this chapter know both systems well. To begin, there is a need for both types of treatment. Unfortunately, the choice is often determined by what is available to the practitioner or how the practitioner was originally trained. Many pediatric dentists, especially those trained some time ago, only consider the hospital operating room option.

While the hospital operating room is safe, it is often not the most ideal place to treat many pediatric dental patients. It is a burden for the pediatric dentist to bring all of the drugs, supplies and equipment needed for an operating room case. In some cases, hospitals charge a facility fee. Hospitals may not have a wide variety of surgical instruments and dental supplies—the dentist has to use what is available. The hospital operating room can also be inefficient. Dental cases are low priority electives in a medical setting, so it is not unusual for a dental case to be "bumped" in order to place a higher priority emergent medical case in the operating room where the dental case was scheduled. Hospital operating rooms also take a significant amount of time to "turn over." Cleaning and replenishing supplies takes much more time compared to the typical dental office.

The Dentist Anesthesiologist

The anesthesia provider for the vast majority of hospital operating rooms will be either a physician anesthesiologist or, more commonly in the United States, a certified registered nurse anesthetist. There are few dentist anesthesiologists working in hospital operating rooms providing anesthesia services. While physicians and nurses can and do provide safe general anesthesia, they lack an understanding of dentistry compared to a dentist anesthesiologist. Most dentist anesthesiologists will provide intraoral local anesthesia when appropriate for the case, or will at least be available for consultation regarding the feasibility.

Dentist anesthesiologists are comfortable with providing nasally intubated general anesthesia. Some physician anesthesiologists and certified registered nurse anesthetists are less comfortable with nasal intubation and may offer only oral intubation or a

laryngeal mask airway (LMA). Neither oral intubation nor an LMA offers the access to the oral cavity, the ability to check occlusion, and the all-around ability to perform ideal dentistry that a nasally intubated pediatric dental case provides. Dentist anesthesiologists are trained as dentists first, acquiring their anesthesia training later. Dentists know dental procedures. Physician anesthesiologists and certified registered nurse anesthetists do not. Dentist anesthesiologists understand that local anesthesia provides post-operative pain control for pediatric dental patients and that longer-acting opioids such as morphine or hydromorphone are not indicated. When physician anesthesiologists and certified registered nurse anesthetists provide deep sedation or general anesthesia for pediatric dentists, they often do not understand this simple concept and sometimes administer large amounts of opioids. This leads to excessively prolonged recovery and unnecessary post-operative nausea and vomiting. Neither of these tends to build patient confidence, nor are they practice builders.

Dentist anesthesiologists are trained to work with patients on whom open airway procedures are performed and are therefore much more comfortable than physician anesthesiologists and certified registered nurse anesthetists who lack such training. Sharing the patient's airway is a normal, daily occurrence for a dentist anesthesiologist, but it is a very foreign concept to most non-dentists performing anesthesia. Most physician anesthesiologists and certified registered nurse anesthetists are not comfortable performing anesthesia outside of a hospital operating room and are unfamiliar with mobile anesthesia practice.

Dentist anesthesiologists understand the private practice of dentistry; they understand the dental environment and strive to maintain a nurturing atmosphere when invited to participate in the care of pediatric dental patients. The atmosphere and expectations in hospital operating rooms are quite different from a private dental office and physician anesthesiologists and certified registered nurse anesthetists often do not understand this distinction. There is also one very interesting statistic regarding patient safety. Since the first dental anesthesia residency was established in 1949, when a dentist anesthesiologist has provided anesthesia in another dentist's office, there has not been a single patient death—ever. The same cannot be said for a physician anesthesiologist or a certified registered nurse anesthetist. In summary, some have said that when compared to physician anesthesiologists, dentist anesthesiologists are safer, more approachable, less patronizing, and more understanding of the dental process and needs of the dentist.

Additionally, the operating table in an operating room offers fewer options to the pediatric dentist. The ability to place the operating table in an exact location and position is often compromised, unlike a dental chair in a dental office. Room lighting and suction are often more difficult to manipulate in an operating room, and sometimes something as simple as a saliva ejector may not be able to be accommodated.

Pediatric dental patients and their parents or guardians know the pediatric dental office; they know where it is located and they know the office staff. Taking their child to a hospital for dental care can be daunting. Usually, they don't know the system or what to expect. The hospital is generally a less nurturing and less comfortable environment than the private office or clinic. As noted by Rashewsky (2012), patients treated in the hospital spend much more time in non-productive activities, such as prolonged waiting times in a pre-operative holding area or longer times in recovery rooms, in comparison to dental office treatment. With more and more scrutiny being given to medical expenditures in health care by insurers and governmental agencies, the use of the hospital operating rooms for healthy dental patients may very well become a thing of the past.

While the emphasis so far has been on in-office deep sedation and anesthesia, there still remains a need for some pediatric dental patients to be seen in the hospital operating room. All ASA IV and ASA V pediatric dental patients that require dental treatment should be seen in the hospital operating room, as should most ASA III patients. Only ASA I and ASA II patients, and potentially some ASA III patients, would be good candidates for office-based deep sedation or general anesthesia.

Use of a Dentist Anesthesiologist by Pediatric Dentists

The use of dentist anesthesiologists appears to be an emerging trend in pediatric dental practice (ASDA 2010). A recent paper by Olabi and associates (2012) found that 20–40% of board-certified pediatric dentists currently use a dentist anesthesiologist, and 60–70% would use a dentist anesthesiologist if one were available. The utilization rate appears to be regional. For example, in the northeast United States, only 12% of board-certified pediatric dentists use a dentist anesthesiologist, yet 46% of that same group would use a dentist anesthesiologist if one were available. However, 59% of board-certified pediatric dentists practicing in the western United States currently use the services of a dentist anesthesiologist, and 78% indicated that they would use

a dentist anesthesiologist if possible. It is also interesting to note that from a regional perspective, the southwest had the highest percentage of respondents reporting that they administered some form of in-office sedation (88%), employed the services of a dentist anesthesiologist (59%), and would use a dentist anesthesiologist if one were available (78%). Finally, a novel finding of this study was that female board-certified pediatric dentists were more likely to employ a dentist anesthesiologist than their male counterparts.

Based on the data of the foregoing study, it is apparent that dentist anesthesiologist availability is a major impediment to increasing the number of deep sedation and general anesthetics in dental offices. To understand the problem, some understanding of the history is needed. It was realized in the 1950s that a specialty of anesthesia in dentistry would benefit the profession. Concomitantly, the department of dental anesthesiology at the Tokyo Medical and Dental University was created by Dr. Tadashi Ueno (Matsuura 1993). In 1953, the American Dental Society of Anesthesiology (ADSA) was formed (Peskin 1993) and the first application for specialty status was submitted to the ADA (Allen 1992). Unfortunately for dentistry—and more importantly dental patients—this application was unsuccessful.

The next major event affecting the administration of anesthesia by dentists was in the early 1980s. Physicians drew a metaphorical line in the sand. As a portion of a policy statement in 1982, The American Society of Anesthesiologists (ASA) wrote that "anesthesia care is the practice of medicine." As a consequence, dentists administering anesthesia could be accused by state medical boards of practicing medicine without a license. Fortunately, by 1987 the ASA had published a more reasonable statement: "The ASA recognizes the right of qualified dentists as defined by the American Dental Association to administer conscious sedation, deep sedation and general anesthesia to patients having dental procedures only."

The ASA recognition has allowed the anesthesia specialty to mature. In 2007 the Commission on Dental Accreditation (CODA) published a Standards document entitled "Advanced Dental Education Programs in Dental Anesthesiology." Hence, standards now exist for accredited dental anesthesia residencies. The standards are stringent. Residents must perform a minimum of 500 deep sedations and general anesthetics, 200 of which must be intubated general anesthetics, and at least 50 of which must be nasotracheal intubations. Twenty cases must incorporate advanced airway techniques such as fiber-optic intubation or laryngeal mask airway. A minimum of 100 cases must be for children age six or younger, and fifty cases must be for special-needs patients.

According to a 2007 editorial by Dr. Joel Weaver, three major benefits to the dental profession will be derived from the accreditation of dentist anesthesiologist residency programs. They are as follows.

- Since the demand for dentists to provide advanced sedation and anesthesia services for others has so largely increased, accreditation should provide increased funding opportunities to support more residents and residency programs.
- Accreditation by dentistry helps cement anesthesia at its highest level as being within the scope of dental education and the clinical practice of dentists.
- Finally, accreditation keeps the highest level of anesthesia education within the control of dentistry and maintains our ability to control the quality of anesthesia training that dentist anesthesiologists receive.

State dental boards now have an appropriate measuring stick to judge the adequacy of anesthesia training for dentist anesthesiologists. They should now recognize that future dentist anesthesiologists must be graduates of CODA-accredited training programs to be eligible for anesthesia permits—with, of course, traditional grandfathering for those who completed training prior to accreditation.

Accreditation helped to provide increased support for more residents and residency programs to meet the need and demand. In 2007, there were roughly 200 dentist anesthesiologists in the United States. There were five dental anesthesia training programs in North America that graduated a combined nine residents in dental anesthesia per year. In 2013 there are approximately 300 dentist anesthesiologists in the United States, the number of dental anesthesia training programs in North America has doubled. Currently, thirty residents graduate in dental anesthesia annually.

Clinic Use of a Dentist Anesthesiologist

Dentist anesthesiologists can help pediatric dentists with their more troublesome patients by allowing dentistry to be completed safely, efficiently, and in a cost-effective manner in the pediatric dental office. Most dentist anesthesiologists in the United States are "mobile"; that is, they bring all of their drugs, supplies, and equipment with them when they travel to a pediatric dental office to provide anesthesia services. Figure 13-1 demonstrates a dentist anesthesiologist's typical "mobile" setup. Figure 13-2 shows the dentist anesthesiologist's drugs, supplies, and equipment in a dental office, providing general anesthesia for a pediatric dental patient.

Figure 13-1. A dentist anesthesiologist's typical "mobile" setup.

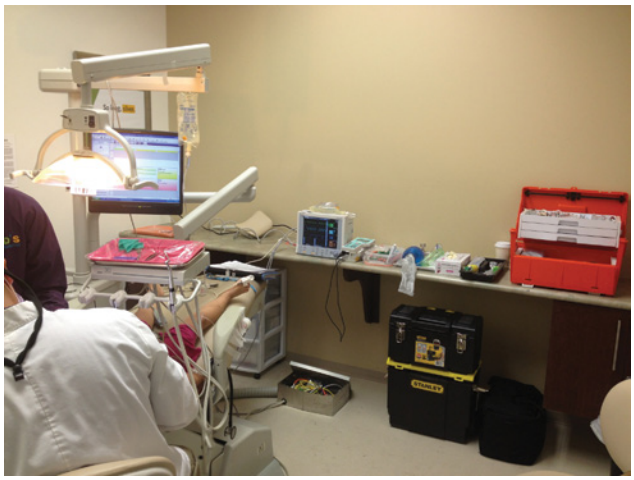

Figure 13-2. The dentist anesthesiologist's drugs, supplies and equipment in a dental office, providing general anesthesia for a pediatric dental patient.

The usual procedure for involving a dentist anesthesiologist is as follows. The pediatric dentist arranges a day for the dentist anesthesiologist to be in the office. A number of cases are scheduled to make the day more efficient for both doctors. A few days before the treatment day, the office provides a copy of the schedule with patient data to the anesthesiologist, who typically reviews the medical history as collected by the pediatric dentist and phones the parent or caregiver at least one day prior to the anesthetic. Further questioning about the medical history of the child occurs at that time. Contact information for physicians or other health care providers may be obtained if consultation with the patient's physician is indicated. Financial arrangements are discussed with the parent. During the pre-operative phone call, NPO (*nihil per os*; nothing by mouth) requirements are relayed, as well as any other pre-operative instructions, such as which medications to take and which to withhold. The dentist anesthesiologist explains to the parent what to expect. For pre-cooperative pediatric patients or uncooperative patients with special needs, it is especially important to inform the parent or caregiver on the method of induction of general anesthesia and what is expected from them.

Choice of Deep Sedation or General Anesthesia

Whether deep sedation or general anesthesia is chosen for a particular case is a moot point. The dentist anesthesiologist is trained in both techniques and there is enough gray area, overlap, and continuum of spectrum between the two techniques that teasing out the exact definition during a given case is nothing but an academic exercise.

Premedication Before Deep Sedation or General Anesthesia

Premedication before general anesthesia in the pediatric patient is generally not recommended unless it is given in the office by the treating practitioner thirty minutes to an hour before planned anesthetic. Parenteral anxiety (fear of a needle) is actually the biggest contribution to the anxiety of the child. When a premedication is chosen, the oral route is by far the most common. Furthermore, a benzodiazepine is the most common class of drug for orally administered premedication prior to deep sedation or general anesthesia, and the specific benzodiazepine is most often midazolam. Midazolam provides some degree of amnesia, is an anxiolytic agent, and has a very shallow dose response curve, which translates to a very wide margin of safety.

Induction of Deep Sedation or General Anesthesia

An IV induction is the safest and most effective method of inducing deep sedation or general anesthesia. Ideally, the patient will allow an IV to be started. Some older children and higher functioning patients with special needs will allow it. If a lack of cooperation precludes starting an IV, there are two primary methods of inducing deep sedation or general anesthesia. Some dentist anesthesiologists prefer an induction with intramuscular (IM) drugs. Most often the IM drug of choice is ketamine, with or without midazolam and/or glycopyrrolate. The other primary method of inducing general

anesthesia to an uncooperative dental patient is a "mask" induction. This technique uses an inhaled volatile general anesthetic gas, most often sevoflurane. Sevoflurane really isn't used to induce deep sedation, only general anesthesia. Some dentist anesthesiologists have both sevoflurane and ketamine available and use each technique for different situations, while others exclusively use one over the other.

Those that prefer a mask induction generally agree that it saves the patient the injection experience. Conversely, those who prefer IM induction hold that pediatric patients receive inoculations on a regular basis—this is simply one more "shot," and they will have more in the future. Those that criticize mask inductions say that holding a child down and forcing a mask on them, especially if the patient is claustrophobic, is less than ideal. Others will point out that in the more cooperative pediatric dental patient who participates in holding the mask, the induction can be stress-free. Based on personal experiences, there is no right or wrong way to induce general anesthesia in the pediatric dental patient.

Once deep sedation or general anesthesia is induced, the vast majority of dentist anesthesiologists will establish IV access. Having an IV allows administration of additional drugs, if needed, and it provides immediate access should emergency drug administration become necessary.

Airways

An open airway is defined as an airway that is not intubated or secured with an adjunct such as a nasoendotracheal tube or laryngeal mask. Open airway anesthesia is performed daily for all levels of anesthesia and has been performed safely for many years and taught in many pediatric dental residency programs in the United States. The literature does not provide a sufficient reason for open airway versus intubated anesthetics. Instead, it is left up to the anesthesiologist, whose training and comfort level will dictate the choice. Any level of sedation administered should include a throat pack or oral partition. It is our recommendation that during open airway cases, practitioners should use water judiciously if it is required, as well as a rubber dam to decrease the amount of debris that goes in the throat pack or oropharynx. The throat pack is placed in the oropharynx to (1) protect contents from going down the airway and causing possible complications such as a laryngospasm and (2) prevent or reduce the escape of gases directly into the face of the operator.

When working in a pediatric dental office, the type of airway is often debated by dentist anesthesiologists. Some strongly prefer an "open airway" for all procedures, feeling that the patient can be kept at a lighter plane of anesthesia than with advanced airway manipulation. They contend that induction and recovery are faster in short cases with an open airway. However, a patent airway must be maintained at all times and often either the pediatric dentist, dentist anesthesiologist, or dental assistant will manipulate the airway for at least a portion of the procedural time. Fewer supplies and equipment are also necessary in an open airway case than one which requires more aggressive airway manipulation. Both deep sedation and general anesthesia may be accomplished with open airway techniques.

Other dentist anesthesiologists prefer a more secure airway, even though it requires a deeper level of anesthesia. Nasotracheal intubation for general anesthesia is considered by some to be the "gold standard" for dental cases. With experience and good technique, it only takes a few seconds to a couple of minutes longer to place the tube. An advantage is that with the secure airway, mandible position and the use of water spray are no concern. If a nasotracheal tube is used, the resultant anesthetic is always general anesthesia, not deep sedation. If the plan is to maintain the anesthetic on a volatile agent such as sevoflurane, some type of advanced airway will be necessary. For a dental procedure in which some degree of airway protection other than an endotracheal tube is desired, a flexible laryngeal mask airway (LMA) may be chosen (Figure 13-3). The LMA offers a more protected airway than a simple throat partition as used in an open airway technique, but it does not offer the same level of protection as an endotracheal tube. Additionally, occlusion may be checked and a variety of other dental manipulations performed in cases of an open airway or nasoendotracheal tube, where these same things may not easily be accomplished under LMA general anesthesia. Technically, deep sedation may be used with an LMA; however, the resultant level if an LMA is used will always be true general anesthesia.

Maintenance of General Anesthesia

Once the patient is induced, IV access is secured, and the airway of choice is established, the next decision is determining how to maintain general anesthesia. Again, there are two main options. One is to maintain general anesthesia with IV drugs and the other is to maintain general anesthesia with inhaled general anesthetic gas. Maintenance with IV agents has a number of advantages. There is no concern of "gas hygiene" and pollution of the dental operatory with waste anesthetic gases. The equipment used to administer the IV medications is typically a small, lightweight infusion pump, and the drugs used most often are propofol with remifentanil or alfentanil. Each of these drugs have a very short clinical duration of action, and therefore have a rapid emergence from general anesthesia. Propofol is also a great antiemetic agent when exerting its effects, so post-operative nausea and vomiting are extremely rare. Other agents may be administered through

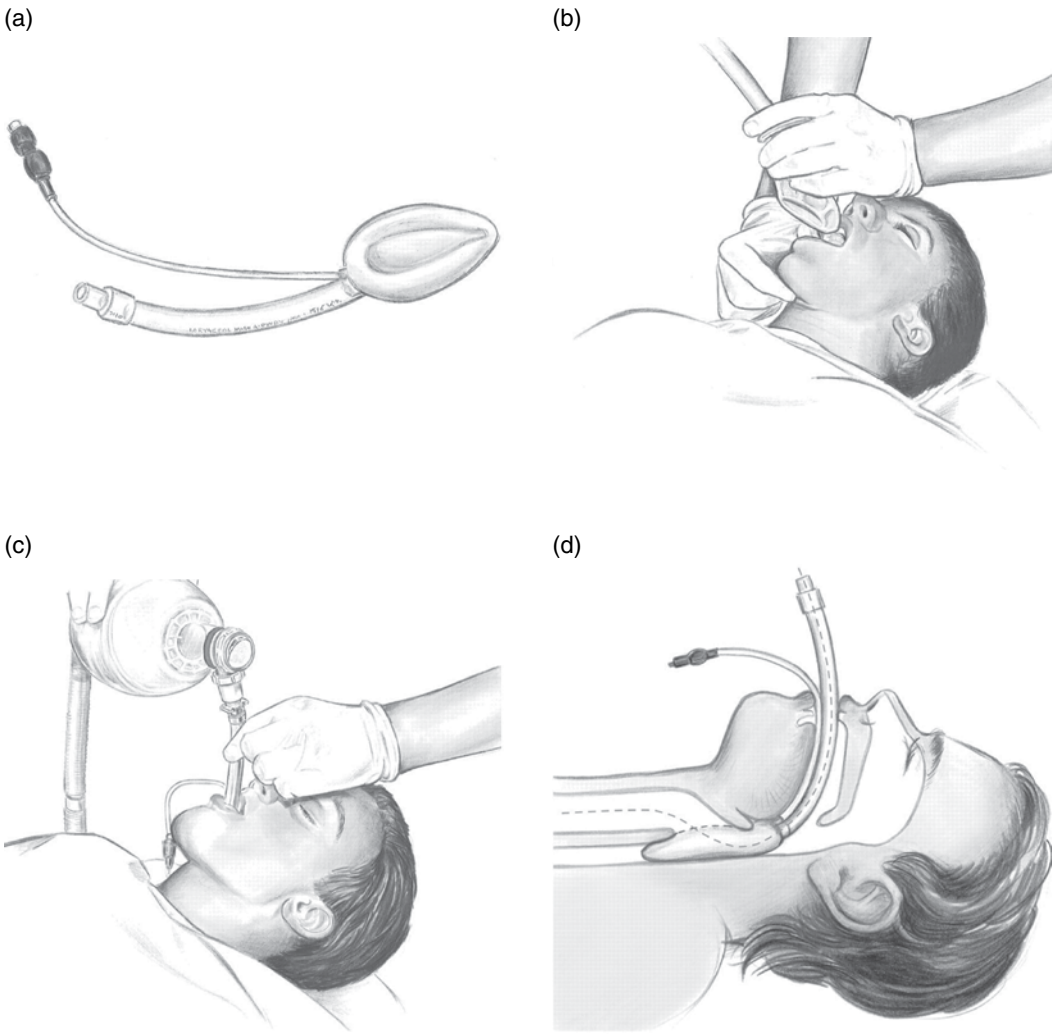

Figure 13-3. For a dental procedure in which some degree of airway protection other than an endotracheal tube is desired, a flexible laryngeal mask airway (LMA) may be chosen. (American Heart Association 2000, figure 3) Reproduced with permission from Lippincott Williams & Wilkins.

the IV, regardless of whether IV or gas maintenance is desired. Various antiemetics are sometimes administered, as are antibiotics, analgesics and/or steroids.

If an inhalational maintenance is desired with either an LMA or endotracheal tube in place, most often that gas is sevoflurane, although occasionally isoflurane or desflurane are chosen for specific reasons. Sevoflurane is a good all-around inhalational general anesthetic. It is the most desirable for an inhalational induction, as it is least irritating to the pulmonary system and has an inoffensive odor. It works rapidly and has a relatively quick offset.

Another benefit of inhalational anesthetics is that, generally speaking, there has never been a shortage, nor have prices escalated as they have with most IV drugs. In 2013, every drug used in anesthesia for dentistry has been in short supply or on back order at least once, and the price of most IV drugs used in anesthesia for dentistry has increased from two to ten-fold over a four-year period, but prices of inhalational general anesthetics have been relatively stable.

Recovery

At the conclusion of the procedure for the pediatric dental patient, the drugs are turned off and the patient is allowed to breathe 100% oxygen. The pediatric patient is allowed to regain consciousness and recover completely. For the patient that had an open airway deep sedation or general anesthetic, the throat partition is simply removed and oxygen continued most often via nasal cannula.

There are different schools of thought on the proper time to extubate those patients that were intubated. Deep extubation has merit, as does conscious extubation, and each may be used on different patient populations or for different reasons. Deep extubation is performed during emergence when the child is deeply anesthetized and will not respond to the endotracheal tube being removed.

Conscious or awake extubation is when the tube is removed once a patient opens their eyes, lifts their head for five seconds, and breathes spontaneously with no residual muscle relaxant on board. It is still debated whether deep extubation versus awake extubation is the preferable technique to reduce the incidence of emergencies on emergence from anesthesia. Regardless of the technique, the overall incidence of adverse events is similar.

Once the patient has regained consciousness, they are observed for a period of time until they may be safely dismissed. For some deep sedation patients, that may be as short a time period as ten minutes, while for other pediatric dental patients and those who experienced a general anesthesia, the recovery time may exceed one hour. Pediatric dental patients usually recover fairly quickly from deep sedation or general anesthesia in the dental office, and they recover without significant upset or discomfort in the majority of cases. These patients have complete amnesia from shortly after the IM injection or mask induction through part of the recovery period. They generally experience no trauma directly related to the anesthesia.

Medical Emergencies

Dentist anesthesiologists handle medical emergencies in the dental setting by virtue of their training and by involving the office staff at each individual office where they administer anesthesia. It is the anesthesia provider's responsibility to ensure that the facility meets appropriate standards. Each state law also mandates minimum levels of equipment and facilities. The anesthesia provider must ensure immediate personal access to emergency drugs and equipment and always ensure that the office staff can provide basic life support and activate EMS. Every patient is monitored as if the patient was in a hospital setting. An ECG is always used and blood pressure, heart rate, respiratory rate and oxygen saturation are also monitored with pulse oximetry. Depending on the practitioner, procedure, type of airway chosen, and tidal carbon dioxide, a precordial stethoscope may be used. Emergency back-up lighting, oxygen, suction and monitors are brought to each facility with the anesthesia provider or are already fixed within the facility.

Summary

There are a variety of locations in which deep sedation and general anesthesia may be safely performed for pediatric dental patients, each with benefits and drawbacks. It is up to the pediatric dentist to make the choice. This chapter was intended to provide background information to facilitate that choice. It has emphasized different cost profiles and availability of both operating room time and mobile dentist anesthesiologists. There are different techniques for inducing and maintaining deep sedation and general anesthesia, different airway adjuncts that may be chosen, different drugs that may be used for maintaining deep sedation and general anesthesia, and different ways of recovering the pediatric dental patient from deep sedation or general anesthesia. The bottom line is that all options are correct. The important thing is not who administers the anesthetic or where, but that there remains the availability of obtaining anesthesia services for pediatric dental patients.

References

Albany Medical Center, St. Peter's Hospital, Albany, NY. A 2009 hospital statement.

Allen, D.L. (1992). The Future of Dental Education. *Anesthesia Progress*, 39, 1–3.

American Dental Association Council on Dental Education. (1972). Guidelines for teaching the comprehensive control of pain and anxiety in dentistry. *Journal of Dental Education*, 36, 62–67.

American Heart Association (2000). Part (6) Advanced Cardiovascular Life Support: Section 3: Adjuncts for Oxygenation, Ventilation, and Airway Control. *Circulation* 102, S1, 1–95.

American Society of Anesthesiologists House of Delegates. (1982). Statement regarding the administration of anesthesia by dentists. October 26.

American Society of Dentist Anesthesiologists. (2010). The necessity for advanced anesthesia services for dental care. http://www.asdahq.org/DentistAnesthesiologist/AboutASDADA.aspx.

American Society of Anesthesiologists Board of Directors. (1987). Statement supporting the right of qualified dentists as defined by the American Dental Association to utilize anesthesia for the management of dental patients. August 22.

Mass, R. (1993). Parenteral Sedation Education. *New York State Dental Journal*, 59, 67–70.

Matsuura, H. (1993). Modern History of Dental Anesthesia in Japan. *Anesthesia Progress*, 40, 109–113.

Olabi, N.F. et al. (2012). The Use of Office-Based Sedation and General Anesthesia by Board Certified Pediatric Dentists Practicing in the United States. *Anesthesia Progress*, 59, 12–17.

Peskin, RM. (1993). Dentists and Anesthesia: Historical and Contemporary Perspectives. *Anesthesia Progress*, 40, 1–13.

Rashewsky, S. et al. (2012). Time and Cost Analysis: Pediatric Dental Rehabilitation with General Anesthesia in the Office and the Hospital Settings. *Anesthesia Progress*, 59, 147–153.

Chapter 14

The Use of General Anesthesia in Behavior Management

Marcio A. da Fonseca

Travis Nelson

Most children can receive dental treatment through non-pharmacologic behavior management. However, some may benefit from pharmacologic adjuncts, such as general anesthesia (GA). GA is defined as a controlled state of unconsciousness accompanied by a loss of protective reflexes, including the ability to maintain an airway independently and respond purposefully to physical stimulation and verbal commands (American Academy of Pediatric Dentistry 2012). It does not require cooperation from the patient, and thus may be desirable in select cases (Table 14-1). GA allows delivery of dental care in a way that protects the developing psyche and promotes the establishment of a lifelong therapeutic relationship (Nelson 2013).

Dentists feel that today's children exhibit more challenging behaviors than in the past, which has created an increased demand for advanced behavior management, such as sedation and GA (Casamassimo et al. 2002, Wilson 2004). In a 2004 US study, 38% of pediatric dentists reported using GA services more often than they did in the previous five years, and 31% indicated that they would likely increase its use in the near future (Adair et al. 2004). Similarly, a recent retrospective study of specialty pediatric dental care in Sweden showed that the percentage of patients treated under GA has nearly doubled over the past twenty-five years (Klingberg et al. 2010). GA used to be one of the least desirable behavior management techniques, but over time parents have come to exhibit high levels of acceptance, with most agreeing to have their child treated in the operating room (OR) again if necessary (Savanheimo et al. 2005, Eaton et al. 2005, Amin et al. 2006). However, some parents may struggle to accept GA for their child's dental care, blaming themselves for placing the child at such risk (Amin et al. 2006). When the original edition of this book was published, GA for dentistry was mostly done as an in-patient hospital procedure. In developed countries, procedures under GA can now be safely accomplished at an outpatient surgical facility or a dental office, leading to a short recovery period, no overnight stay, and lower costs than in a hospital. However, in many countries GA is not performed outside the OR due to regulatory practices (Wilson and Alcaino 2011). The increased acceptance of dental care under GA may be explained by the public's familiarity with surgery provided on an outpatient basis. To accommodate this shift in practice, it is not uncommon to find dental anesthesiologists (i.e., dentists who have received formal training in anesthesiology) and nurse anesthetists working in the United States (Hicks et al. 2012). Unfortunately, patients from low- and middle-income countries face significant financial, cultural and structural barriers to access GA services, including distance to a surgical center; poor roads; lack of transportation; lack of facilities, equipment, and expertise; direct and indirect costs related to surgical care; and fear of undergoing GA (Grimes et al. 2011).

Although the use of GA is mostly uneventful, it is associated with greater morbidity and mortality than provision of dental care under local anesthetic (LA) or minimal sedation. Complications may include sore throat (14–64%), nausea and vomiting (20–30%), damage to the teeth (6.9%), and conscious awareness during the procedure (0.1–0.7%) (Jenkins and Baker 2003). Sleeping irregularities, vomiting, disruption of bodily functions, diarrhea, sore throat, bleeding, and mild to moderate pain are usually not significant enough to warrant medical attention (Mayeda and Wilson 2009), with most patients returning to their normal behavior within 24 hours (Needleman et al. 2008, Mayeda and Wilson 2009, Costa et al. 2011). For healthy individuals, the chance of death solely related to GA is estimated at approximately 1:100,000, increasing 5–10 times for high-risk patients and for emergency surgery (Jenkins and Baker 2003).

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

Table 14-1. Indications and Contraindications for GA. Copyright © 2012 American Academy of Pediatric Dentistry and reproduced with their permission.

Indications	Contraindications
Patients who cannot cooperate due to a lack of psychological or emotional maturity and/or mental, physical, or medical disability.	A healthy, cooperative patient with minimal dental needs.
Patients for whom local anesthesia is ineffective because of acute infection, anatomic variations, or allergy.	Predisposing medical conditions which would make general anesthesia inadvisable (e.g., malignant hyperthermia, unstable cardiac condition, poorly controlled cystic fibrosis).
Patients who are extremely uncooperative, fearful, anxious, or uncommunicative, including language barrier.	
Patients requiring significant surgical procedures.	
Patients for whom the use of GA may protect the developing psyche and/or reduce medical risk.	
Patients requiring immediate, comprehensive oral/dental care.	

Preoperative Considerations

Informed Consent

When preparing a family for GA, it is important to ensure that caregivers have enough information to make informed decisions. The dentist can facilitate this process through informed consent (IC). Unfortunately, studies of IC for GA show that parents often feel they are not adequately informed of its risks (Patel 2004, Shahid et al. 2008). In societies with a large influx of immigrants, cultural influences and language fluency must be taken into consideration when obtaining consent. Trained interpreters who have an understanding of cultural norms are very helpful in these situations. Family members, especially children, should not be used as interpreters. When children interpret, there is a reversal of power between them and their caretakers. Family members may also choose not to translate sensitive information, leading to potentially serious misunderstandings. It is crucial that the IC form and the preoperative instruction paperwork be written in the language spoken by the legal guardians. Although IC must be obtained from an adult in pediatric dentistry, it is important to consider the child's participation, or assent, in the process. Children between the ages of eight and thirteen years have shown a desire to be involved in discussions regarding their care and are highly satisfied with the treatment they receive when they are involved (Adewumi et al. 2001).

History And Physical Examination

To prevent problems during the delivery of GA, the dentist must gather a detailed medical history for the child and decide which venue is appropriate for the surgery, given the patient's health status. For example, if the child is healthy, then dental care under GA is safe to be carried out at an outpatient facility. If the child has severe systemic disease, treatment should be done where there is ample and immediate medical care available to support an emergency situation. All patients must undergo a history and physical examination (H&P) within thirty days of the procedure. For healthy children, it is not uncommon to have the exam done by the anesthesiologist on the day of the surgery. Given their higher risk for complications, patients with special health care needs should have the H&P done by a physician who is thoroughly familiar with their health issues. It is imperative that the dentist discuss concerns related to the delivery of dental care with the physician and the anesthesiologist to anticipate complications (e.g., bleeding in a child with hemophilia). To facilitate comprehensive planning, many hospitals have a preanesthesia evaluation service in which all involved parts are consulted so that the patient, family, physicians, anesthesia care team, and dentist understand how the child will be cared for.

Preoperative Pain Management

Pediatric patients experience pain with equal or greater intensity as their adult counterparts (Cramton and Gruchala 2012). Dentists should educate themselves on accurate assessment of pain, as well as pharmacologic and non-pharmacologic methods of pain management. When that is not adequate, the child may suffer long-term consequences regarding future pain reactions (Cramton and Gruchala 2012).

A substantial percentage of children may experience moderate pain or worse following procedures under GA. Even though post-operative pain is the most common parental concern, many patients do not receive adequate analgesia (American Academy of Pediatrics 2001, Atan et al. 2004). Health care professionals and

parents under-medicate children post-operatively, often due to misconceptions (Rony et al. 2010, Cramton and Gruchala 2012). Socio-economic status also seems to influence pain perception, with parents who have less education being more likely to report post-procedural pain for their children (Needleman et al. 2008). Therefore, good post-operative pain control starts before surgery. Providing tailored interventions to improve a caretaker's knowledge of analgesia at an earlier stage and allowing ample time for discussion may improve parental attitude (Rony et al. 2010, Jensen 2012).

Preoperative Child Anxiety

Although GA is typically a humane and effective way to provide dental care, the surgical experience may have a negative psychological effect on some children. Between 50% and 75% of pediatric patients who undergo ambulatory surgery in the United States each year experience significant fear and anxiety (Kain et al. 1996c, Kotiniemi et al. 1997, Tzong et al. 2012). Thus, the anesthesia care team should anticipate and treat anxiety as part of the OR experience.

Preoperative fear may result from a child's concerns about separation, pain, disfigurement, loss of loved ones, and loss of control or autonomy. Alterations of the family's routine, wearing unfamiliar clothing (i.e, surgical gowns), and experiencing unknown equipment, sights, sounds, and smells also increase stress (Justus et al. 2006). Anxiety frequently causes resistance to the anesthesia mask, prolongs induction, and may require physical restraint of the child. Children may have specific fears of the mask (e.g., inability to breathe, claustrophobia, concerns about dying or not waking up), aversion (dislike of the feel or odor of the mask), and/or a true phobia (an irrational fear of the mask) (Przybylo et al. 2005, Aydin et al. 2008). Furthermore, a complex interplay of genetic and environmental influences determines how each child will respond to the OR experience. Shyness, passive coping style, high baseline anxiety, high parental anxiety, previous upsetting surgical experiences, and male gender are factors associated with anxiety and disruptive behavior in relation to the GA visit (Melamed et al. 1988, Quinonez et al. 1997, Kain et al. 2000b). Age should also be considered, as children between the ages of one and five years appear to be at highest risk for developing significant anxiety before surgery (Lumley et al. 1993, Kain et al. 1996b, c).

Other factors that may contribute to increased levels of anxiety include many people present during induction, a long waiting time between arrival at the facility and induction, having a mother who does not practice a religion, and negative memories of hospital experiences (Wollin et al. 2003). Playing at home with an anesthesia mask was shown to relieve mask-related anxiety, improving its acceptance and shortening the induction period (Aydin et al. 2008).

Preoperative Pharmacological Interventions to Reduce Anxiety

Induction of anesthesia appears to be the most stressful point of the entire GA experience (Kain et al. 1996c, Kain et al. 1998). Up to 25% of children cry, scream, try to avoid the anesthesia mask, and/or require restraint (Lumley et al. 1993, Kain et al. 1999). The principal pharmacological approach to facilitate induction of fearful patients is the use of sedative premedication. While other agents are available, midazolam is the most extensively researched pre-induction sedative, showing an effective anxiety reduction in the one to ten year age group, especially the most anxious children (Kain et al. 2004). It may also cause amnesia, which is desirable should the induction prove to be difficult (Stewart et al. 2006). However, a paradoxical negative response to midazolam may occur, especially in children with impulsive temperament (Roelofse and Joubert 1990, Wright et al. 2007). Midazolam may also cause delay in anesthetic emergence, recovery, and discharge as well as an increase in anxiety immediately following surgery (Viitanen et al. 1999a, b, Wright et al. 2007).

Preoperative Non-Pharmacological Interventions to Reduce Anxiety

Parental Presence During Induction

The practice of allowing parents to be present for their child's induction is a highly debated topic. Suggested benefits of parental presence include eliminating separation anxiety, minimizing premedication use, increasing child cooperation, enhancing parental satisfaction, fulfilling parents' perceived sense of duty to be present, and enhancing parental satisfaction with the medical care provided (Kain et al. 2003, Wright et al. 2007). Anesthesia care teams in the United States have increasingly allowed parental presence at induction (Kain et al. 2004). The presence of a calm parent is typically beneficial for an anxious child, whereas an anxious parent does not improve child behavior (Cameron et al. 1996, Kain et al. 1996a, Kain et al. 2006). Unfortunately, those who most desire to be present have higher levels of anxiety and tend to have more anxious children than parents who are not as interested in participation at induction (Caldwell-Andrews et al. 2005). When provided in the right context, both premedication and parental presence appear to improve child behavior

(Kain et al. 1996c, Kain et al. 2000a). However, it should be recognized that some parents may experience unpleasant feelings related to the child's induction (Mayeda and Wilson 2009).

Preoperative Preparation Programs

The goal of these programs is to provide information for the patient and the caretakers about the process (through OR tours, print materials, audiovisual methods, websites), model the experience (using videos or puppet shows), and teach coping strategies (with Child Life counselors), using age-appropriate language and imagery (Wright et al. 2007). Children who receive these interventions tend to exhibit less pre-surgical anxiety, even upon separation from their parents (Kain and Caldwell-Andrews 2005, Wright et al. 2007). Many factors should be considered when selecting a program, one of the most important being the child's age. According to Piaget's theory of cognitive development, children from three to six years (the preoperational stage of development) are not able to think logically: thus, preoperative preparation may have negative effects for them (Brewer et al. 2006). In contrast, children from seven to seventeen years have a strong desire for and benefit from comprehensive information, including details on postoperative pain (Kain et al. 1996b, Fortier et al. 2009). Timing of preparation is also important-- the patient must be allowed to adequately process what was discussed. Children younger than six years should receive preparation no more than one week in advance, while older children benefit most if they are given information more than five days before surgery (Perry et al. 2012). Children with a history of surgical procedures who did not benefit from modeling and play programs should be enrolled in programs that teach coping skills before their next GA procedure (Kain et al. 1996b, Kain et al. 2005).

Parental anxiety is a significant risk factor for child anxiety; thus, caretakers should also receive preoperative information. Preparation may be even more critical in day surgery than for inpatient procedures. Parents whose children will have outpatient surgery experience greater anxiety because the surgery unit provides little time to become accustomed to its environment (Mishel 1983). Caretakers who participate in pre-surgical programs exhibit decreased anxiety and show higher levels of satisfaction with the overall quality of care (Chan and Molassiotis 2002, Felder-Puig et al. 2003). Unfortunately, the benefits of these programs do not appear to extend to high-stress periods such as anesthetic induction, recovery, or even at 2 weeks postoperatively (Kain et al. 1996b, Kain and Caldwell-Andrews 2005, Wright et al. 2007).

Preoperative Dental and Surgical Plan

Given the high costs and possible complications of GA, and the fact that most children treated in the OR are high caries risk, an aggressive treatment approach is usually advocated. For example, using stainless steel crowns (SSC) for full coronal coverage in teeth with extensive decalcification should be considered. In dental care under GA, SSCs have a significantly lower failure rate than amalgams, while composites and composite strip crowns have the highest failure (Tate et al. 2002, Al-Eheideb and Herman 2003, Drummond et al. 2004). The tentative treatment plan should consider all potential scenarios, parental compliance with oral care, and longevity of the restorations.

The family must understand that the plan may change on the day of the procedure, particularly if no recent radiographs are available or if there is a long waiting period to schedule the OR visit. All possible treatments should be discussed in detail, including the appearance of the proposed materials, so as not to take the caretakers by surprise after the procedure is complete. For example, if crowns are planned for the maxillary primary incisors, it is wise to make the family aware that the teeth may need to be extracted if they are found to be abscessed or if too little tooth structure remains after caries removal. Additionally, financial issues, such as the potential need for pre-authorization from the medical and dental insurance companies, must be addressed.

Preoperative Call to the Family

A few days before the patient's scheduled appointment, a staff person from the surgery center will call the family to discuss the plan for the day. Preoperative fasting guidelines (Table 14-2) should be discussed in detail both verbally and in writing (Apfelbaum et al. 2011). Fasting is crucial to reduce the severity of complications related to perioperative pulmonary aspiration of gastric content, to avoid delays or cancellation of the procedure, to decrease risk of dehydration or hypoglycemia from prolonged fasting, and to minimize perioperative morbidity such as aspiration pneumonia and respiratory disabilities (Apfelbaum et al. 2011).The time and location of the appointment, and payment and surgical pre-authorization information should also be reviewed. If the H&P was to be performed by a physician prior to the day of surgery, it is important to verify that the documentation clearing the patient for GA has been received. A second change of clothes should be brought in case the child soils those he is wearing. If the parent is planning to drive, a second adult should accompany them to ensure the child's safety on the way home. Patients who have been sedated are at risk for

Table 14-2. Pre-operative Fasting Recommendations for Healthy Patients Undergoing Elective Procedures (Apfelbaum et al. 2011). Reproduced with permission from Lippincott Williams & Wilkins.

Ingested material	Minimum fasting period
Clear liquids*	2 hours
Breast milk	4 hours
Infant formula	6 hours
Nonhuman milk	6 hours
Light meal**	6 hours

*Water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee.

**Typically consists of toast and clear liquids.

post-procedural airway blockage and loss of head-righting reflex (Martinez and Wilson 2006), so the child should lie on the side in the car instead of on the back to avoid aspiration of gastric contents in case of vomiting. With a second adult present to assist the child, the driver can focus on the road.

Perioperative Considerations

Upon arrival at the surgical facility, the child is given an identification bracelet. Some surgical centers will give the child a surgical gown, while others allow the child to be induced in their own clothes. A staff person, usually a nurse, takes the vital signs, height, and weight, and inquires about fasting and whether anything has changed since the H&P was completed, such as recent colds or asthma attacks. If the patient has a fever, wheezing, cough, runny nose, or has been exposed to a contagious or infective disease, the procedure may be cancelled. If the patient has violated the fasting recommendations, the procedure may be either cancelled or postponed to a later time on the same day to allow for emptying of gastric contents.

Once the admission assessment is complete, the anesthesiologist meets with the family in order to:

1. prepare the patient for anesthesia, determine the child's health status and prescribe a plan of care;
2. evaluate tonsil size (Brodsky 1989) and potential intubation issues (Mallampati et al. 1985);
3. determine that the fasting requirements have been followed;
4. assess the need for a pre-operative sedative;
5. discuss placement of an intravenous (IV) line for fluid maintenance, route of intubation, anesthetic agents, and the peri- and post-operative pain management plan;
6. review the risks and management of complications related to GA;
7. obtain GA consent (the legal guardians should be given time to read the form and ask questions before signing it);
8. determine whether the caretakers will be allowed to be present during the induction phase and how the separation is to take place. In case their presence is allowed, they must be told the order in which the events will occur, the normal physiological and emotional reactions the child may display, what they will be expected to do, and when they will leave the room.

After the anesthesia evaluation, the pre-operative sedative (if warranted) is ordered for the nurse to administer right away. The dentist then meets with the family and child to review the preliminary treatment plan. Once all questions are clarified, the dental consent form can be signed. Questions about post-operative diet and dental pain management can be deferred until after the treatment is completed. Many parents inquire about whether the dentist will come out to discuss the clinical findings before starting the procedure. To keep the child under GA for the least amount of time to decrease risks and costs, it is better to do so only if there is an unusual finding that may alter the treatment plan significantly or if further consent is necessary. A pre-operative progress note should be written in the patient's chart, documenting the encounter.

Intraoperative Considerations

The patient is brought into the OR, where identification is checked again. After GA induction, which is most commonly done with a facial mask, is completed, the caretaker is escorted out, padding is placed under pressure points, the patient is secured on the operating bed with safety straps, and an IV line is established for fluid maintenance. The most common calculation used for fluid therapy in pediatrics is the "4-2-1 rule" (Oh 1980). Administering either normal saline or lactated Ringer's solution is important to replace fasting deficits and ongoing losses during the procedure to maintain cardiovascular stability (Murat and Dubois 2008, Bailey et al. 2010). Routine dextrose administration is no longer advised for healthy children (Bailey et al. 2010).

Intranasal endotracheal intubation is preferred in dentistry because it leaves more working room in the oral cavity. However, the anesthesiologist may choose to do an intraoral intubation due to difficulty passing the tube through the nares (e.g., in cases of nasal atrophy such as seen in epidermolysis bullosa dystrophica) or due to a medical concern (e.g., causing intranasal bleeding in a child with hemophilia or rupturing a

repaired cleft palate tissue flap). Patients who may present atlanto-axial instability (e.g., Down syndrome) or bone fragility (e.g., osteogenesis imperfecta) should have minimal manipulation of the neck, avoiding hyperextension during both intubation and dental care because of the high risk of fractures and/or spinal cord compression (Butler et al. 2000, Cohen 2006, Hankinson and Anderson 2010). Patients with craniofacial syndromes also pose a great challenge for intubation, due to their limited airway access (Butler et al. 2000).

Following intubation, the patient's body is draped, the eyes are protected, a shoulder roll is placed, and a towel is wrapped around the child's head to protect the hair from debris and to secure the endotracheal tube. During the procedure, the dentist must be mindful to not dislodge the endotracheal tube. A time-out should be called to identify the child one more time, introduce all staff assigned to the case and their roles, and review the anesthesia plan, the pain management plan, and the dental procedure. The dentist should perform a cursory dental exam to determine the type of radiographs needed (if recent films are not available), which will be obtained next using lead protection. A throat pack should be placed, followed by a dental cleaning and a detailed oral and dental exam to define the treatment plan. Rubber dam isolation and a mouth prop should be used throughout the procedure to protect the soft tissues, and all restorative procedures should be accomplished before extractions to keep the operating field as clean and dry as possible. Impressions for oral appliances can be taken at any time during the procedure. It is not uncommon to observe intra- and post-operative angioedema of the oral tissues, including the tongue, due to sensitivity and extensive oral manipulation.

Fifteen minutes before the end of the procedure, the anesthesiologist should be warned to start preparing the patient to emerge from GA. When all dental care is complete, the oral cavity and the face are cleaned, fluids and debris are suctioned out of the mouth, fluoride is applied, the throat pack is removed, and all extracted teeth, needles, sutures, instruments and gauze used in the case must be accounted for. Another time-out should take place to review the post-operative care plan and any unexpected events that occurred during the procedure. The patient may be extubated in the OR or in the Post-Anesthesia Care Unit (PACU), depending on his status and the anesthesiologist's preference. The anesthesiologist and the dentist must write orders for the PACU staff as well as for home care, including pain management, oral hygiene instructions, diet, follow-up appointment plan, and contact numbers in case of questions or an emergency. The procedure must be documented in detail in the patient's dental or medical chart, including the justification for the procedure, findings, type and number of radiographs, all materials used, which procedures were done per tooth, estimated blood loss, location and amount of injection of LA, complications, etc. The patient is taken to the PACU by the anesthesia care team, who is also responsible for monitoring and supporting the child during transport. Both the anesthesiologist and the dentist must do a verbal transfer of care to a PACU nurse, reviewing what transpired in the OR as well as the post-procedural orders and follow-up plan.

Postoperative Considerations

It is best to meet with the family in a private area before they are invited to the PACU, where they will focus on the child and not pay full attention to the post-operative discussion. The dentist should start by reassuring them that the child is doing well, and proceed to discuss:

1. the dental treatment performed;
2. location of numbness and expected duration, instructing the family to watch the child carefully to avoid traumatic biting;
3. expected amount and length of bleeding, instructing the family on how to avoid prolonging it (e.g., not sucking through a straw for a few days);
4. suture removal, if necessary;
5. pain management at home;
6. diet—very light meals and lots of fluids on the first day, followed by soft foods for a few more days depending on the treatment;
7. oral hygiene—clarify when to resume toothbrushing and how often;
8. prevention counseling (diet, oral hygiene, frequency of dental visits, supplemental fluoride);
9. when to return to normal activities (school, sport practices, etc.);
10. common post-operative complications;
11. who to call in case of questions or emergencies;
12. when the next dental appointment will take place.

The patient will be offered popsicles and liquids to help enhance the hydration process so that the IV line can be disconnected as soon as possible. The anesthesiologist is responsible for the discharge of the patient; if one is not available, the PACU nurse can make that determination. The most common discharge criteria include the child's ability to hold fluids and light foods without vomiting, to void, to be at least somewhat alert, and to ambulate, even if assisted. It is good practice to have a surgical staff member or the dentist call the family within 12–24 hours for a post-operative check.

Postoperative Pain Management

Pain tends to be more severe when a high number of dental procedures are performed (Atan et al. 2004, Needleman et al. 2008). SSCs and pulpotomies cause more distress than extractions or other types of restorative work (Mayeda and Wilson 2009, Costa et al. 2011). It is important to control pain as rapidly as possible, with analgesic doses titrated according to the patient's response. Early effective treatment is safer and more efficacious than delayed treatment, and results in improved comfort and possibly less total administered medication. Overall, patients' discomfort is mild and of short duration (Mayeda and Wilson 2009, Costa et al. 2011, Jensen 2012) and sometimes pain is not even reported (Vinckier et al. 2001). However, more than one-third of children who receive dental care under GA may experience moderate to severe pain (Atan et al. 2004, Hosey et al. 2006). In such cases, continuous or around-the-clock dosing at fixed intervals is recommended. Before prescribing analgesics, it is important to confer about the anesthesiologist's pain management plan, in order for the child to receive the correct amount of medication. Oral administration of ibuprofen alone or combined with paracetamol (acetaminophen) decreased the mean pain and distress scores in children compared to paracetamol alone (Gazal and Mackie 2007). In contrast, paracetamol, ibuprofen and LA used together did not decrease distress in young children having extractions under GA (McWilliams and Rutherford 2007). Children who receive over the counter analgesics the day after the procedures show less pain in the first week (Costa et al. 2011). Sadly, parental adherence to the dentist's analgesic recommendations following extractions under GA is poor (Jensen 2012). The most commonly prescribed analgesics in pediatrics are described in Table 14-3.

The other controversial issue in dental care under GA is the need for LA. In cases of oral surgical procedures, it is not unusual to inject LA for two reasons: (1) to numb the tissues to minimize discomfort at recovery, and (2) to help control bleeding through the action of vasoconstrictors. LA reduced postoperative pain but increased dizziness in one study (Atan et al. 2004). In contrast, LA reduced bleeding but not pain in the early recovery period (McWilliams and Rutherford 2007, Townsend et al. 2009) and led to a higher incidence of cheek and lip biting compared to children who did not receive it (Townsend et al. 2009). The use of resorbable hemostatic sponges in the socket and/or sutures is also commonly used to control bleeding.

Effects of Dental Care Under GA on the Patient and the Family

Dental treatment under GA can improve a child's quality of life (QoL) through reduction of pain, improved eating and sleeping, better acceptance of supervised toothbrushing, improved behavior, and increased concentration at school (Anderson et al. 2004, Amin and Harrison 2007, Klaassen et al. 2009). Families also report improvement in their QoL as a whole because of fewer parental sleep disturbances, less attention required by the child, fewer financial difficulties and fewer days off work to attend to the child's dental needs (Anderson et al. 2004, Thomson and Malden 2011).

The high levels of parental satisfaction with dental care provided under GA may initially lead to some positive behavioral changes, such as understanding the importance of a healthy primary dentition, improving dental health practices, and reducing sugar consumption and snacking (Anderson et al. 2004, Amin et al. 2006). However, many caretakers do not follow the preventive advice given before and after the procedure (Amin and Harrison 2007, Peerbhay 2009, Olley et al. 2011). A parental sense of "fatalism" is a major barrier to positive changes. They may feel as though they do not have the ability to control their child's oral health, which may be linked to factors such as their own poor oral

Table 14-3. Most Commonly Prescribed Analgesics for Children (Cramton and Gruchala 2012, Sohn et al. 2012, Wilson and Ganzberg 2013).

Drug	Route	Dose	Remarks
Acetaminophen	oral	10–15 mg/kg q4–6 h	total dose from all sources not to exceed 100 mg/kg for children and 75 mg/kg for infants or 5 doses in 24 hours for all pediatric patients
	rectal	20 mg/kg q4–6 h	
Ibuprofen	oral	4–10 mg/kg q6–8 h	maximum: 40 mg/kg/day
Naproxen	oral	5–7 mg/kg q8–10 h	
Codeine	oral	0.5–1 mg/kg q4–6 h	maximum: 60 mg/dose
Acetaminophen with codeine	oral	3–6 yr olds: 5 ml (12 mg codeine) q4–6 h 7–12 yr olds: 10 ml (24 mg codeine) q4–6 h	

care, lack of knowledge about oral health, limited financial resources and time, and lack of access to care (Peerbhay 2009, Karki et al. 2011, Olley et al. 2011). Some do not see the importance of preventive practices at home and fail to keep appointments (Roberts et al. 1990). Thus, parental readiness to change is an important predictor of whether they will engage in preventive behaviors over time (Amin and Harrison 2007).

A child's preoperative fear and anxiety may be perpetuated by the GA experience itself. Children who are anxious before surgery were found to have a 3.5 times greater risk for development of negative postoperative behavioral changes. Some problems persisted for up to one year in 7.3% of children who had outpatient GA (Kain et al. 1996a). Recent reports indicate that there may be adverse neurocognitive consequences of GA in young children with developing brains. There is some controversy surrounding these findings, and the behavioral implications for GA care are not yet clear (International Anesthesia Research Society 2012). Furthermore, having dental care under GA does not seem to improve the child's previous uncooperative behavior (Savanheimo et al. 2005, Amin and Harrison 2007, Klaassen et al. 2009), although not all studies agree (O'Sullivan and Curzon 1991, Al-Malik and Al-Sarheed 2006). Nevertheless, positive experiences and appointments focused primarily on preventive treatment may facilitate the child's acceptance of dental care in the office (Savanheimo et al. 2005, Klaassen et al. 2009).

Caries Prevention and Recurrence Rates After Treatment Under GA

Most studies report a low follow-up rate, both immediately after the GA appointment and long-term, with many returning only when they have a problem (Peerbhay 2009, Olley et al. 2011, Kakaounaki et al. 2011). Perhaps the dentist contributes to the patient's poor compliance due to a personal sense of fatalism (there is no known effective prevention for ECC), misconceptions (these parents are not interested in their child's oral health) and/or unrealistic expectations (counseling low-income families to eat healthy foods, which can be very expensive).

All these factors create a vicious cycle that leads to low oral health care support in children with early childhood caries (ECC). Many parents complain that the dental team did not offer a plan for continued care after GA (Anderson et al. 2004, Olley et al. 2011), and even those who brought their children regularly reported that preventive advice and interventions were poor (Peerbhay 2009, Olley et al. 2011, Karki et al. 2011). To further complicate matters, dentists seem to prefer operative appointments for uncooperative children with ECC, rather than focusing on prevention (Savanheimo and Vehkalahti 2008). However, children with ECC do not seem to respond to conventional or increased preventive care, which is dependent on regular attendance to the dental office (Almeida et al. 2000, Jamjoom et al. 2001, Amin et al. 2010). Intensive preventive care produced no decrease in new carious lesions in high risk patients compared to a basic prevention program, which involved less effort and lower costs (Hausen et al. 2000). Dental retreatment was prevalent even for children who complied with follow-up evaluations, despite a statistically significant improvement in plaque, gingival and mutans streptococci scores (Primosch et al. 2001).

Aggressive dental surgery for ECC may not result in acceptable clinical outcomes—that is, prevention of new carious lesions. It is possible that these patients are affected by more virulent strains of caries-producing bacteria. Recurrent caries are usually evident within a few months of the procedure, with many patients returning for further treatment under GA (Foster et al. 2006, Jamieson and Vargas 2007, Olley et al. 2011). Some studies were able to identify predictors for a child's repeat visit to the OR (Sheller et al. 2003, Kakaounaki et al. 2011), but others failed to discriminate influences on predicting compliant behavior (Primosch et al. 2001).

Innovative, family-centered, evidence-based interventions that address the social determinants of dental caries are needed to prevent dental disease (Amin and Harrison 2007, Olley et al. 2011). Dietary and preventive advice should be provided to the extended family because it is not realistic to expect a change in the diet of one child alone. Furthermore, low income children, who comprise the largest share of the population affected by ECC, face many barriers regarding food insecurity, housing instability and access to dental care (da Fonseca 2012). Moreover, all these issues lead to maternal depression, which is associated with decreased positive parenting behaviors, including dental care (Kavanaugh et al. 2006). Oral health programs should be ongoing—they should not only be a snapshot in time. Counseling should be tailored to an individual parent's stage of change and readiness (Amin and Harrison 2007).

Summary

While most children can receive dental treatment through non-pharmacologic behavior management, some may benefit from GA. The use of GA to provide dental care has dramatically increased in the past thirty years due to increased access to anesthesia services, child behavioral concerns and parent preferences. Delivering care safely under GA requires firm adherence to protocol and an appreciation for the strengths

and limitations of individual surgical venues. While relatively atraumatic, a significant portion of children who undergo surgery have preoperative fear and anxiety. By considering child-specific conditions and interventions such as parental presence, pre-surgery preparation, and premedication, it may be possible to limit adverse psychological effects of the surgical experience. While GA allows the dental team to address oral health needs, it does not change the behaviors that caused the conditions. Relapse following GA is common; thus, clinicians should work together with families to improve post-operative outcomes.

References

Adair, S. et al. (2004). A survey of members of the American Academy of Pediatric Dentistry on their use of behavior management techniques. *Pediatric Dentistry*, 20, 159–166.

Adewumi, A., Hector, M.P., King, J.M. (2001). Children and informed consent: a study of children's perceptions and involvement. *British Dental Journal*, 191, 256–259.

Al-Eheideb, A.A. and Herman, N.G. (2003). Outcomes of dental procedures performed on children under general anesthesia. *Journal of Clinical Pediatric Dentistry*, 27, 181–183.

Al-Malik, M.I. and Al-Sarheed, M.A. (2006). Comprehensive dental care of pediatric patients treated under general anesthesia in a hospital setting in Saudi Arabia. *Journal of Contemporary Dental Practice*, 7, 79–88.

Almeida, A.G. et al. (2000). Future caries susceptibility in children with early childhood caries following treatment under general anesthesia. *Pediatric Dentistry*, 22, 302–306.

American Academy of Pediatric Dentistry Reference Manual. (2012). Guideline on behavior guidance for the pediatric dental patient. *Pediatric Dentistry*, 34, 170–182.

American Academy of Pediatrics Committee on Psychosocial Aspects of Child and Family Health and Task Force on Pain in Infants, Children and Adolescents. (2001). The assessment and management of acute pain in infants, children, and adolescents. *Pediatrics*, 108, 793–797.

Amin, M.S., Harrison, R.L., Weinstein, P. (2006). A qualitative look at parents' experience of their child's dental general anaesthesia. *International Journal of Paediatric Dentistry*, 16, 309–319.

Amin, M.S. and Harrison, R.L. (2007). A conceptual model of parental behavior change following a child's dental general anesthesia procedure. *Pediatric Dentistry*, 29, 278–286.

Amin, M.S., Bedard, D., Gamble, J. (2010). Early childhood caries: recurrence after comprehensive dental treatment under general anesthesia. *European Archives of Paediatric Dentistry*, 11, 269–273.

Anderson, H.K., Drummond, B.K., Thomson, W.M. (2004). Changes in aspects of children's oral-health-related quality of life following dental treatment under general anaesthesia. *International Journal of Paediatric Dentistry*, 14, 317–325.

Apfelbaum, J.L. et al. (2011). Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures. An updated report by the American Society of Anesthesiologists (ASA) Committee on Standards and Practice Parameters. *Anesthesiology*, 114, 495–511.

Atan, S. et al. (2004). Morbidity following dental treatment of children under intubation general anesthesia. *International Journal of Paediatric Dentistry*, 14, 9–16.

Aydin, T. et al. (2008). Do not mask the mask: use it as a premedicant. *Pediatric Anesthesia*, 18, 107–112.

Bailey, A.G. et al. (2010). Perioperative crystalloid and colloid fluid management in children: where are we and how did we get here? *Anesthesia & Analgesia*, 110, 375–390.

Brewer, S. et al. (2006). Pediatric anxiety: child life intervention in day surgery. *Journal of Pediatric Nursing*, 21, 13–22.

Brodsky, L. (1989). Modern assessment of tonsils and adenoids. *Pediatric Clinics of North America*, 36, 1551–1569.

Butler, M.G. et al. (2000). Specific genetic diseases at risk for sedation/anesthesia complications. *Anesthesia & Analgesia*, 91, 837–855.

Caldwell-Andrews, A.A. et al. (2005). Motivation and maternal presence during induction of anesthesia. *Anesthesiology*, 103, 478–483.

Cameron, J.A., Bond, M.J., Pointer, S.C. (1996). Reducing the anxiety of children undergoing surgery: parental presence during anesthetic induction. *Journal of Paediatric Child Health*, 32, 51–56.

Casamassimo, P.S., Wilson, S., Gross, L. (2002). Effects of changing U.S. parenting styles on dental practice: perceptions of diplomates of the American Board of Pediatric Dentistry. *Pediatric Dentistry*, 24, 18–22.

Chan, C.S. and Molassiotis, A. (2002). The effects of an educational programme on the anxiety and satisfaction level of parents having parent present induction and visitation in a postanesthesia care unit. *Paediatric Anaesthesiology*, 12, 131–139.

Cohen, W.I. (2006). Current dilemmas in Down syndrome clinical care: celiac disease, thyroid disorders, and atlantoaxial instability. *American Journal of Medical Genetics Part C (Seminars in Medical Genetics)*, 142C, 141–148.

Costa, L.R. et al. (2011). Factors related to postoperative discomfort in young children following dental rehabilitation under general anesthesia. *Pediatric Dentistry*, 33, 321–326.

Cramton, R.E.M. and Gruchala, N.E. (2012). Managing procedural pain in pediatric patients. *Current Opinion in Pediatrics*, 24, 530–538.

da Fonseca, M.A. (2012). The effects of poverty on children's development and oral health. *Pediatric Dentistry*, 34, 32–38.

Drummond, B.K. et al. (2004). Outcomes two, three and four years after comprehensive care under general anaesthesia. *New Zealand Dental Journal*, 100, 32–37.

Eaton J.J. et al. (2005). Attitudes of contemporary parents toward behavior management techniques used in pediatric dentistry. *Pediatric Dentistry*, 27, 107–113.

Felder-Puig, R. et al. (2003). Using a children's book to prepare children and parents for elective ENT surgery. *International Journal of Pediatric Otorhinolaryngology*, 67, 35–41.

Fortier, M.A. et al. (2009). Children's desire for perioperative information. *Anesthesia & Analgesia*, 109, 1085–1090.

Foster, T. et al. (2006). Recurrence of early childhood caries after comprehensive treatment with general anesthesia and follow-up. *Journal of Dentistry for Children*, 73, 25–30.

Gazal, G. and Mackie, I.C. (2007). A comparison of paracetamol, ibuprofen or their combination for pain relief following extractions in children under general anaesthesia: a randomized controlled trial. *International Journal of Paediatric Dentistry*, 17, 169–177.

Grimes, C.E. et al. (2011). Systematic review of barriers to surgical care in low-income and middle-income countries. *World Journal of Surgery*, 35, 941–950.

Hankinson, T.C. and Anderson, R.C.E. (2010). Craniovertebral junction abnormalities in Down syndrome. *Neurosurgery*, 66(3 Suppl), 32–38.

Hausen, H., Karkkainen, S., Seppa, L. (2000). Application of high-risk strategy to control dental caries. *Community Dental and Oral Epidemiology*, 28, 26–34.

Hicks C.G. et al. (2012) Demand in pediatric dentistry for sedation and general anesthesia by dentist anesthesiologists. *Anesthesia Progress*, 59, 3–11.

Hosey, M.T. et al. (2006). Dental anxiety, distress at induction and postoperative morbidity in children. *British Dental Journal*, 200, 39–43.

International Anesthesia Research Society. (2012). Consensus Statement on the Use of Anesthetics and Sedatives in Children. www.SmartTots.org. Accessed on January 29, 2013.

Jamieson, W.J. and Vargas, K. (2007). Recall rates and caries experience of patients undergoing general anesthesia for dental treatment. *Pediatric Dentistry*, 29, 253–257.

Jamjoom, M.M. et al. (2001). Dental treatment under general anaesthesia at a hospital in Jeddah, Saudi Arabia. *International Journal of Paediatric Dentistry*, 11, 110–116.

Jenkins, K. and Baker, A.B. (2003). Consent and anaesthetic risk. *Anaesthesia*, 58, 962–984.

Jensen, B. (2012). Post-operative pain and pain management in children after dental extractions under general anesthesia. *European Archives of Paediatric Dentistry*, 13, 119–125.

Justus, R. et al. (2006). Preparing children and families for surgery: Mount Sinai's multidisciplinary perspective. *Pediatric Nursing*, 32, 35–43.

Kain, Z.N. et al. (1996a). Parental presence during induction of anesthesia. A randomized controlled trial. *Anesthesiology*, 84, 1060–1067.

Kain, Z.N., Mayes, L.C., Caramico, L.A. (1996b). Preoperative preparation in children: a cross-sectional study. *Journal of Clinical Anesthesiology*, 8, 508–514.

Kain, Z.N. et al. (1996c). Preoperative anxiety in children. Predictors and outcomes. *Archives of Pediatrics & Adolescent Medicine*, 150, 1238–1245.

Kain, Z.N. et al. (1998). Parental presence during induction of anesthesia versus sedative premedication. *Anesthesiology*, 89, 1147–1156.

Kain, Z.N. et al. (1999). Distress during the induction of anesthesia and postoperative behavioral outcomes. *Anesthesia & Analgesia*, 88, 1042–1047.

Kain, Z.N. et al. (2000a). Parental presence and a sedative premedicant for children undergoing surgery: a hierarchical study. *Anesthesiology*, 92, 939–946.

Kain, Z.N. et al. (2000b). Social adaptability, cognitive abilities, and other predictors for children's reactions to surgery. *Journal of Clinical Anesthesiology*, 12, 549–554.

Kain, Z.N. et al. (2003). Parental intervention choices for children undergoing repeated surgeries. *Anesthesia & Analgesia*, 96, 970–975.

Kain, Z.N. et al. (2004). Trends in the practice of parental presence during induction of anesthesia and the use of preoperative sedative premedication in the United States, 1995–2002: results of a follow-up national survey. *Anesthesia & Analgesia*, 98, 1252–1259.

Kain, Z.N. and Caldwell-Andrews, A.A. (2005). Preoperative psychological preparation of the child for surgery: an update. *Anesthesiology Clinics of North America*, 23, 597–614.

Kain, Z.N. et al. (2006). Predicting which child-parent pair will benefit from parental presence during induction of anesthesia: a decision making approach. *Anesthesia & Analgesia*, 102, 81–84.

Kakaounaki, E., Tahmassebi, J.I., Fayle, S.A. (2011). Repeat general anesthesia, a 6-year follow up. *International Journal of Paediatric Dentistry*, 21, 126–131.

Karki, A.J., Thomas, D.R., Chestnutt, I.G. (2011). Why has oral health promotion and prevention failed children requiring general anaesthesia for dental extractions? *Community Dental Health*, 28, 255–258.

Kavanaugh, M. et al. (2006). Maternal depressive symptoms are adversely associated with prevention practices and parenting behaviors for preschool children. *Ambulatory Pediatrics*, 6, 32–37.

Klaassen, M.A., Veerkamp, J.S.J, Hoogstraten, J. (2009). Young children's oral health-related quality of life and dental fear after treatment under general anaesthesia: a randomized controlled trial. *European Journal of Oral Sciences*, 117, 273–278.

Klingberg, G. et al. (2010). Specialist paediatric dentistry in Sweden 2008—a 25-year perspective. *International Journal of Paediatric Dentistry*, 20, 313–321.

Kotiniemi, L.H., Ryhanen, P.T., Moilanen, I.K. (1997). Behavioural changes in children following day-case surgery: a 4-week follow-up of 551 children. *Anaesthesia*, 52, 970–976.

Lumley, M.A., Melamed, B.G., Abeles, L.A. (1993). Predicting children's presurgical anxiety and subsequent behavior changes. *Journal of Pediatric Psychology*, 18, 481–497.

Mallampati, S.R. et al. (1985). A clinical sign to predict difficult tracheal intubation: a prospective study. *Canadian Anaesthetists' Society Journal*, 32, 429–434.

Martinez, D. and Wilson, S. (2006). Children sedated for dental care: a pilot study of the 24-hour postsedation period. *Pediatric Dentistry*, 28, 260–264.

Mayeda, C. and Wilson, S. (2009). Complications within the first 24 hours after dental rehabilitation under general anesthesia. *Pediatric Dentistry*, 31, 513–519.

McWillimams, P.A. and Rutherford, J.S. (2007). Assessment of early postoperative pain and haemorrhage in young children undergoing dental extractions under general anaesthesia. *International Journal of Paediatric Dentistry*, 17, 352–357.

Melamed, B.G. and Ridley-Johnson, R. (1988). Psychological preparation of families for hospitalization. *Journal of Developmental & Behavioral Pediatrics*, 9, 96–102.

Mishel, M.H. (1983). Parents' perception of uncertainty concerning their hospitalized child. *Nursing Research*, 32, 324–330.

Murat, I. and Dubois, M.C. (2008). Perioperative fluid therapy in pediatrics. *Pediatric Anesthesia*, 18, 363–370.

Needleman, H.L. et al. (2008). Postoperative pain and other sequelae of dental rehabilitations performed on children under general anesthesia. *Pediatric Dentistry*, 30, 111–121.

Nelson, T. (2013). The continuum of behavior guidance. *Dental Clinics of North America*, 57, 129–143.

Oh, T.H. (1980). Formulas for calculating fluid maintenance requirements. *Anesthesiology*, 53, 351.

Olley, R.C. et al. (2011). Why are children still having preventable extractions under general anaesthetic? A service evaluation of a high caries risk group of children. *British Dental Journal*, 210, E13.

O'Sullivan, E.A. and Curzon, M.E. (1991). The efficacy of comprehensive dental care for children under general anesthesia. *British Dental Journal*, 171, 56–58.

Patel, A.M. (2004). Appropriate consent and referral for general anaesthesia—a survey in the Paediatric Day Care Unit, Barnsley DGH NHS Trust, South Yorkshire. *British Dental Journal*, 196, 275–277.

Peerbhay, F.B. (2009). Compliance with preventive care following dental treatment of children under general anaesthesia. *South African Dental Journal*, 64, 442, 444–445.

Perry, J.N., Hooper, V.D., Masiongale, J. (2012). Reduction of preoperative anxiety in pediatric surgery patients using age-appropriate teaching interventions. *Journal of Perianesthesia Nursing*, 27, 69–81.

Primosch, R.E., Balsewich, C.M., Thomas, C.W. (2001). Outcomes assessment an intervention strategy to improve parental compliance to follow-up evaluations after treatment of early childhood caries using general anesthesia in a Medicaid population. *Journal of Dentistry for Children*, 68, 102–108.

Przybylo, H.J., Tarbell, S.E., Stevenson, G.W. (2005). Mask fear in children presenting for anesthesia: aversion, phobia, or both? *Pediatric Anesthesia*, 15, 366–370.

Quinonez, R. et al. (1997). Temperament and trait anxiety as predictors of child behavior prior to general anesthesia for dental surgery. *Pediatric Dentistry*, 19, 427–431.

Roberts, G.J. (1990). Caries and the preschool child: treatment of the preschool child in a hospital service. *Journal of Dentistry for Children*, 18, 321–324.

Roelofse, J.A. and Joubert, J.J. (1990). Unpleasant sequelae of benzodiazepine sedation. *Anaesthesia*, 45, 890–891.

Rony, R.Y. et al. (2010). Parental postoperative pain management: attitudes, assessment, and management. *Pediatrics*, 125, e1372-e1378.

Savanheimo, N. et al. (2005). Reasons for and parental satisfaction with children's dental care under general anaesthesia. *International Journal of Paediatric Dentistry*, 15, 448–454.

Savanheimo, N. and Vehkalahti, M.M. (2008). Preventive aspects in children's caries treatments preceding dental care under general anesthesia. *International Journal of Paediatric Dentistry*, 18, 117–123.

Shahid, S.K. et al. (2008). Obtaining informed consent for children receiving dental care: a pilot study. *Primary Dental Care*, 15, 17–22.

Sheller, B. et al. (2003). Reasons for repeat dental treatment under general anesthesia for the healthy child. *Pediatric Dentistry*, 25, 546–552.

Sohn, V.Y., Zenger, D., Steele, S.R. (2012). Pain management in the pediatric surgical patient. *Surgical Clinics of North America*, 92, 471–485.

Stewart, S.H. et al. (2006). Effects of midazolam on explicit vs implicit memory in a pediatric surgery setting. *Psychopharmacology*, 188, 489–497.

Tate, A.R. et al. (2002). Failure rates of restorative procedures following dental rehabilitation under general anesthesia. *Pediatric Dentistry*, 24, 69–71.

Thomson, W.M. and Malden, P.E. (2011). Assessing change in the family impact of caries in young children after treatment under general anesthesia. *Acta Odontologica Scandinavica*, 69, 257–262.

Townsend, J.A., Ganzberg, S., Thikkurissy, S. (2009). The effect of local anesthetic on quality of recovery characteristics following dental rehabilitation under general anesthesia in children. *Anesthesia Progress*, 56, 115–122.

Tzong, K.Y. et al. (2012). Epidemiology of pediatric surgical admissions in US children: data from the HCUP. *Journal of Neurosurgical Anesthesiology*, 24, 391–395.

Viitanen, H. et al. (1999a). Premedication with midazolam delays recovery after ambulatory sevoflurane. *Anesthesia & Analgesia*, 89, 75–79.

Viitanen, H. et al. (1999b). Midazolam premedication delays recovery from propofol-induced sevoflurane. *Canadian Journal of Anaesthesiology*, 46, 766–771.

Vinckier, F. Gizani, S., Declerck, D. (2001). Comprehensive dental care for children with rampant caries under general anesthesia. *International Journal of Paediatric Dentistry*, 11, 25–32.

Wilson, S. (2004). Pharmacological management of the pediatric dental patient. *Pediatric Dentistry*, 26, 131–136.

Wilson, S. and Alcaino, E. (2011). Survey on sedation in paediatric dentistry: a global perspective. *International Journal of Paediatric Dentistry*, 21, 321–332.

Wilson, S. and Ganzberg, S.I. (2013). Pain perception control. In: *Pediatric Dentistry Infancy Through Adolescence*, (Eds P.S. Casamassimo, H.W. Fields, D.J. McTigue, A.J. Nowak), 5th ed. 98–104. Elsevier Saunders, St. Louis.

Wollin, S.R. et al. (2003). Predictors of preoperative anxiety in children. *Anaesthesia & Intensive Care*, 31, 69–74.

Wright, K.D., Stewart, S.H., Finley, G.A., et al. (2007). Prevention and intervention strategies to alleviate preoperative anxiety in children: a critical review. *Behavior Modification*, 31, 52–79.

Chapter 15

Management of Emergencies Associated with Pediatric Dental Sedation

Kenneth L. Reed

Amanda Jo Okundaye

Introduction

Medical emergencies, sometimes life-threatening, can and do occur in the pediatric dental office. While one generally thinks of these as affecting the patient, many medical emergencies occur to others in the dental office such as parents or caregivers, the pediatric dentist, and dental staff. Additionally, many pediatric dentists treat patients with special needs who tend to be relatively older, with more "adult" types of medical emergencies. However, the focus of this chapter will be management of medical emergencies directly associated with pediatric sedation. For all other emergency situations, the reader is referred to textbooks devoted entirely to this subject (Bennet and Rosenberg 2002; Malamed 2007).

In-office sedation to treat children has increased over the past fifteen years. It is estimated that up to 20% of children will require pharmacosedation to safely and efficiently complete dental treatment. Children present the highest risk and lowest error tolerance in patient safety during sedation procedures. Although rare, the most serious adverse outcomes of pediatric sedation are brain damage and death. Precipitating adverse events to these tragic outcomes are primarily respiratory, owing to the child's respiratory and cardiopulmonary physiology and anatomy (Chika 2012). Prevention of an emergency is much more desirable than managing one once it occurs. Most sedation medical emergencies are avoidable. Strict adherence to sedation guidelines does not guarantee that emergencies will not occur, but it will definitely prevent most of them. A recent study of malpractice incidents shows that guidelines were not followed in the majority of cases (Chika 2012). Potential problems also may occur due to poor patient screening before treatment, overdoses of sedation or local anesthesia agents, improper monitoring, and failure to react properly once an emergency situation has been detected.

The basic algorithm for the management of most medical emergencies is: (P) position, (A) airway, (B) breathing, (C) circulation, and (D) definitive care: differential diagnosis, drugs, defibrillation. The algorithm will be discussed in detail as it relates to pediatric dental sedation.

Medical History

Familiarity with the patient's medical history is highly important in preventing medical emergencies. Knowing what to expect of the patient based on her medical history is invaluable. Completion of the medical history questionnaire before the start of any dental treatment is mandatory. The questionnaire may be completed by the patient's parent or legal guardian (Malamed 2010). In recent years, computerized medical history forms have become available, simplifying the history-taking process.

Next, the pediatric dentist reviews the completed form with the patient's parent and questions any medical problems that have been reported. Through this dialogue, the dentist seeks to determine any reported medical disorder's significance to the proposed sedation. For example, if a patient has had an asthmatic attack, the review of the medical history will include the following questions: "How often does the patient experience attacks?" "Are there any specific triggers?" "When was the last attack?" "Did it require a visit to the emergency room or hospitalization?" "Has the child ever required intubation in the hospital to manage the asthmatic attack?" "What medications is the patient taking?" "Does the child carry albuterol with them on a

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

regular basis?" Obtaining medical histories for all patients has been discussed in Chapter Six; however, it is of utmost importance when scheduling a patient to receive sedation.

Physical Examination

The next step is a physical exam. Pediatric dentists actually perform a physical exam on each patient, whether they realize it or not. It may not be as comprehensive or time-consuming, nor is it done in exactly the same fashion as those conducted by physicians, but nevertheless, one is done. The physical exam that pediatric dentists perform is partially formal and partially informal. The informal part consists of things like a simple visual inspection of the patient. By simple observation, the pediatric dentist can determine if a patient has various gross diseases such as obesity, jaundice, exophthalmos, breathing difficulties (asthma or other bronchospastic diseases), or heart defects; possibly even conditions such as attention deficit hyperactivity disorder (ADHD) may be determined. These two items, history and physical examinations, are referred to as the H&P.

The more formal portion of the physical exam consists of such things as recording blood pressure, pulse rate, respirations, height, weight, body mass index (BMI), Mallampati classification and American Society of Anesthesiology (ASA) Score.

Body Mass Index (BMI)

BMI is used as a screening tool to identify possible weight problems for children. The Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP) recommend the use of BMI to screen for overweight and obesity in children beginning at age two.

BMI for age percentile results are divided into four main groups: children under the 5th percentile are considered underweight; those between the 5th to 85th percentile, healthy weight; those between the 85th to 95th percentile are overweight; and those above the 95th percentile are obese, by definition. A recent study examined childhood overweight/obesity as a risk factor for adverse events during sedation for dental procedures (Kang et al. 2012). Overall, weight percentiles were higher in children who had one or more adverse events. Similarly, patients with higher BMI percentiles were more likely to experience adverse events. Although preliminary in nature, these findings suggest that childhood overweight/obesity may be associated with adverse events during sedation for dental procedures. Obese child patients in need of sedation may be referred to a medical center or may be treated together with a dentist anesthesiologist.

Mallampati Airway Classification

The original Mallampati classification consisted of three classes (Mallampati et al. 1985), but was subsequently expanded into the widely known four-class version (Nuckton et al 2006), as shown in Figure 15-1.

Mallampati (Samsoon and Young) grading of the upper airway is as follows:

- Class I: everything visible (tonsillar pillars)
- Class II: uvula fully visible, fauces visible
- Class III: soft palate and base of uvula visible only
- Class IV: cannot see soft palate

The Mallampati score is an independent predictor of the presence and severity of obstructive sleep apnea. On average, for every one-point increase in the Mallampati score, the odds of having obstructive sleep apnea increase more than two-fold (Nuckton et al. 2006). Patients with obstructive sleep apnea are generally not good candidates for moderate sedation administered by the pediatric dentist, as the perioperative risk to patients increases in proportion to the severity of sleep

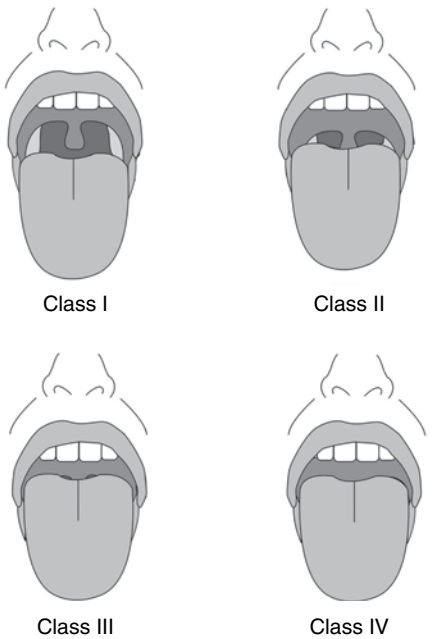

Figure 15-1. Mallampati classification, as modified by Samsoon and Young. Class I: uvula, faucial pillars, and soft palate are visible. Class II: faucial pillars and soft palate are visible. Class III: soft palate is visible. Class IV: hard palate only is visible. Baker, S. and Yagiela, J.A. (2006). *Pediatric Dentistry*, 28,487–493. Reproduced with permission from AAPD.

apnea. The pediatric dentist should consider working with a dentist anesthesiologist to treat these patients (see Chapter Thirteen).

By age eight or so, most children have an airway that resembles that of an adult more than that of an infant or small child. Prior to this point, there are significant anatomical differences compared to adults. Infants have a larynx at C3–4—not C4–5, as in adults—that pushes the tongue, that is larger, superiorly. The epiglottis is also larger, stiffer, and angled posteriorly. Pediatric patients have a large thyroid cartilage and a narrow cricoid cartilage—the narrowest portion of the airway in pediatric patients. Infants may require shoulder or neck rolls in the event that they require facemask ventilation. When evaluating infants, pay particular attention to the chin: if it is posterior to the upper lip, a difficult airway can be expected. Nasal and oral airways can be particularly useful in infants or pediatric patients.

After completion and review of the H&P, the dentist assigns the patient to a physical status category. Most patients, especially pediatric dental patients, are quite healthy. By definition, these are "ASA I" patients with low risk of complications.

American Society of Anesthesiology (ASA) Score

The American Society of Anesthesiology (ASA) proposed the physical status (ASA PS) classification of preoperative patients for anesthetic risk assessment in 1963. The ASA score is a subjective assessment of a patient's overall health based on five classes (see Table 10-3 in Chapter Ten). Only patients with an ASA score of I (a completely healthy, fit patient) or II (a patient with mild systemic disease) should be sedated in a private dental setting. Wolters et al. (1996) examined the strength of association between ASA physical status classification and perioperative risk factors and postoperative outcome, concluding that ASA physical status classification was a predictor of postoperative outcome. To summarize, a patient's BMI, airway evaluation and ASA score may all be used to screen out potentially complicated patients.

Medical Emergencies

Early recognition of medical emergencies begins at the first sign or symptom (Norris 1994). The pediatric dentist needs to focus on what is happening second-by-second during a medical emergency. Distractions slow response time, and pediatric patients have physiological and anatomical differences from adults. This causes pediatric medical emergencies to proceed much more rapidly than with adults. When treatment is indicated, the dentist should immediately proceed. Management of medical emergencies in the dental office may be limited to supporting a patient's vital functions until emergency medical services (EMS) arrive, especially in the case of major morbidity. It may also involve real, aggressive action to address a particular situation such as anaphylaxis. Treatment should always minimally consist of basic life support and monitoring of vital signs (Fukayama and Yagiela 2006).

The dentist should never administer poorly understood medications. The drugs discussed in this chapter will be limited to those that a pediatric dentist is trained to use and administer. Since there is no venous access during minimal and moderate sedation, drugs given intravenously will be avoided.

Emergency Kit

A medical emergency kit for a pediatric dental office should consist of three broad categories: equipment, supplies, and drugs. Only equipment and drugs that the pediatric dentist should be able to use confidently will be discussed. However, other components of both equipment and drugs may be required in the dental office. Readers are referred to the AAPD guidelines and to their relevant state or national regulations for other requirements.

Equipment

- Oxygen E tank with regulator, including pressure gauge and flow adjustment
- Pediatric non-rebreather face mask
- Resuscitation bag, adult 1000 mL, with pressure manometer and face mask
- Stethoscope
- Blood pressure cuff (small and medium) and aneroid sphygmanometer
- Automatic external defibrillator programmed to current AHA Guidelines
- Magill forceps. These can be lifesaving in retrieving foreign objects lost in the hypopharynx during dental therapy.

Supplies:

- Yankauer tip. This suction tip is designed to allow effective suction without damaging surrounding tissue. It is used to suction oropharyngeal secretions in order to prevent aspiration.
- Suction tubing, vacuum high volume system adapter
- Nasal cannula

- Nasopharyngeal airways (soft): 4.0, 4.5, 5.0, and 6.0 mm I.D.
- Oral airways (Guedel): 40 mm, 60 mm, and 80 mm
- Laryngeal Mask Supraglottic Airway Sizes 1.5 (5–12 kg), 2 (10–25 kg) and 2.5 (25–35 kg)

Drugs

The following list relates to the limited discussion of this chapter. The basic drug kit for medical emergencies consists minimally of seven drugs:

- Oxygen (E-Cylinder)
- Epinephrine Pediatric auto-injectors (0.15 mg/actuation), epinephrine adult auto injector (0.3 mg/actuation) and 1:1000 (1 mg/ml) ampule—quantity two.
- Albuterol (Ventolin) inhalation aerosol (90 mcg/actuation)
- Diphenhydramine parenteral injection, 50 mg/mL
- Aspirin 325 mg, non-enteric coated
- Nitroglycerin, 0.4 mg tablets
- A form of sugar

Additional required medications if oral sedation using narcotics and/or benzodiazepines are used include Naloxone (0.4 mg/mL, 1 mL vial) and Flumazenil (0.1 mg/mL, 10 mL vial). The latter drug is to be administered IV only.

Management of Medical Emergencies

An emergency management plan, as described by Haas (2010) and by Peskin and Siegelman (1995), is of paramount importance. It is recommended that all medical emergencies be managed in the same way by using what is known as the basic algorithm (Malamed 2007): (P) position, (A) airway, (B) breathing, (C) circulation and (D) definitive care: differential diagnosis, drugs, defibrillation (see Figure 15-2).

The one exception is cardiac arrest, where the currently suggested algorithm is (C) circulation, (A) airway, and then (B) breathing. The basic algorithm for managing all medical emergencies is consistent—that

Pharmacology and doses of basic emergency drugs:

- Albuterol is used in bronchospastic medical emergencies (acute asthmatic attack) as an inhaled beta-2 specific agonist. It causes bronchodilation that increases the lumen size of the bronchioles, leading to better oxygen uptake.
  Dose: Two puffs with deep inspiration.
  [source: drug package insert]
- Epinephrine is the universal agonist; it affects alpha one, alpha two, beta one and beta two receptors. This is the only drug in the medical emergency kit that must be given rapidly in order to save a patient's life. In case of anaphylaxis, the severe life-threatening allergic reaction, this is the only drug that will help. Alpha one agonistic activity increases blood pressure by causing a vasoconstriction. Beta one effects of epinephrine increase heart rate, force of contraction, stroke volume, and cardiac output. Epinephrine's beta two effects cause bronchodilation, making breathing easier. It may also be used for severe asthmatic attacks unresponsive to albuterol.
  Dose: Pediatric 0.01 mg/kg IM maximum 0.3 mg/dose. Adult: 0.3 mg/dose
  [source: drug package insert]
- Diphenhydramine is used for mild allergic reactions. Histamine blockers reverse the actions of histamine by occupying H1 receptor sites on the effector cell, and are effective in patients with mild or delayed-onset allergic reactions.
  Dose: 1–2 mg/kg IM up to 50 mg.
  [source: drug package insert]
- Naloxone is required in the medical emergency kit only if sedation using an opioid is used in the pediatric dental office. Naloxone is the specific antagonist for any of the opioids. It may be administered IV or IM, and has a duration of action of roughly 45 minutes if administered IV, and four hours if administered IM.
  [source: package insert for Narcan]
- Flumazenil. Most regulatory jurisdictions will require the immediate availability of flumazenil as a required component of the medical emergency kit if sedation using a benzodiazepine is used in the pediatric dental office. While this drug may be legally required, it must be strongly emphasized that the package insert for flumazenil, in no uncertain terms, explicitly says that this drug must be administered IV only. Therefore, if no one in the pediatric dental office is trained to start an IV and uses it regularly, the reality is that flumazenil will not be a valuable drug in a medical emergency.
  [source: package insert for Romazicon]

is, one algorithm fits all cases, and all cases are worked through in the same organizational method each and every time. This adds consistency and predictability to a response to a medical emergency. Prevention, prompt recognition, and efficient management of medical emergencies by a well-prepared dental team can increase the likelihood of a satisfactory outcome. Note that drug therapy is always secondary to basic life support. The basic intent in responding to a medical emergency is always the same: ensure that the patient's brain receives a constant supply of blood containing oxygen and glucose with enough perfusion pressure to keep it functioning, and without morbidity.

Recognize the Problem

Prior to initiating the emergency logarithm protocol, the pediatric dentist needs to recognize that an emergency situation is present. Recognition of the sedated pediatric patient's problem comes about by continuous monitoring, as per AAPD guidelines. The patient's pulse, oxygen saturation, and breathing should always be within age-appropriate normal ranges. Heart rates are typically higher in children and decrease with increasing age. For example, the normal ranges are 80–130 BPM in a two-year-old, and 70–110 BPM in a ten-year-old (Haas 2010). Any changes need to be immediately identified and analyzed. The following can be regarded as warning signs:

- **Change in saturation level**: If this occurs, reposition pulse oximeter probe (or, if the extremity is restrained, loosen strap), reposition head, and raise the chin. If level returns to normal, continue treatment.
- **The unresponsive sedated patient**: For the most part, pediatric dentists only administer minimal and moderate sedation. Patients undergoing such sedations should be responsive.

A sedated patient who fails to respond may have advanced to a state of deep sedation, which represents an emergency situation. Therefore, the dentist should cease treatment and evaluate the patient's state. To begin patient evaluation, try to elicit a response. After verifying unresponsiveness by stimulating the patient, including head tilt and jaw lift (Figure 15-3), remove rubber dam.

If using nitrous oxide sedation, immediately deliver 100% oxygen. Activate the office emergency team/plan/protocol. Emergency medical assistance (EMS) should be sought once the dentist, who is legally responsible for the patient, feels it is needed.

Following these steps, proceed immediately to (P) position: place the patient supine in the dental chair with legs elevated slightly (Figure 15-4).

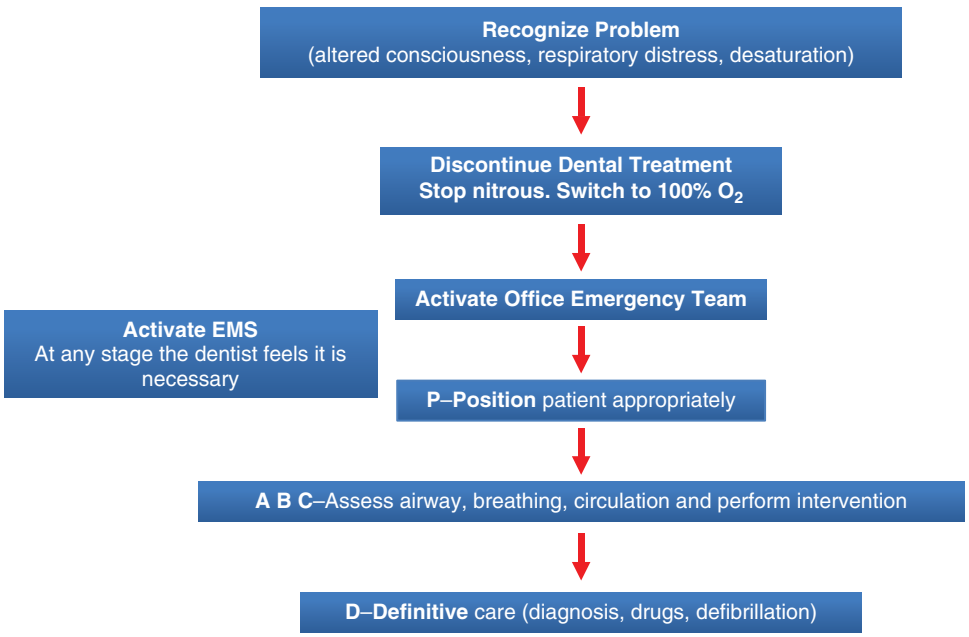

Figure 15-2. Dentists should initially manage all medical emergencies in the same way by using what is known as the basic algorithm. Based on Malamed, S.F. (2007). *Medical Emergencies in the Dental Office*. 6th ed. St. Louis: Mosby.

Figure 15-3. The head-tilt chin-lift maneuver. Courtesy of Dr. Ari Kupietzky.

Figure 15-4. The patient is placed supine in the dental chair with legs elevated slightly. Courtesy of Dr. Ari Kupietzky.

Chest compression, if needed, can be effectively performed in the dental chair. Lepere (2002) demonstrated that the modern dental chair provides firm support for the spinal cord, enabling sufficient blood volume to circulate during cardiac arrest. Most dental chairs are programmable, allowing the clinician to preset an emergency position option. Pediatric treatment benches are flat and suitable for delivery of all emergency treatment; a pillow may be placed under the child's legs for their elevation. Almost all medical emergencies involving loss of consciousness share the same cause: low blood pressure in the brain. Unconsciousness is defined as the absence of response to sensory stimulation (e.g., verbal or physical stimulation). Making the patient supine will increase blood pressure in the brain and allow the patient to regain consciousness in most cases. If the patient remains unresponsive, proceed to ABC.

Airway

Practitioners and staff members must ensure patency by tilting the patient's head and lifting the chin immediately. By itself, this maneuver may prevent brain damage, as it moves the tongue away from the back of the pharynx, thereby eliminating the obstruction (the tongue). In turn, this permits oxygenation. If the airway is not patent after this maneuver, the clinician should reposition the patient's head once more. If the airway still is not opened, the clinician should perform a jaw thrust maneuver by placing his or her thumbs posterior to the angle of the patient's mandible and advancing them (and the mandible) anteriorly. The two most common emergencies encountered while sedating a pediatric patient are respiratory obstruction and respiratory depression (Haas 2010).

Respiratory Obstruction

By far, the most common type of medical emergency from an oral sedation overdose is respiratory obstruction. In this case, it is the obligation of the pediatric dentist to stop the dental procedure and "rescue" the patient. While it is possible that a patient may be sensitive to a drug, the dentists administering more than the recommended dose of a sedation agent causes the overwhelming majority of oral sedation overdoses in pediatric dental offices. Benzodiazepines are most likely to cause respiratory obstruction. They are the most widely used class of drugs for oral sedation in the pediatric dental office today, and when used in recommended doses, they are remarkably safe. Some pediatric dentists, however, are tempted to push the limits of oral sedation in their practices. While it is true that increasing the dose of a sedative agent increases efficacy, it is equally true that increasing doses beyond a manufacturer's recommendations leads to decreased safety. The dose in a package insert has been shown to be both safe and efficacious. Beyond that dose, there is no safety data.

The tongue relaxing and obstructing the airway typically causes respiratory obstruction. The treatment is to pull the tongue off of the airway, which has classically been treated as simply a head tilt with a chin lift. More recently, a jaw thrust with less head tilt and chin lift has been demonstrated to be even more effective.

Finally, turning the patient's head approximately 30 degrees to either side opens the airway even more efficiently. Assuming the oral sedation drug was not given in such a large dose as to cause the respiratory obstruction, the patient should regain consciousness with spontaneous ventilation within 1–3 minutes.

Flumazenil, which is in the medical emergency kit, reverses the effect of the benzodiazepines. However, the

drug package insert clearly states that this drug must be given IV only. Flumazenil should never be administered IM, subcutaneously, or sublingually. Flumazenil, therefore, is of little benefit to most pediatric dentists who do not use IV regularly, and it should not be relied upon for a benzodiazepine overdose.

Respiratory Depression

The second type of respiratory event secondary to an overdose of an orally administered sedative is respiratory depression. It rarely occurs after administration of a benzodiazepine alone. When respiratory depression occurs, it is almost always associated with the administration of an opioid, which is essentially always administered in conjunction with a benzodiazepine (never by itself). Opioids benefit oral sedation, but they do so at additional risk. Opioids do not have the wide safety profile of the benzodiazepines, and their overdose is not managed as simply as head tilt with chin lift. Again, not exceeding a manufacturer's maximum recommended doses means overdose will rarely occur. However, pushing the limits by adding "just a little bit more" every time will eventually cause overdose. Respiratory depression always follows or is in conjunction with respiratory obstruction, so head tilt with chin lift and/or jaw thrust still needs to be done. In addition to good airway management, respiratory depression requires the delivery of positive pressure oxygen via a bag-valve-mask technique to either supplement or supplant respiratory effort by the patient. The mask is sealed with the thumbs of each hand and the mandible is elevated via jaw thrust to open the airway. One person performs the ventilations while another maintains a patent airway with two hands (Figure 15-5).

Unlike flumazenil, the specific opioid antagonist naloxone may be administered IM. However, IM administration has a significantly longer onset and peak effect than IV administration. Expect 2–3 minutes for an onset of action of IM naloxone and a peak effect to be achieved 10–15 minutes after IM administration.

Figure 15-5. The mask is sealed with the thumbs of each hand and the mandible is elevated via jaw thrust to open the airway. One person performs the ventilations while the other maintains a patent airway with two hands.

Figure 15-6. To locate the carotid pulse, the dentist or team member palpates the patient's thyroid cartilage, then moves the fingers into the "groove" just before encountering the sternocleidomastoid muscle. Courtesy of Dr. Ari Kupietzky.

Breathing and Circulation

In most unconscious persons, head-tilt chin–lift (A) provides a patent airway. However airway patency must still be assessed using the 'look', 'listen', and 'feel' technique (B). If the patient is not breathing, administer two breaths, with each breath lasting one second and only using a volume of air sufficient to see the chest rise. The nitrous nasal mask is removed and the clinician should use a barrier device such as a pocket mask or the mask from a bag-valve-mask device, if available. The dentist should take care not to ventilate too rapidly or administer excessive volumes. In children younger than the age of adolescence—defined as the age just before the onset of puberty, as determined by the presence of secondary sex characteristics—the clinician should administer rescue breaths at a rate of 12–20 breaths per minute.(For teenagers and adults, the rate should be 10–12 breaths per minute.) Next, the carotid pulse is palpated. In an unconscious child, adolescent, or adult patient, the carotid is the best artery for assessing the pulse. To locate the carotid pulse, the dentist or team member palpates the patient's thyroid cartilage, then moves the fingers into the "groove" just before encountering the sternocleidomastoid muscle (Figure 15-6).

Although BLS training for laypeople recommends skipping the pulse check, that rule does not apply to health care providers, including dentists. Health care professionals are expected to be able to detect a pulse (Haas 2010). If no

pulse can be palpated after 10 seconds, the dentist or a staff member should assume that the patient has experienced cardiac arrest and begin chest compressions at a rate of 100 per minute, consistent with current BLS training.

The dentist should place hands over the lower half of the patient's sternum between the nipples, then, push down by using the heel of one hand with the other hand on top. For children older than one year but younger than the age of adolescence, the compressions should depress the chest by one-third to one-half its depth. For older children and adults, each compression should depress the chest 1.5–2 inches. It is important that the clinician push hard and fast and allow full chest recoil. The compression-to-ventilation ratio for one-person CPR in children is the same as that in adults (30:2), but for two-person CPR in children, the ratio should be 15:2. Four to five sequences are provided in approximately 2 minutes. Coincident with beginning BLS is the administration of oxygen. The next step is to turn on the AED and follow the voice prompts.

As mentioned, the goal of the steps (P→A→B→C) described thus far is to ensure that the victim's brain and heart are receiving an adequate supply of blood containing oxygen and sugar, the fuels required by the cells of the body to maintain normal function.

Definitive Care

Definitive care represents the final step of management. Possible components of definitive care include diagnosis, drugs, and defibrillation. When possible, a diagnosis is made and treatment proceeds accordingly. (Examples of diagnosed problems are asthma, hypoglycemia, and allergy.) Drugs, other than oxygen (which may be administered in any emergency situation), are rarely needed. Notable exceptions are acute bronchospasm (asthma) and allergy.

Asthma

Probably the most common cause of respiratory distress seen in pediatric dental patients is asthma, also known as acute bronchospasm (Malamed 1997). Other possibilities for respiratory distress in pediatric patients include an allergic reaction, tachypnea, hyperventilation, diabetic ketoacidosis, or unconsciousness.

Millions of children in the United States are affected by asthma, a chronic respiratory disease characterized by attacks of difficulty breathing. An asthma attack is a distressing and potentially life-threatening experience (National Heart, Lung, and Blood Institute). Asthma is one of the leading chronic childhood diseases in the United States (Adams and Hendershot 1996) and a major cause of childhood disability (Newacheck and Halfon 2000). The most current data shows that the challenges of childhood asthma remain, and that asthma persists as a significant public health problem (Akinbami 2006). However, asthma deaths among children are rare. Children most at risk of dying from asthma are those with severe, uncontrolled disease, a near-fatal attack of asthma, or a history of recurrent hospitalizations or intubation for asthma (McFadden and Warren 1997). Thus, the importance of a thorough review of the medical history of an asthmatic child patient.

Management

Patients experiencing asthmatic respiratory distress typically will want to sit upright (P = position). The dentist follows this with an evaluation of the patient's airway. Is it patent? By definition, conscious patients who can talk have a patent airway, are breathing, and have sufficient cerebral blood flow and blood pressure (adequate perfusion pressure) to remain conscious. Definitive care includes administration of a bronchodilator. For conscious patients, this bronchodilator is commonly albuterol, administered via a metered dose inhaler (MDI). Patients with a history of asthma will have their own inhaler. If the patient loses consciousness or does not cooperate with the administration of albuterol via inhalation due to hypoxia, hypercarbia, or some other reason, or if the bronchospasm is refractory to administration of albuterol, the dentist should contact EMS and administer epinephrine intramuscularly.

Altered Consciousness

As with respiratory distress, altered consciousness or unconsciousness may be present, owing to a variety of precipitating factors including overdose of sedation medication.

Dizziness developing in the dental office may have many origins, but low blood pressure in the brain often is the ultimate cause. The easiest and least-invasive way to increase blood flow to the brain is to place the patient in a supine position. Patients in whom dizziness is the only symptom are conscious and able to talk (airway, breathing, and circulation have been assessed and verified). Definitive therapy consists simply of placing the patient properly in a supine position. The Trendelenburg position is less ideal. In that position, the contents of the lower gastrointestinal tract impinge on the diaphragm, increasing the breathing effort. Once the patient is positioned properly, the pediatric dentist should determine the cause of the dizziness. What was the cause? Was it initiated by vasovagal syncope? Hypoglycemia? Hypovolemia? Although many possible explanations exist, the more common reasons for loss of consciousness in the dental office (assuming no

medications have been administered) are syncope and low glucose level.

Vasovagal Syncope

Fainting, or vasovagal syncope, is the most common medical emergency seen in the dental office (Findler et al. 2002). The incidence of syncope is increased in two age groups: young adults (15–24) and in those over sixty-five. However, a lower peak also occurs in older infants and toddlers (Wieling et al. 2004). By far the most common cause of syncope in young subjects is a reflex syncopal event, and in particular a vasovagal faint.

The basic algorithm is the same as that for dizziness, described earlier. The dentist or a team member should place the patient in a supine position. Most patients with syncope have a patent airway, are breathing, and demonstrate an adequate pulse. Patients who faint typically respond to positional changes within 30–60 seconds. If the patient does not respond in this time frame, he did not simply faint, and the dentist must consider a differential diagnosis. The responding patient should be kept in a supine position and administered 100% oxygen until full recovery. To allow the body to return to a normal state, the patient should not undergo additional dental treatment for the remainder of the day (Ross et al. 2013).

Hypoglycemia

Pediatric dentists should consider hypoglycemia in a differential diagnosis of dizziness. Sometimes, but not always, these patients have a history of diabetes. Pediatric dental patients with type 1 diabetes (and some with type 2) self-administer insulin to lower a high glucose level (hyperglycemia) toward the upper limit of normal (120 milligrams/deciliter or 6 mmol/L). Patients with diabetes must ingest food immediately after administering insulin to prevent the development of hypoglycemia as a result of the insulin injection. The most common cause of hypoglycemia in patients with type 1 diabetes is not eating after administering insulin.

Patients with clinically significant hypoglycemia may be recognizable because they commonly experience diaphoresis and tachycardia, causing them to feel faint. Subsequently, they may be confused and ultimately lose consciousness. As long as the patient retains consciousness, the clinician should allow her to remain in a comfortable position. Conscious patients with hypoglycemia have a patent airway, are breathing, and have an adequate pulse. The treatment of choice for patients with hypoglycemia is administration of sugar (specifically glucose, not sucrose). Unconscious pediatric dental patients with hypoglycemia require parenteral administration of sugar. Absolutely never place anything into the mouth of an unconscious patient. Absent proficiency in venipuncture for the pediatric patient, the dentist should activate EMS.

In each of these examples of unconsciousness, the initial management of the emergency situation is the same. The dentist should place the patient in a supine position. If the child has not responded within one minute, the clinician probably can rule out syncope. The dentist then should open the airway and assess breathing ("look, listen, and feel") (American Heart Association 2005). If the patient is breathing, the next step is to check circulation. Does the patient have a palpable pulse at the carotid artery (or brachial artery, in infants)? Patients who are breathing spontaneously and normally may be experiencing hypoglycemia or a cerebrovascular accident (CVA), but not cardiac arrest. In cardiac arrest, the patient does not breathe spontaneously (agonal breathing notwithstanding). A patient with apnea requires positive pressure ventilation with 100% oxygen.

Patients placed in a supine position who do not respond within 30–60 seconds but are breathing spontaneously are likely experiencing hypoglycemia or a CVA. If the patient's blood pressure is normal (that is, close to baseline values) the problem is probably a low blood glucose level.

Seizures

Pediatric dental patients who convulse in the dental office typically have a seizure history and often are characterized as being epileptic (Bryan and Sullivan 2006). The initial treatment for seizures is the same as that for any other medical emergency. The patient experiencing a generalized tonic-clonic seizure (the term currently preferred over Grand Mal) is unconscious and should be placed in a supine position. The dentist should perform a "head tilt, chin lift, and jaw thrust" to the farthest extent possible. Patients who are seizing are breathing and have adequate cardiovascular function, which the pediatric dentist can verify by checking for and finding a strong carotid pulse.

The pediatric dentist or a team member must remove all dental instruments and supplies from the patient's mouth and protect him from harm. No one should place anything into the mouth of a patient who is seizing. The pediatric dentist or a team member should bring the patient's parent into the operatory to help evaluate the patient. The parent may determine that this is a typical seizure for the patient, in which case simple monitoring is sufficient. On the other hand, if a seizure is unusually severe, the pediatric dentist might contact EMS.

Local Anesthetic Overdose

Many pediatric dentists will not recognize a local anesthetic overdose until a seizure is seen. Of course, prevention is primary. Do not exceed the manufacturer's maximum recommended doses for the local anesthetics chosen and this problem will essentially cease to exist. Local anesthesia is discussed in depth in Chapter Eight of this textbook. Local anesthetic overdoses are only fatal if the patient's airway is not maintained throughout the episode. Head tilt with chin lift and/or jaw thrust is essential. The administration of oxygen is always recommended in any medical emergency. For the majority of pediatric dentists, this is the entire treatment algorithm for a local anesthetic overdose. However, if a pediatric dentist is trained to start IVs, the IV administration of intralipid is now available. Initial dosing is 1.5 mL/kg of the 20% formulation of intralipid (Brull 2008).

Allergy

An allergic reaction can be mild or severe. Based on data from Malamed (1993), a "mild allergic reaction" was the second most common medical emergency seen in dental offices after syncope (fainting). Additionally, anaphylaxis was the eleventh most common medical emergency. The most common allergen in the dental environment today, of course, is latex (Desai 2007). Penicillin is the most common cause of drug-induced anaphylaxis (Lieberman et al. 2005). Patients can have allergies to penicillin and penicillin-like drugs (amoxicillin, Augmentin®, etc.), as well as other drugs and agents prescribed, administered, and dispensed in dental offices. It should be noted here that a true allergic reaction to an injected local anesthetic in dentistry has an incidence approaching zero. It simply does not occur to any measurable degree (Malamed 2007).

If the allergic reaction presents with itching, hives, or a rash as the only signs and symptoms, the allergy may be considered mild (non–life-threatening). However, if the patient experiences cardiovascular and/or respiratory embarrassment, which are normally seen as dizziness or loss of consciousness due to inadequate blood pressure and/or blood flow to the brain (cardiovascular issues), or difficulty in breathing (respiratory issues), the dental professional must treat the allergy as a life-threatening situation (Reed 2010).

In addition to severity, allergic reactions may also be characterized based on time. Those allergic reactions occurring many minutes to many hours after exposure to the allergen may be termed "delayed onset," while those that occur within a few seconds to a few minutes after contact with the allergen are termed "immediate onset." As a general rule, the faster the signs and/or symptoms occur, the more likely a severe allergy will occur. It is not the purpose of this chapter to review the intricate pathophysiology of allergy involving IgE, IgG, and other antigen-antibody and other cellular responses, or deal with non-life-threatening mild allergies.

Severe Allergy (Anaphylaxis)

Anaphylaxis is an acute, life-threatening, systemic reaction with varied mechanisms and clinical presentations. Immediate discontinuation of the offending drug(s) and early administration of epinephrine are the cornerstones of treatment. Epinephrine is the drug of choice in the treatment of anaphylaxis because its alpha-1 effects help support the blood pressure, while its beta-2 effects provide bronchial smooth-muscle relaxation (Hepner and Castells 2003). Absorption is faster and plasma levels are higher in patients who receive epinephrine intramuscularly in the thigh with an autoinjector (Simons et al. 1998). Intramuscular injection into the thigh (vastus lateralis) is also superior to intramuscular or subcutaneous injection into the arm (deltoid) (Simons et al. 2001). No established dosage or regimen for intravenous epinephrine in anaphylaxis is recognized. Because of the risk for potentially lethal arrhythmias, epinephrine should be administered intravenously only during cardiac arrest, or to profoundly hypotensive subjects who have failed to respond to intravenous volume replacement and several injected doses of epinephrine (Malamed 2007).

If the allergy is severe, the patient has lost (or will soon lose) consciousness. The dentist should place the patient in a supine position, open the airway, and evaluate breathing. Often, breathing is spontaneous and adequate. If the patient is not breathing, the dental professional must administer positive pressure oxygen via a bag-valve-mask device. If the patient has lost consciousness, their cerebral blood pressure is too low. Another dental staff member also must contact EMS, as the patient likely requires treatment in hospital. The appropriate pharmacologic management for anaphylaxis in an outpatient setting is outlined in Figure 15-7.

Precaution: When treating dental office patients who may have a history of allergic reactions, the first step is to consult with an allergist to test the patient for allergy to the drug in question. Treatment should be postponed, if at all possible, until this is accomplished. If the allergy is truly to a local anesthetic, another option is the use of general anesthesia, Yet another option is the use of a histamine blocker such as diphenhydramine as a local anesthetic for pain management during treatment. Most injectable histamine blockers possess

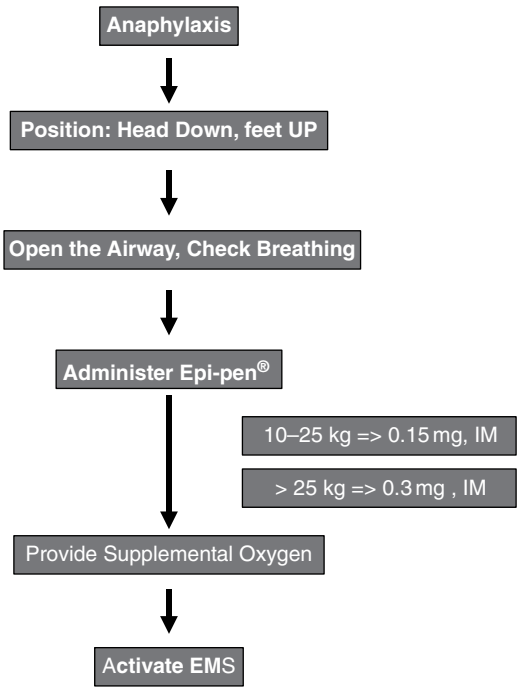

Figure 15-7. Pharmacologic management of anaphylaxis.

local anesthetic properties. Diphenhydramine has been the most commonly used histamine-blocker in this regard (Reed 2010).

Foreign Body Aspiration

A common hazard in dental practice that cannot be taken lightly is aspiration of dental instruments and materials (Cameron et al. 1996). Aspiration of foreign objects during restorative procedures, especially under sedation, remains a real threat due to the challenges involved with treating young children and the difficulties of airway management (Adewumi and Kays 2008). Such incidents reinforce the need for prevention. The practicing dentist should routinely employ adequate barrier techniques and high volume suction. Rubber dams should be used routinely and cotton rolls should never be left in a sedated child's mouth. During handling of stainless steel crowns, extra precaution is needed if the rubber dam is removed. A gauze pad should be used as a throat partition, and the assistant should be prepared with the high volume suction for instant retrieval of a lost crown.

Following aspiration, most foreign bodies become lodged in the peripheral airways. Large, sharp, or irregular objects may lodge at the laryngeal inlet, especially in children less than one year old (Leith et al. 2008). Foreign bodies may also lodge in the trachea, but in most cases the inhaled object passes down into one of the main bronchi. In adults, the right bronchus is the most common site for a foreign body to lodge because of its wider diameter and more vertical disposition (Zerella et al. 1998). However, in children, the impaction site of a foreign body is determined by the individual anatomy of the airway, and studies have shown that there is little difference in the distribution of inhaled foreign bodies between the right and left main bronchi in this age group (Zerella et al. 1998, Black et al. 1994, Ciftci et al. 2003). This is generally explained by the relatively symmetric bronchial angles in the pediatric airway until about fifteen years of age.

The American Heart Association (2005) has published guidelines for the acute management of foreign body airway obstruction. If the obstruction is mild and the child can cough and make some sounds, it is recommended not to interfere and to allow the victim to clear the airway by coughing or gagging, while observing for more severe signs. These airway reflexes are protective, and indicate that the obstruction is incomplete. Complete airway obstruction is recognized by sudden respiratory distress. If the obstruction is complete and the child cannot make sounds, subdiaphragmatic abdominal thrusts (the Heimlich maneuver) are indicated for the child who is one year of age or older. This may be accomplished by lifting the child and delivering the thrusts from behind while standing, or the abdominal thrust may be modified for the patient in the dental chair by delivering the thrust with the heel of the hand from the front of the child (Ganzberg 2013). If the victim becomes unresponsive, cardiopulmonary resuscitation should be initiated. It is important to attempt to remove an object from the pharynx with caution, as blind finger sweeps can push obstructing objects further into the oropharynx.

Summary

Medical emergencies can occur in the dental office, and it is important for the entire dental team to be prepared for them. Regardless of the specific type of medical emergency, they all are best managed in basically the same way: position the patient; assess the airway, breathing and circulation; and provide definitive therapy.

DISCLAIMER: This information is not intended to be a comprehensive list of all medications that may be used in all emergencies. Drug information is constantly changing and is often subject to interpretation. While care has been taken to ensure the accuracy of the information presented, the authors are not responsible for the continued currency of the information, errors, omissions, or the resulting consequences. Decisions about drug therapy must be based upon the independent judgment of the clinician, changing drug information, and evolving healthcare practices.

References

Adams, P.F. and Hendershot, G.E. (1996). Current estimates from the National Health Interview Survey, 1996. *Vital and Health Statistics*, 10, 200.

Adewumi, A. and Kays D.W. (2008). Stainless steel crown aspiration during sedation in pediatric dentistry. *Pediatric Dentistry*, 30, 59–62.

Akinbami, L.J. (2006). The State of Childhood Asthma, United States, *1980–2005.* Advance data from *Vital and Health Statistics*, 381. Hyattsville, MD: National Center for Health Statistics.

American Heart Association (2005a). Guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Part 4: adult basic life support. *Circulation*, 112, IV-19–IV-34.

American Heart Association (2005b). Guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Part 11: pediatric basic life support. Circulation, 112, IV–156-IV-166, 13.

Baker, S. and Yagiela, J.A. (2006). Obesity: a complicating factor for sedation in children. *Pediatric Dentistry*, 28, 487–493.

Bennet, J. and Rosenberg, M.B. (2002). *Medical Emergencies in Dentistry*. W. B. Saunders. Philadelphia, PA, USA

Black, R.E., Johnson D.G., Matlak M.E. (1994). Bronchoscopic removal of aspirated foreign bodies in children. *Journal of Pediatric Surgery*, 29, 682–684.

Boyce, J.A. et al. (2010). Guidelines for the Diagnosis and Management of Food Allergy in the US: Summary of the NIAID-Sponsored Expert Panel. *Journal of Allergy and Clinical Immunology*, 126, 1105–1118.

Brull, S.J. (2008). Lipid emulsion for the treatment of local anesthetic toxicity: patient safety implications. *Anesthesia and Analgesia*, 106, 1337–1339.

Bryan, R.B. and Sullivan, S.M. (2006). Management of dental patients with seizure disorders. *Dental Clinics of North America* 50, 607–623.

Cameron, S.M., Whitlock, W.L., Tabor, M.S. (1996). Foreign body aspiration in dentistry: a review. *Journal of the American Dental Association*, 127, 1224–1229.

Chicka, M.C. et al. (2012). Adverse Events during Pediatric Dental Anesthesia and Sedation: A Review of Closed Malpractice Insurance Claims. *Pediatric Dentistry*, 34, 231–238.

Ciftci, A.O. et al. (2003). Bronchoscopy for evaluation of foreign body aspiration in children. *Journal of Pediatric Surgery*, 38, 1170–1176.

Desai, S.V. (2007). Natural rubber latex allergy and dental practice. *New Zealand Dental Journal*, 103, 101–107.

Findler, M. et al. (2002). Syncope in the dental environment [in Hebrew]. *Refuat Hapeh Vehashinayim*, 19(1), 27–33, 99.

Fukayama, H. and Yagiela, J.A. (2006). Monitoring of vital signs during dental care. *International Dental Journal*, 56, 102–108.

Ganzberg, S.I. (2013). Medical emergencies. In: Pediatric dentistry infancy through adolescence (eds. P.S. Casamassimo, H.W. Fields, D.J. Mctigue, A.J. Nowak) 5th edn. 126–138. Elsevier Saunders, St Louis, Missouri.

Haas, D.A. (2010). Preparing dental office staff members for emergencies: developing a basic action plan. *Journal of the American Dental Association*, 141, 8s–13s.

Hepner, D.L. and Castells, M.C. (2003). Anaphylaxis During the Perioperative Period. *Anesthesia and Analgesia*, 97, 1381–1395.

Kang, J. et al. (2012). The safety of sedation for overweight/obese children in the dental setting. *Pediatric Dentistry*, 34, 392–396.

Leith, R. et al. (2008). Aspiration of an avulsed primary incisor: a case report. *Dental Traumatology*, 24, e24-6. doi: 10.1111/j.1600-9657.2008.00593.x. Epub 2008 Jun 28.

Lepere, A.J., Finn, J., Jacobs, I. (2003). Efficacy of cardiopulmonary resuscitation performed in a dental chair. *Australian Dental Journal*, 48, 244–247.

Lieberman, P. et al. (2005). The diagnosis and management of anaphylaxis: An updated practice parameter. *Journal of Allergy and Clinical Immunology*, 115, S483–523.

Malamed, S.F. (1993). Managing medical emergencies. *Journal of the American Dental Association*, 124, 40–53.

Malamed, S.F. (1997). Emergency medicine: beyond the basics (published correction appears in *Journal of the American Dental Association*, 128, 1070). *Journal of the American Dental Association*, 128, 843–854.

Malamed, S.F. (2007). *Medical Emergencies in the Dental Office*. 6th ed. St. Louis: Mosby.

Malamed, S.F. (2010a). *Sedation: A Guide to Patient Management*. 5th ed. St. Louis: Mosby.

Malamed, S.F. (2010b). Knowing your patients. *Journal of the American Dental Association*, 141, 3S-7S.

Mallampati, S.R. et al. (1985). A clinical sign to predict difficult intubation: a prospective study. *Canadian Anaesthesia Society Journal*, 32, 429–34.

McFadden, E.R., Jr. and Warren, E.L. (1997). Observations on asthma mortality. *Annals of Internal Medicine*, 127, 142–7.

National Heart, Lung, and Blood Institute. (2007). National Asthma Education and Prevention Program Expert Panel report 2: Guidelines for the diagnosis and management of asthma.

Newacheck, P.W. and Halfon, N. (2000). Prevalence, impact, and trends in childhood disability due to asthma. *Archives of Pediatrics and Adolescence Medicine*, 154, 287–293.

Norris, L.H. (1994). Early recognition limits in in-office emergencies. *Journal of the Massachusetts Dental Society*, 43, 19–23.

Nuckton, T.J. et al. (2006). Physical examination: Mallampati score as an independent predictor of obstructive sleep apnea. *Sleep*, 29, 903–8.

Peskin, R.M. and Siegelman, L.I. (1995). Emergency cardiac care: moral, legal, and ethical considerations. *Dental Clinics of North America*, 39, 677–688.

Reed, K.L. (2010). Basic Management of Medical Emergencies: Recognizing a Patient's Distress. *Journal of the American Dental Association*, 141, 20s–24s.

Ross, P.J., Schneider, P.E., Helpin, M. (2013). Neurocardiogenic syncope of child dental patient: a case review. *Pediatric Dentistry*, 35, 71–73.

Samsoon, G.L. and Young, J.R. (1987). Difficult tracheal intubation: a retrospective study. *Anaesthesia*, 42, 487–490.

Simons, F.E.R. et al. (1998). Epinephrine absorption in children with a history of anaphylaxis. *Journal of Allergy and Clinical Immunology*, 101, 33–7.

Simons, F.E.R., Gu, X., Simons, K.J. (2001). Epinephrine absorption in adults: intramuscular versus subcutaneous injection. *Journal of Allergy and Clinical Immunology*, 108, 871–873.

Wieling, W., Ganzeboom, K.Z., Saul, J.P. (2004). Reflex syncope in children and adolescents. *Heart*, 90, 1094–1100.

Wolters, U. et al. (1996). ASA classification and perioperative variables as predictors of postoperative outcome. *British Journal of Anaesthesiology*, 77, 217–22.

Zerella, J.T. et al. (1998). Foreign body aspiration in children: value of radiography and complications of bronchoscopy. *Journal of Pediatric Surgery*, 33, 1651–1654.

Chapter 16

Practical Considerations and the Dental Team

Jonathon E. Lee

Brian D. Lee

The foundation for practicing pediatric dentistry is the ability to guide infants, children, and adolescents through their dental experiences. Today, practicing pediatric dentistry is a team effort, with dentists leading and delegating responsibilities to team members: trained dental auxiliaries and administrative office staff. A pediatric dental team has to work together so that the patient develops a positive attitude toward the dental experience.

The pediatric dental team is an extension of the dentist in that it uses communicative behavior guidance techniques, leading the child patient stepwise through the dental experience. All personnel have a stake in guiding the child through the experience. Dental auxiliaries and reception staff are invaluable when dealing with the pediatric patient (Wright 1983). Therefore, all dental team members are encouraged to expand their skills and knowledge in behavior management techniques. When assembling a team, technical skills are important, but the authors have found that it is more important to hire for positive attitude and passion first. Happy individuals are much more likely to participate in activities that are adaptive, both for them and the people around them (Fredrickson 2004).

Team Rules for Behavior Management

There are six fundamental rules of behavior management for establishing positive relationships for both the team and the pediatric patient (Wright and Stiger, 2011).

1. Have a positive, upbeat approach. Positive attitudes lead to positive outcomes.
2. Have a team attitude and culture. Personality factors, shared values, and commitments to action serve as the basis for relationships and behaviors.
3. Have organized plans and protocols. Written protocols and contingency plans with defined roles for each team member are characteristics of a well-organized office. With increased effectiveness and efficiency, there are fewer delays and less indecisiveness.
4. Be truthful and credible. These traits help to build trust with your team members and your patients.
5. Be tolerant and empathic. Cope and with different behaviors and situations while maintaining composure and self-control.
6. Be flexible. Team members have to adapt to each situation because children's behaviors are unpredictable.

While nearly everyone would agree with these rules, following them is another matter. They are often overlooked. To illuminate the points, Wright applied these rules in context with case scenarios (1983). These updated cases remain applicable today.

Case 16.1 The Positive Approach

Four-year-old Johnny sat in the reception area, awaiting his third dental checkup appointment. Entering the area, the receptionist greeted him: "Hi Johnny, it's your turn now." Johnny withdrew slightly and held his parent's hand firmly. Noticing this, the dental assistant said, "Johnny, don't be afraid. Nothing will hurt you."

Case 16.1, Discussion: Both the receptionist and the dental assistant greeted Johnny, and the dental assistant tried to relax him to encourage a smooth patient transfer

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

from the reception area to the dental clinic. Without realizing it, however, the dental assistant's final comment violated a fundamental precept of pediatric patient management: the entire dental team's approach must be positive.

A more positive effect could have been created if the receptionist had simply said something concrete and truthful, such as "Hi Johnny, I like your outfit, it is so colorful and bright. I am glad you came today. We are excited to see you." Then the dental assistant could have taken the lead and said "Come on Johnny. You were such a good boy last time when you were able to help count your teeth. Dr. J. really wants to see if you can still count to twenty. Let's go quickly."

To achieve success with children, it is important to anticipate success (Wright 1975). Positive statements are far more effective than thoughtless questions or remarks directed mostly to parent figures. When dealing with difficult pediatric patients, the dental team has to mask emotional reactions and remain positive. The dental team member's attitudes or expectation can affect the outcome of an appointment because children are likely to respond with the type of behavior expected of them. In essence, the child fulfills the dentist's prophecy. This theory was advanced by Rosenthal and Jacobson in their book *Pygmalion in the Classroom*, which discusses children and the educational process.

In addition to taking a positive approach, the dental team has to be direct, specific, and confident. Questions that imply choice should be avoided unless the choice will definitely be granted. For example, the dental assistant summoning a child from the reception area will undoubtedly get a better response by saying "Johnny it's your turn to see Dr. J., please come with me," rather than asking, "Johnny, would you come with me?" The same is true when the dental team member says, "Now I am going to brush and clean your teeth. Please help me by opening nice and big," rather than "I think it is time to clean your teeth now, OK?" Positive and direct communication is easy to learn, and after a short period of time it becomes automatic. All members of the dental team should be aware of its importance and help one another to use it with children. Another approach is indeed to give the child a choice, but structure the question and possible choices so that both options will be acceptable and lead to the same outcome. For example, do not ask "Would you like me to clean your teeth?" Instead, ask "Would you like me to clean your top teeth first, or start with your lower ones?" The child is given a choice. Both options will lead to the start of the cleaning. There is actually a benefit to this approach: the child subconsciously realizes that he made the choice to start the cleaning.

Case 16.2 Team Attitude and Culture

Mrs. W. brought her six-year-old to the dental office for a recall appointment. As they approached the front desk, the receptionist greeted them: "Hello, Mrs. W. and William. Please fill out a medical update, give me your insurance card so I can copy it, and then have a seat. The doctor will be with you in a few moments."

Case 16.2, Discussion: The proper team attitude for dealing with children includes personality factors, such as warmth or patient interest that can be conveyed without a spoken word. A pleasant smile is body language that engages multisensory communication, and it may indicate to a child that the adult cares. In this case, the greeting to the child and his mother was businesslike, matter of fact, and formal. While this may be suitable for some adult patients, a nicer welcoming for the child might be, "Hi Billy, good to see you. How is school these days?" Children are informal. Consequently, they respond best to an attitude that is natural and friendly. Acknowledging Billy's presence first also makes him the center of attention. It places the child at the apex of the Pediatric Dentistry Treatment Triangle. At that point, the receptionist can hand out the medical update, which includes a section on insurance, and ask the parent if she needs help filling it out.

An attitude of friendliness can be conveyed to the child patient almost immediately. A casual greeting, such as, "Hi buddy, how are you today?" usually evokes a smile, whereas "Hello William" does not tend to put a child at ease. A mechanical tone certainly should be avoided, and modulation of voice control should be encouraged. As they famously say in Hawaii, "Hang loose."

Children can be made to feel at home in the dental office in many ways. If youngsters have nicknames they prefer, these should be noted on their patient records and used during future appointments to promote a natural and friendly atmosphere. For example, if William prefers to be called "Billy," it should be noted and used at all times.

The world that we live in today is one that embraces multi-culturalism and diversity. Just look at the authors and contributors in this book. "It is a Small World After All" (Thomas Friedman). Today it is very common to welcome children in our practices with unique names. For those names that are unfamiliar and difficult to pronounce, it often helps to have the phonetic spelling noted in their charts.

Additionally, patients' school accomplishments or extracurricular activities should be noted in the dental record. Most children are delighted to share their interests and hobbies. Keeping this in mind, and keeping a

record of those interests, helps the team initiate future conversations and demonstrate a caring attitude toward child patients. However, care must be taken to prevent matters from getting out of hand. For example, after telling the dental team stories, a child may become excited and difficult to settle down for the dental procedure. While friendliness is fundamental to behavior management, over-permissiveness or an overly affectionate approach should be avoided. Thus, the dental team must project a degree of firm confidence when necessary. Children have to respect the team approach and realize who the leader is. They must be aware of what is expected of them. Sometimes the behavior guidelines can be re-established by simply saying, "Billy, there is a time for play and a time for work. Now it is time to work." The whole team must embody this attitude and culture.

Case 16.3 Organized Plans and Protocols

Five-year-old Tammy had two restorative dental appointments during the previous month and, although not easy to manage, she cooperated adequately to allow the treatment. Now Tammy requires anterior restorations. At the outset, the dentist invited Tammy's parent into the dental operatory to explain the anterior restorations. While Tammy was seated in the dental chair, the dentist explained the proposed treatment. Since the parent had several questions, the discussion dragged on for fifteen minutes. Eventually, Tammy became restless and began to complain, whine and whimper.

Case 16.3, Discussion: This case illustrates another fundamental aspect of behavior management. In pediatric dentistry, an organized plan or protocol is a necessity. A proper, prioritized treatment plan should have been discussed with the parent prior to the appointment, ideally at the examination and treatment planning appointment. In this case, detailing the procedure at the beginning of the appointment delayed the start of the treatment and was unfair to both the child and the parent. Technical discussions in the presence of a child may build apprehension, and hurrying the conversation does not allow a parent sufficient time to ask questions and make an informed decision.

Organized plans and protocols in the dental office have many dimensions. For example, begin with the reception area. Who summons the new patient—the dentist, the dental assistant, the dental hygienist, or the receptionist? If a child creates a disturbance in the reception area, who deals with the situation? A plan might stipulate that the dentist be summoned at once, but this may differ from office to office. Each dental office must design its own contingency plans, and the entire office team must know in advance what is expected of them. Such plans can be placed in the office and employment manuals, and are a key feature of many pediatric dental offices. Good plans increase efficiency and contribute to successful work environments as well as positive relationships between dental teams and child patients.

Case 16.4 Truthfulness and Credibility

An alert dental assistant has seated a three-year-old patient in the dental chair. While waiting for the dentist, the child looks up and asks, "Am I going to get a shot today?" The dental assistant replies hesitantly, "I'm not sure. Ask when the doctor comes in."

Case 16.4, Discussion: Many dental assistants have been placed in a position similar to this one. The child asks the question with an apparent concern. If the dental assistant replies affirmatively, the young child might become very apprehensive, and a behavior problem could ensue. If the dental assistant states that the child is not going to have an injection and, in fact, the child needs one, then credibility is lost. Therefore, the assistant adopted an appropriate, "middle-of-the-road" course of action. She deferred to the dentist to inform the child and intercept any adverse behavior if it occurs.

Unlike adults, most children see things as either "black or white." Examples must be concrete. There are no "shades of grey." To them, shades between are abstract and difficult to understand. To youngsters, the dental team is either truthful or not. Therefore, truthfulness is extremely important in building trust, and is a fundamental rule for dealing with children.

As the above case exemplifies, the dental team should be careful not to be trapped into being untruthful by circumstances. For example, when a child is told that an appointment is for a checkup, it is wrong to proceed with a restoration without the child's permission. Since children often do not understand the reason for a change in plan, the dentists must take the time to explain. Sometimes parents coax the dentist to complete the work at the checkup appointment. If this occurs, it seems reasonable to ask the child, "Would you mind having a filling today so that you do not have to come back tomorrow? If I do it today, then Daddy won't have to take more time off

work." If the child is agreeable, then the dentist may proceed. If the reply is negative, the child patient's choice should be respected because the youngster was told at the beginning that the appointment was for a "checkup." Parents will accept the explanation that it is wrong to establish one set of expectancies for their child and then suddenly revise them. Remember, parents and caregivers are part of the Pediatric Dentistry Treatment Triangle, and most are interested in their children having good working relationships with their dentists. They do not want to see confidence and trust destroyed.

Case 16.5 Tolerance and Empathy

Eight-year-old Paul was undergoing a one-hour restorative appointment. Although he experienced no pain, Paul whined and fidgeted throughout the appointment. Despite the dental team's best efforts, the child's behavior aggravated them. In an attempt to modify the situation, the dentist firmly instructed Paul to stop whining and moving. This proved unsuccessful; the disturbance continued and the child began to scream. Finally, the dentist felt that she was about to lose control. She decided to take a "time out" and walk away from the dental chair.

Case 16.5, Discussion: This could happen. Children sometimes whine, fidget, and aggravate, despite the best dental team efforts to minimize disruptive behavior. The important point is that the dentist recognized a potential loss of personal control. This story demonstrates that all people have limitations in dealing with negative behaviors. Recognizing individual tolerance levels and empathizing with the patient and situation is important when dealing with children.

Tolerance level and empathy are seldom-discussed concepts in dentistry, and they vary from person to person. As an illustration, consider the possible effect of Paul's behavior, which might be described as borderline cooperative-uncooperative, on two different dentists. Dr. A. copes with Paul's whining with the attitude that the child will gain confidence and eventually change. She ignores the whining and continues treatment. Dr. B., on the other hand, finds the whining highly irritating. Because it is bothersome and upsetting to the entire dental team, as well as the parent, Dr. B. manages the child by using a firm, reassuring, positive voice control technique. The dentists tolerated and reacted to the child's behavior quite differently. Yet both provided the treatment successfully, even though their approaches to the problem were dissimilar. Their management of the situation was governed by their individual tolerance levels.

As well as varying from person to person, tolerance levels fluctuate for the individual. For example, an upsetting experience at home can affect the clinician's mood in the dental office. Some people are in a better frame of mind early in the morning, whereas the abilities of others to cope and empathize improve as the day progresses. The important thing is for clinicians to know their tolerance levels. Morning people should instruct receptionists to book behavior problems first thing in the morning. Learning to recognize factors that overtax tolerance levels is one way to avoid loss of self-control.

Case 16.6 Flexibility

Four-year-old Daniel was apprehensive but cooperative for his dental exam one week earlier. Now he has returned to the office for a restorative treatment. When the dentist entered the operatory and was about to begin treatment, Daniel said, "I have to go to the bathroom." The dentist questioned the boy's necessity and reluctantly acknowledged Daniel's need: "OK, but hurry up!" Then he added, "Be quick, we are already half an hour behind schedule."

Case 16.6, Discussion: Daniel may have had an urgent need, or he may have been delaying treatment. The dentist tried to determine the necessity and, failing to do so, allowed Daniel to go to the bathroom. To avoid this situation, patients should be asked to use the restroom before entering the treatment room and be told that during treatment it will be difficult to stop and go to the bathroom. However, Daniel was not prompted before treatment to use the bathroom. In cases such as this, the child has to be given the benefit of the doubt. Sometimes, however, children use this ploy as a means of delaying treatment. The bathroom incident is of secondary importance in this case. It is included here to point out another important principle when dealing with children: the dental team has to be flexible. Since it was not Daniel's fault that the office was operating behind schedule, there was no reason to be impatient with him.

Children are children. They lack the maturity of adults, and the dental team must be prepared to change its plans at times. A child may begin fretting and squirming in the dental chair after half an hour, and the proposed treatment may have to be shortened. Conversely, a dentist may plan an indirect temporary pulp treatment with final restoration at a second appointment, but because the child is difficult, the

plan may have to be altered to complete the treatment in one session. Sometimes a child may appear for a dental appointment out of sorts, with a low grade fever and stuffy nose that was unrecognized previously by a parent, and the dental appointment has to be terminated.

The size of children may also demand a change in operating procedure. Many dentists, following accepted four-handed dentistry practices, work at the eleven or twelve o'clock position. This is not always possible with the young child patient. Thus, the dental team has to change with each situation, and flexibility becomes a necessary ingredient in the behavior management of children.

Keys to Effective Communication in a Pediatric Office

Communications are used universally in pediatric dentistry. Establishing communication with the pediatric patient helps alleviate fear and anxiety, builds a trusting relationship between the dental team, the pediatric patient, and the parent, and aids in promoting the child's positive attitude toward oral health. The dental team must consider the cognitive development of the pediatric patient as well as the presence of other communication deficits, such as hearing disorders, when communicating with them (AAPD 2012). There are keys that help open and guide effective communication with children. These are:

- The first rule is to establish communication. Engage the child in conversation. This enables the dentist and the team to learn about the patient, and may relax the child.
- Be sure that everyone acknowledges the lead communicator. Members of the dental team must be aware of their roles when communicating with a child, and at which point one person takes the lead over the other. For example, the dental assistant starts engaging the child in conversation before the dentist arrives. Then, when the dentist arrives, the dentist takes over the lead and the assistant becomes an active listener. It is important that communication comes from one single source. If the parent is in the operatory, this must be explained in advance. When the dentist is conversing with the child, the parent must be a silent observer and active listener. If multiple people try to engage the child in conversation or give directions at the same time, it can be confusing for the child.
- It is important that the message is simple and age-appropriate. When talking with children, use real-life descriptive examples to explain procedures.
- Use the voice appropriately. A controlled alteration of voice volume, tone, or pace to influence and direct the patient's behavior is known as voice control. The objectives of voice control are to gain the patient's attention and compliance, avert negative or avoidance behavior, and establish appropriate adult/child roles.
- Use multisensory communication. In addition to spoken messages, nonverbal messages can be used with patients. Body contact such as a simple tap on the shoulder or a smile conveys a friendly feeling of warmth and reassurance. Eye contact is important. Children that avoid eye contact may not be fully prepared to cooperate. When talking with children, every effort should be made to speak at the child's eye level, rather than towering over them. Eye level communication allows for a friendlier and less authoritative or intimidating experience.

The foregoing are keys to communicating with children. There are others as well. All are described in greater detail in the communication section of Chapter Six.

Training the Dental Team

The practice of pediatric dentistry is a team effort, with the dentist leading and delegating responsibility to the pediatric dental staff (including trained dental auxiliaries and office personnel). Each pediatric dental auxiliary and office staff member has to be trained and should actively participate in the management of child behavior in the dental office (Wright 1975). The dental auxiliaries and office staff members must support the dentist's efforts to welcome the patient and parent into a child-friendly environment and facilitate behavior guidance and a positive dental visit (AAPD 2012). The responsibility, or role, of individuals varies according to the philosophies and competency of those concerned.

In the Pediatric Dental Team Approach, everyone contributes. The pediatric dentist is the leader, but it is important to note that this means giving the team members autonomy and empowerment. As Bill Gates said, "As we look ahead to the next century, leaders will be those who empower others" (Aeker and Smith 2010). There are instances where the dental assistant or hygienist may be the "key" person in the control of the child's behavior—instances in which they engage the pediatric patient better than the pediatric dentist. In such instances, it is important to give the dental auxiliary considerable freedom in developing rapport with the child. Research has shown that people working in self–organized teams are more satisfied, resulting in a more

positive work environment (Bharat 2007). Research outside of dentistry also has found that happy individuals are much more likely to participate in activities that are adaptive for both them and the people around them. Positive emotions lead people to produce more ideas and think more creatively and flexibly, which in turn encourages imagination and enhances social relationships (Aeker and Smith 2010). Auxiliaries need to be encouraged to contribute to this pleasant experience.

Dentistry is often described as an art and a science. Both are important when bringing a team together. Thus, a basic program for training a dental auxiliary to participate in the management of child behavior—a fundamental skill—is important. How each dental office or clinic engages and teaches their auxiliaries will vary, according to the educational background of the auxiliary. There are two types of backgrounds to consider. One type is the person who has been engaged because of a positive attitude and keen interest in children. These persons need to be taught dental assistant skills from the bottom up. The second type is a certified dental assistant who has completed a formal dental assistant program. In this case, begin with a fresh slate and share with them the importance of embracing changes and flexibility. Few dental assisting training programs spend much time teaching behavior management. Additionally, ask the assistants to share ideas that worked well in previous experiences. Foster an open-minded and flexible team culture by implementing the rules of behavior management. The keys to effective team communication not only work with pediatric patients, but also in training the pediatric team member. Personal communication between the dentist and the dental auxiliary is one of the most important and commonly used methods in training the dental auxiliary. Think of it as tell-show-do.

Again, be concrete, and have plans and protocols. The dentist must define each auxiliary's role and emphasize that the goal of pediatric dentistry is to positively guide infants, children, and adolescents through their dental experiences. It is absolutely essential to communicate expectations clearly to the auxiliary. The reason many staff members do not achieve their goals or become engaged team members is they have not be given clear or concrete instructions as to their role (Koestner 2002).

While staff roles should be defined, they also need to be tweaked periodically. This is usually based on what is learned while monitoring a staff member's progress (Aeker and Smith 2010). Regularly scheduled staff meetings for discussions of the philosophy of child management to which an office subscribes are exceedingly important. Such discussions provide an opportunity for an individual auxiliary to question certain policies and methods, and to more clearly understand their application. They also provide an opportunity for the entire staff to share in this understanding, which is absolutely essential. Dental auxiliaries demonstrating a team mentality and loyalty to the practice are important.

The First Non-Emergent Parent Encounter

The receptionist usually has the first contact with a prospective patient's parent when scheduling an appointment over the telephone. Since parents often do not know how to prepare their children for the first dental visit, it is the receptionist's to help "set the stage." The receptionist should provide information that helps the parent understand what to expect prior to an appointment, alleviating anxiety. This is done in several ways, such as a pre-appointment letter or through an office's web page. These strategies are described in detail in Chapter Six. All of these encounters serve as education tools that may answer questions, allay fears, and help the parent and child be better prepared for the first visit (AAPD 2012).

Through this initial contact with a parent, the receptionist can gain important information to prepare the rest of the pediatric dental team for the new patient encounter. For example, is this the child's first dental experience? If not, did the parent indicate that there had been problems in the past? Are other siblings treated in this office? Who referred the patient? It is the responsibility of the receptionist to obtain and record this information, and provide it to the team. Figure 16-1 shows a telephone information slip for recording information. (Figure 16-2 is a different telephone information slip that is used for the emergency patient.) A receptionist with a good attitude can gain much information and is extremely important because she is the "preview" of the office staff and the sole contact before the new patient arrives.

Scheduling Appointments

The parent or caregiver's first direct impression of an office is formed when the pediatric patient's first dental visit is scheduled. This may be the child's first dental experience. Every dental team member should be prepared to make this first significant "one-time" event as pleasant as possible. If a positive first encounter provides a pleasant introduction to dentistry, it is the first stage in building a good dentist-patient relationship.

If a child has not been seen before, it is often difficult to assess the amount of time that will be required for the first visit. Children with special needs may or may not require special consideration. It can be advantageous to schedule these patients where extra time can

TELEPHONE INFORMATION SLIP NEW PATIENT FORM

New Patient Form

Caller Name City

Patient's Name Age

List any family members who are patients

How did you hear about our office

Has your child been to the dentist before Y N

Name of previous dentist Date of last visit

Has your child taken any X-rays Y N

Did the previous dentist find any cavities on the last visit N N

Did they start the work & have all the work completed Y N

How was it done

If no, why

Do you want to have the work done Y N

Plan on returning to the previous dentist after the work is done Y N

Is your child having any problems at this time Y N

Is there pain and for how long Y N

Reason for visit

Describe the problem

If appointment is scheduled then remind parent to contact previous dentist and have them forward the records to our office.

Figure 16-1. A telephone information slip for recording information.

TELEPHONE INFORMATION SLIP EMERGENCY PATIENT

Patient Emergency Message

Caller Name

Date Time

Contact Phone Number

Patient Name Age

Name of previous dentist and reason for visit

Is your child having any problems at this time Y N

Is there pain and for how long Y N

Did your child have an injury Y N

Describe the problem

Figure 16-2. An emergency patient telephone information slip.

be allotted if necessary. For most children, a successful first-time scheduling procedure (followed by the authors) is to limit the appointment to an examination and radiographs, if indicated. A second appointment is made for a dental prophylaxis and fluoride treatment. Having two separate visits allows better evaluation of the child's behavior and greater opportunity to engage parents in prevention discussions and the anticipatory guidance aspect of pediatric oral health. By separating into two appointments, the focus is narrowed for each visit and positive experiences are enhanced for the parent and patient. Narrowing the goals and tasks lead to better participation (Latham and Seigjts 1999) and increases the enjoyment of the tasks (Bandura and Schunk 1981; Manderlink and Harackiewicz 1984).

Although many pragmatic factors dictate office procedures, the schedule itself can influence the child's cooperative behavior. Scheduling, appointment length, and time of day are important practical considerations of the child's treatment plan. Further, nobody likes to be kept waiting, including children. A child kept waiting results in a restless patient; thus, there should not be long waiting periods in the reception area. It can have an adverse effect on the child and the parent.

Pediatric dentists have to determine what works best for them and their staff. Many dentists prefer to schedule young patients in the morning. In addition, many dentists feel that by keeping age groups together (preschoolers in the morning, older children in the afternoon), the peer groups have a positive influence and the dental office runs more smoothly, with less psychological change of pace for the dental staff. Some pediatric dentists also prefer to see patients with behavior problems first thing in the morning. However, the issue of "tolerance level" must be considered when scheduling. Does the dentist's tolerance level change between 9 a.m. and 5 p.m.? Since tolerance level affects dentist-child interactions, the attitudes of both the patient and the dentist are considered when selecting appointment times. The authors prefer to see behavior problems first in the morning, but a colleague of theirs prefers to wait until he has had his morning coffee! Different strokes for different folks.

Everyone on the pediatric dental team wants the patient to enter the office calmly, progress through treatment easily, and leave the office happy. For this to occur, everything has to go well from beginning to end. The following case scenarios focus on the scheduling of the dental visit and their influence on the behavior of pediatric patients.

Case 16.7 Patient Sequence

Four-year-old Johnny and his mom are contently waiting in the reception room for Johnny's first dental visit. After a brief time, three-year-old Tina storms into the reception room following her treatment. Tina is visibly upset and crying. This has been her history for the past two checkups. Now Johnny looks up at his mom and starts to tear up.

Case 16.7, Discussion: Unfortunately, this problem can occur in the dental office. It is termed behavior contagion. Johnny was initially sitting beside his mom, waiting calmly. Tina, who was obviously upset by the dental experience, has adversely influenced Johnny, the next patient. If the waiting child is a new patient, the experience likely increases apprehension even more.

To avoid duplicating this type of situation, a good scheduling guideline dictates that a first-time child patient's appointment should follow the appointment of a child with a positive behavioral background. Then the child who exits happily from the dental operatory can influence the new patient favorably. Perhaps the best way to avoid the problem is an office protocol that instructs receptionists or booking clerks to check the behavior of each patient preceding a new patient. If the exiting child's behavior is positive, it could have a beneficial influence on that of the following child, especially when the children are of the same sex and are closely matched in age.

Case 16.8 Waiting Periods

Mrs. Jones has arrived in the office with her two young children for their dental appointments. After waiting in the crowded reception area for a half hour, the children became restless and began to chase each other around the room. An argument followed, which embarrassed Mrs. Jones and disturbed the other patients.

Case 16.8, Discussion: Children are bundles of energy. Lacking the patience of adults in an environment that was not designed to occupy their attention, the children in this case made up their own "game." How unusual is it for children to argue when they are confined in close quarters? The point is that adults may relax and read, but children become restless and tired, especially if there is nothing to occupy them. Beginning an appointment in this way can negatively affect the remainder of an office

visit. This is especially true for a new patient, or one who has demonstrated apprehension or uneasiness at earlier appointments.

A good general rule is that a child should not be kept waiting in the reception area, and that every effort should be made to be on time. Years ago, Brauer (1964) pointed out that long waiting periods in the reception area should be avoided because they can have an adverse effect on the child and the parents. This still holds true, and emphasizing the importance of staying on schedule and keeping the waiting periods for children as short as possible. The reception area may also be designed as a fun place for kids, with planned activities to avoid problems. Fun is the easiest way to change behavior for the better (Ramos 2009). Many pediatric dentists provide separate areas for children, with activities such as television, video games, or play structures (see Chapter Seventeen). Other suggestions are children's books, toys, fish tanks, blackboards, building blocks, and small chairs and tables.

Case 16.9 Appointment Sequence

Charlene, age three, had an appointment for her first dental examination. After entering the operatory, the child screamed and flailed about in the dental chair. With consent from the parent, the dentist used firm positive voice control to manage her behavior. The child ultimately cooperated for the dental examination, but additional treatments were required. At the front desk, the receptionist made Charlene an appointment for a month later.

Case 16.9, Discussion: This case features a child who misbehaves or is apprehensive and who, by good behavior management, becomes cooperative. After establishing rapport, everything went well, but the scheduling of the next appointment increased the chance of the problem repeating itself. This patient should not have to wait for an extended period for the next office visit. Such a child should be rescheduled as soon as possible to reinforce the new-found positive attitude.

By reducing the time between appointments, the dental team uses a management strategy that can be called the "rapid sequence" appointment technique. It is typically used in the following way for the apprehensive new patient without emergency treatment needs. At the first visit, the dentist expects to perform a clinical examination and to take radiographs, if indicated. The apprehensive child balks or is difficult. Eventually, the child becomes more cooperative through proper management techniques, and the dentist examines the patient without problem. However, the dentist senses that the child is still quite apprehensive. This can be a good place to terminate the appointment and reschedule the patient for the indicated radiographs within two weeks. Delaying the radiographs benefits the clinician as well as the child. It provides the clinician the opportunity to build the child's confidence and reassess the behavior before treatment. The patient leaves the office after the first visit believing that the task was accomplished, which promotes the child's pride and autonomy.

It was previously mentioned that the authors separate the first examination and prophylaxis procedures into two shorter appointments. In this case, children who experience the rapid sequence appointment technique usually perform well upon returning for radiographs. Often they display little or no apprehension at the second visit. They have been led slowly through the dental experience. Parents usually appreciate the little extra time taken to develop a positive attitude in their children, especially when the situation is explained to them.

The rapid sequence appointment technique is a form of behavior modification that desensitizes the anxious child. From the clinician's viewpoint, this strategy may be too time-consuming, and therefore impractical. If carried to an extreme, this may be true. However, many first-time child patients exhibiting anxieties accommodate quickly, and they are entitled to be led through initial dental experiences slowly. In the long run, taking time to desensitize the patient offers great dividends to the clinician.

Further, when a long series of restorative appointments have taken place, the final appointment should be brief, and simple procedures should be planned. In this way, the child leaves the dental office awaiting the recall visit with a good feeling.

Case 16.10 Appointment Time

Alice, age three, is apprehensive and very active. She requires considerable dental treatment. The dentist decided to pre-medicate her with an oral conscious sedative. The drug was supposed to relax the child during the lengthy appointment. Despite his knowledge that Alice often naps in the late morning, the dentist recommended an early morning appointment.

Case 16.10, Discussion: Consider this case carefully. The sedation was supposed to relax and calm the child, facilitating a lengthy treatment. However, the scheduling of the appointment may be in error because children who are accustomed to late morning naps frequently have

higher activity levels early in the morning. Thus, both children's behaviors and dentists' management strategies have to be taken into account in the daily office schedule.

If a child is accustomed to napping late in the morning, she is likely to require less sedation, or at least respond better to the sedation prescribed, if her appointment is scheduled near her napping period. Again, the scheduled appointment can influence the behavior management. Although many dentists encourage morning appointments for children, some situations necessitate changes in the office schedule.

Case 16.11 Appointment Duration

Jeffrey, age six, has always been a cooperative dental patient. Returning for a recall appointment, it was discovered that he needed restoration on two of his newly erupted upper first permanent molars and sealants on his two lower permanent first molars. The dentist recommended that Jeffrey have three half-hour appointments—one appointment for each restorative filling and one appointment for the sealants.

Case 16.11, Discussion: Why was the cooperative patient given three appointments? Would one long appointment (one hour) or two appointments (45 minutes each) be better, or would they be too long? Scheduling appointment length is variable. It often depends on the patient's current behavior and temperament.

Improved technology, the application of time, and motion studies by efficiency experts have altered today's current dental practices. Nowadays, the tendency is to treat the patient quickly and effectively while maintaining concern for patient comfort, health, and time. This change in approach conforms to the definition of behavior management proposed in the introductory chapter of this book. This definition included the terms "effectively" and "efficiently." Given this patient's history, there is little doubt that treatment could be accomplished in one or two sessions. Only a few studies have concentrated on appointment duration. Those few, however, note that appointments lasting one half hour to one hour are not detrimental to a child's behavior.

Further Considerations for the Dental Team

Parental Presence/Absence

Parent involvement, especially in their children's health care, has changed dramatically in recent years. It is important to understand the changing emotional needs of parents because of the growth of a latent but natural sense to be protective of their children. Practitioners should become accustomed to this added involvement of parents and welcome their questions and concerns for their children. They should consider parents' desires and wishes, and be open to a paradigm shift in their own thinking (AAPD 2012). Currently, many clinicians design operatories to accommodate parents (see Chapter Seventeen).

There is little agreement in practitioner philosophy regarding parents' presence or absence during pediatric dental treatment. Surveys on the topic in the 1970s were almost unanimous in reporting that parents should not accompany their children into the dental operatory. There were, of course, exceptions, such as for the toddler, the special needs patient, and so forth. However, beginning in the 1980s, surveys found an increasing number of practitioners allowing parents into the dental operatory with their children (see Chapter Four). Nowadays, it is becoming more and more common for the parent-child pairing to remain together.

Gifts and Tangible Reinforcements

Giving gifts or prizes to children has become a fact of commercial life in North America and almost throughout the world. There is general agreement on the merit of this practice in the dental office, for gift-giving can serve as a reward. If the gift has dental significance (such as a toothbrush kit), it also serves as a reinforcement for dental health.

It is very important that the various trinkets in a toy chest are used as tokens of affection for children—not as bribes. A bribe is a promise to induce positive behavior. A token of affection reward is recognition of good behavior after completion of the operation, without a previously implied promise. What Finn called a bribe in 1973, Pink calls a "contingent" reward in his 2009 book, *Drive—The Surprising Truth About What Motivates Us*. This is how a contingent reward sounds: "if you do this, then you will get that." Contingent rewards, or bribes, can have negative effects—they require people to forfeit some of their autonomy (Pink 2009). Studies have shown that when contingent rewards are given to control a person's behavior, they can do long-term damage.

Deci and colleagues re-analyzed nearly three decades of studies on the subject of rewards. After carefully considering reward effects in 128 experiments, they concluded that tangible rewards tend to have a substantially negative effect on intrinsic motivation when focused short-term to controlling behavior (Deci et al. 1999). Gift-giving practices which are not "contingent" or bribe-based can have spectacular results. Many children who seem tense during operative procedures suddenly perk up upon completion, eager for a gift. These gifts provide a pleasant reminder of the appointment. It is

Figure 16-3. It is always special when a member of the dental team accompanies the child to the gift box and praises her while she selects her prize.

always special when a member of the dental team accompanies the child to the gift box and praises her while she selects her prize (see Figure 16-3).

Wearing Apparel

When it comes to apparel for the dental team, there has been concern that professional clothing worn by the dentist can increase anxiety in children because fears may be transferable from one situation to another unrelated encounter. For example, if a child had previous poor experiences with a professional in a white coat (who could be a physician or a barber), it is possible that these fears could be generalized to the dental environment. The uniform can be common to all. Similarly, children who have been exposed to prior surgical procedures might be frightened by a face mask. Investigating this potential problem, Siegel et al. (1992) suggested that wearing a mask during dental treatment represents a minimal stressor for the young child, but recommended introducing the child to the dental environment and experience without the use of a protective mask.

Wearing apparel can conceivably influence both patients and professional staff. Studying the issue in a dental faculty, Mistry (2009) found that parents favored traditional dress, as it gives an air of professionalism. Children, however, preferred dental students in casual attire. All are not in agreement with this view. Kuscu and colleagues (2009) examined the preference in attire of 827 Istanbul school children eight to fourteen years of age. The children were shown photos of dentists wearing different clothing. Almost half of the children selected formal attire as their choice for dentists' wearing apparel. The study does not support the popular view that white coats raise anxiety levels in children.

An investigation by Austin et al. (1991) surveyed the wearing apparel of women dentists with a questionnaire. Based upon the replies of 928 of 2000 women, only 51% felt the need to wear a lab coat over their street clothes. Interestingly, women dentists reporting the highest gross incomes were more likely to wear street clothes without a lab coat. The study suggested that dressing for success and infection control was a professional issue.

What to wear in the clinic is not only a dental issue. Troung et al. (2006) reported that physicians wearing standard precautions attire in the pediatric emergency

department need to be aware that this apparel may negatively impact their relationship with pediatric patients four to eight years of age. In terms of the effect of physician dress style on patient confidence, patients of all ages who consulted with physicians in a hospital or private practice had the most confidence in a physician who wore a professional white coat (Maruani et al. 2012).

Taking Radiographs on Children

In 1987, the FDA developed safe guidelines for the use of dental X-rays. These guidelines were updated in 2004 and again in 2012. The development and progress of many oral conditions are associated with a patent's age, stage of dental development, and vulnerability to known risk factors. Therefore, the 2012 FDA guidelines are presented within a matrix of common clinical and patient factors which may determine the type(s) of radiographs commonly needed. The guidelines are intended to serve as a resource for the practitioner and are not intended as standards of care, requirements, or regulations. While the dentist is responsible for ordering the number and type of X-ray required, auxiliary personnel who take X-rays in a dental office should be aware of the guidelines. They should know how many and what type of films are to be used. Consider the following case.

Case 16.12 Film Selection

Cora, a lovely four-year-old, was referred to a pediatric dentist as a management problem. While the previous dentist had obtained radiographs, they were of poor quality and the had child refused to have them re-taken. The alert dental assistant immediately recognized the problem—the previous dentist used bitewing films, size number 2.

Case 16.12, Discussion: Personnel taking radiographs need to know what type of films to use, and it is the dentist's responsibility to ensure that staff members know the procedures. In this case, the child likely was hurt by the type 2 radiographs. Large radiographs also could have caused her to gag. A good rule is that type 0 films should be used at least until the first permanent molars erupt.

The young patient has to be re-trained. New expectations have to be developed. It is important to point out that "things are different here." In accordance with leaning theory, the stimulus has to be altered to get a different response. One way is to begin by taking an anterior occlusal radiograph (Figure 16-4). This type of film generally does not cause gagging and is easy to obtain. It also allows the clinician to assess the cooperative behavior. An important teaching technique is to begin with an easy task (the occlusal film) and, once successful, increase the difficulty of the tasks (the bitewings). In addition, show the child the size of the radiograph from the former dental office and compare it to the type 0 film that you intend to use. Have the child hold the films. Be sure to keep repeating, "See, things are different here."

If there is difficulty taking a bitewing film, a Rinn holder can help. While it may not provide a good view of the furcation regions, it is adequate for diagnosing proximal caries. In this case, in order to gain Cora's confidence, she needs to be convinced again that "things are different here." A more detailed description of retraining procedures can be found in Chapter Six.

Another consideration should be made when switching over to digital radiography. Two basic techniques are available to obtain digital images: the direct method using an electronic receptor, called a sensor, and the indirect method, which uses a semi-indirect sensor called a photostimulable phosphor plate (PSP) and scanner (Figure 16-5). The direct sensor may either be cordless or, in many instances, have a fiber optic cable attached. The sensor is quite bulky and although it may be similar in size to conventional film, its dimensions are not identical. In addition to its increased thickness, the plastic protective cover and cord may be uncomfortable for toddlers and young children. PSP plates are very thin and are available in sizes that match conventional film. The PSP system may be more suitable for pediatric dentistry: the thin, flexible plates are almost equal to X-ray films. The protective sleeve covers do not add any bulkiness to the plate. In addition, during bitewing exposures, the conventional bitewing tab may be affixed to the plate (Figure 16-6). The only disadvantage of PSP plates is that when taking occlusal radiographs, the child is asked to bite down on the plate, potentially damaging it. A useful clinical tip is to protect the plate for the occlusal view with a plastic cover found in packages of routine films.

It should be noted that the authors use the direct sensor method successfully, and when switching over to digital radiography, the clinician will ultimately decide which method is best for the dentist's individual style and needs.

Successfully introducing youngsters to radiographic procedures involves both the science and the art of behavior management. Explaining and demonstrating to patients, as well as answering questions and modifying procedures, are all parts of the art of behavior management.

The radiograph introduction is similar to other procedures for the young patient. A child's potential to

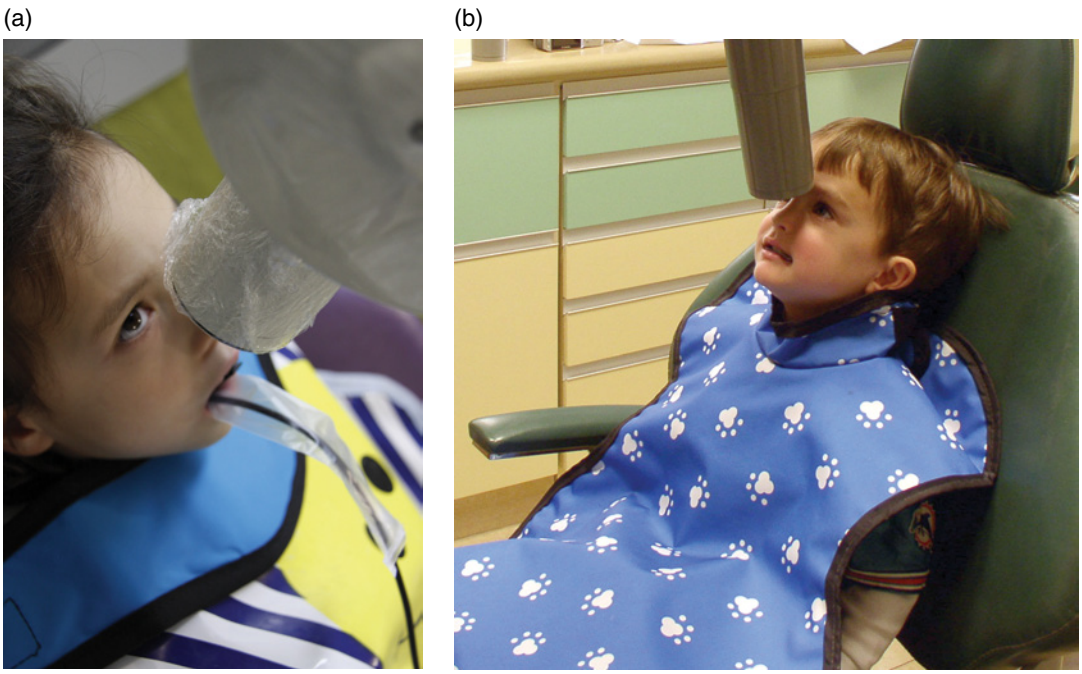

Figure 16-4. The anterior occlusal radiograph is the easiest and should be used before taking bitewings. Note the complexity of the sensor system, including plastic barrier sleeve and cable (a) versus the photostimuable phosphor plate (PSP) system (b), which is identical in technique to standard X-ray films. Courtesy of Dr. Ari Kupietzky.

Figure 16-5. The PSP plate (middle) is almost identical in size and dimension to conventional film (left), unlike the sensor (right), which is more bulky and has a plastic protective sleeve and cord. Courtesy of Dr. Ari Kupietzky.

Figure 16-6. For bitewings, a simple bitewing tab may be used with PSP plates (left) versus the sensor (right), which is used with a bitewing holder or bite block. Courtesy of Dr. Ari Kupietzky.

cooperate should be evident before attempting radiographs. Communication has to be at the child's level of comprehension. Examples, instructions, and explanations should incorporate words and objects familiar to the patient, with as much repetition as necessary to acclimate the child to the procedure. Lengthy, complicated procedures should be broken down into steps for easier communication. When the child performs as instructed, praise is necessary to positively reinforce the desirable behavior. However, the praise should be specific: for example, "You are a good patient. You sat still."

The behavior-shaping procedure, although similar to the tell-show-do method, employs more concepts from learning theory. For instance, the child who is told about the radiographic equipment, shown the equipment, and then looks away may be telling the operator that he is not prepared to cooperate. In this case, attempts to shape behavior by returning to the "tell" portion of the procedure (i.e., the most distant approximation) may

be helpful: "Michael, do you remember what I told you? I have a big camera to take pictures of your teeth. Please look over here so that I can show it to you. See it? Good!"

Behavior shaping entails successive approximations of desired behavior. Therefore, the dental assistant would not begin taking radiographs until the child heard, saw, or touched as instructed. Only after the desired behavior has come about should the next approximation occur. Thus, reciprocal interaction is an important feature of any behavior-shaping procedure, and the dental team member has to observe a child patient's reactions closely.

The following description for introducing radiographs begins by placing the protective apron on the child. Radiographs are then placed in the child's hand. Thus, the patient is involved in the procedure. The dentist or dental auxiliary might say: "These are like paper" (if film) or, "These are like a memory stick" (if direct hard sensors are used). "They make pictures for your teeth. Can you count them for me to see that I have enough? Can you pick out the biggest ones? Good, you are a smart boy, Mike!"

Every attempt is made to relax the child (patients tend to gag when not relaxed). Since most children like to touch and feel things, the dental assistant may allow them to hold the radiographs. Permitting the youngster to count the films and select the larger ones also helps the clinician estimate a child's developmental level. A four-year-old patient who counts the four films and selects the large ones is probably a capable child.

Again, the child is introduced to the radiographic equipment with explanations from the dental assistant, such as the following: "I use a big camera. Do you ever have your picture taken at home? Yes? Well, my camera is a little different. Look, it has a long neck and a big head." Children have vivid imaginations and like to use them. "Here is its nose" (indicating the cone). Most children will look at the cone carefully. "I see that you are looking at its nose. Look up there. Can you see anything? No? Good! I wouldn't want anything to get in the way of your nice pictures."

Since radiographic technique differs from home photography, a suitable explanation is offered. "When you take tooth pictures, it is a little different from home pictures. The camera moves beside your face (showing the child). It doesn't, but it makes a funny noise (buzz and a beep) as it takes the picture. Also, the picture has to be in your mouth, not in the camera" (pointing to a location in the child's mouth).

In behavior shaping, the "tell" and "show" portions of the technique often go hand in hand. Modeling can be an important part of the showing procedure: "Let me show you how I like the children to do it" (Figure 16-7). The dental assistant can demonstrate film and X-ray machine placement on herself, or a model of a dentition can be used for this purpose. Since an X-ray machine is large and can frighten a young child patient, it should be introduced slowly. Rapid movements or unexpected noises should be avoided. If a specific room is used for radiographs, poster-sized pictures showing children having radiographs can be helpful. The objective of the entire process is to shape the child's behavior, which is brought about by a series of successive approximations.

Figure 16-7. Tell-show-do: The dental assistant is showing the patient the protective apron.

One common question that preschoolers ask is, "Why do you use the blanket?" (meaning the lead apron). An understandable response might be, "Because I only want to take pictures of your teeth. I don't want your tummy to get in the picture." Another common question is, "Why do you go out of the room (or move away) when you take the picture?" Two logical responses could be "So that I do not get in the picture" or "Because I have to go over here to press the button for the camera." Explanations such as these, made at a level children can comprehend, usually satisfy curiosity. For older children, these answers will not suffice. They appreciate a brief explanation of radiation hygiene, which also demonstrates the dental team's concern for them.

When it is time to take the radiographs, the child is involved in a potentially pleasant learning situation: "Could you please pick out the biggest picture film and give it to me? Thanks. Mike, first I want to take a picture of your front teeth. Did you know that this picture can show me where your new teeth are? After I take the pictures, I will show you where your new teeth are, and maybe we can tell when they will come in for you."

Taking the X-ray, the dental assistant places the film or sensor in the child's mouth and says, "Close your teeth and hold the picture like a cookie, please." It is important for instructions to be brief, straightforward, and at the child's level of comprehension: "Good, now I will bring the camera nose near your nose to take the

picture." The dental assistant, backing away from the camera says, "Hold still and I will take the picture. Don't move. Smile!" Many children grin when told to smile. This also facilitates positioning of the film. The analogy between home photography and radiography is maintained. Following the first film, the child is rewarded socially. The appropriate behavior is reinforced by verbal cues such as "Great!" and smiles from the office staff.

The procedure can move along rapidly. "Can you find the other big picture?" While the child rummages through the films, the operator explains, "We took a picture of your upstairs front teeth. Now I will take one of your downstairs front teeth. Did you know that you had upstairs and downstairs teeth?" While many young children laugh at this dental description, they understand. It is at their level of comprehension.

For a posterior bitewing or periapical view, a film tab or holding instrument is used. This, too, must be introduced to the child: "Look, Mike, when I take pictures of back teeth, I use a holder. It holds pictures. See my holder? I will put it in your mouth now, and you can bite on it. Great, you bit hard! Now I need the holder back" (removing it). "I put the picture in the holder so that it is easy for you to bite on." If you use sensors, you can use the analogy of a sugar-free lollipop. "Now I put the picture in your mouth and take a picture of your other teeth."

Panoramic Radiography and Extra Oral Bitewings

This procedure presents a different situation for the child patient. While panoramic radiographs or extraoral bitewings are not difficult procedures, some children are alarmed when they first see the equipment. For this reason, the panoramic radiographic equipment should be explained by the dental assistant before it is shown to a child. Children can be told that they are going to have their picture taken in a "space machine" and that they are not to be the space pilots. While positioning children (Figure 16-8), they are told that it is very important to hold still and that the big "space head" will move around them but not touch them. It is helpful to have smaller children stand on a stool (see Figure 16-9). A dry run can be made with the radiation turned off on most machines. Because the length of time that the patient must sit still is considerably greater then with standard radiographic techniques, constant voice contact provides security to the young patient. When taking panoramic, extraoral bitewings or intraoral radiographs on bright, curious children, the dental assistant should expect questions and provide suitable explanations.

Figure 16-8. Patient positioning with the dental assistant using the tell-show-do method.

Figure 16-9. Patient positioning. It is helpful for small children to stand on a stool.

Summary

Dental auxiliaries are an important part of the dental team. Without them, contemporary dental offices would not function as they do. This chapter highlights some of the important aspects of child management in which auxiliaries are involved, hopefully provides information to help them with their work. It also strays

somewhat into the area of practice management. That is because, at times, behavior management and practice management are inseparable. Many more aspects could have been added. Indeed, an entire book could be written detailing the work of dental auxiliaries. However, other parts of this book, although written for dentists, also may be applicable to everyone interested in pediatric dentistry.

Note: Cases in this chapter were taken from Managing Children's Behaviour in the Dental Office by Wright, Starkey and Gardner (1983) with permission of Dr. Gerald Z. Wright.

References

Aeker, J. et al. (2010). *The Dragonfly Effect: Quick, Effective, and Powerful Ways To Use Social Media to Drive Social Change*. Jossey-Bass, San Francisco, California.

American Dental Association and US Department of Health and Human Services. (2012). Dental Radiographic Examinations: Recommendations for Patient Selection and Limiting Radiation Exposure. Revised 2012.

American Dental Association. (2006). Dental X-Ray Examinations Answers to Common Questions, W566.

Austin, G.B., Tenzer, A., Lo Monaco, C. (1991). Women dentists office apparel: dressing for success in an age of infection control. *Journal of Law and Ethics in Dentistry*, 4, 95–100.

Bandura, A. and Schunk, D. (1981). Cultivating competence, self-efficacy and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology*, 41, 586–598.

Bharat, M. as told to Julie Bick. (2007). "The Google Way: Give Engineers Room." New York Times, October 21.

Brauer, J.C. et al. (1964). *Dentistry for Children*, 5th ed., Mcgraw-Hill Book Co, New York, USA.

Deci, E.L., Koestner, R., Ryan, R.M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin* 125, 627–68; discussion 692–700.

Finn, S.B. (1973). *Clinical Pedodontics*, 4th ed., WB Saunders, Philadelphia, PA, USA.

Fredrickson, B. (2004). The broaden-and-build theory of positive emotions. *Philosophical Transactions: Biological Science*, 359(1449), 1367–1378. doi: 10.1098/rstb.2004.1512.

Los Angeles Times. "You're being exposed to radiation—but it's the amount that counts." March 15, 2011. http://articles.latimes.com/2011/mar/15/world/la-fg-radiation-comparison-20110315

Koestner, R. et al. (2002). Attaining personal goals: self-concordance plus implementation intentions equals success. *Journal of Personality and social Psychology*, 83, 231–244.

Kuscu, O.O. et al. (2009). Preference of dentists' attire in a group of Istanbul school children with related anxiety. *European Journal of Paediatric Dentistry*, 10, 38–41.

Latham, G.O. and Seijt, G.H. (1999). The effects of proximal and distal goals on performance on moderately complex tasks. *Journal of Organizational Behavior*, 20, 421–429.

Manderlink, G. and Harackiewicz, J.M. (1984). Proximal versus distal goal setting and intrinsic motivation. *Journal of Personality and Social Psychology*, 46, 918–928.

Maruani, A. et al. (2012). Effect of physician dress style on patient confidence. *Journal of the European Academy of Dermatology and Venereology*, Aug 9. doi: 10.1111/j.1468-3083.2012.04665.x.

Mistry, D. and Tahmassebi, J.F. (2009). Children's and parents' attitudes towards dentists' attire. *European Archives of Paediatric Dentistry*, 10, 237–240.

Pink, D.A. (2009). *Drive: The Surprising Truth About What Motivates Us*. Canongate Books, Edinburgh.

Pink, D.A. (2006). *A Whole New Mind: Why Right Brainers will Rule the Future*. Riverhead Trade, a division of Penguin Books, USA.

Ramos, K. (2009). "Volkswagen Brings the Fun: Giant Piano stairs and Other 'Fun Therory' Marketing." Los Angeles Times. October 15. http://latimesblogs.latimes.com/money_co/2009/10/volkswagen-brings-the-fun-giant-piano-stairs-and-other-fun-theory-marketing.html

Siegel, L.J. et al (1992). The effects of using infection-control barrier techniques on young children's behavior during dental treatment. *Journal of Dentistry for Children*, 59, 17–22.

Truong, J. et al. (2006). Young children's perceptions of physicians wearing standard precautions versus customary attire. *Pediatric Emergency Care*, 22, 13–7.

US Department of Health and Human Services. (2000). Oral health in America: A report of the Surgeon General. Rockville, MD: US Deptartment of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.

Wright, G.Z. (1975). *Behavior Management in Dentistry for Children*. W.B. Saunders Co., Philedalphia, PA, USA.

Wright, G.Z., Starkey, P.E., Gardner, D.E. (1983). *Managing Children's Behavior in the Dental Office*. The C.V. Mosby Company, St. Louis, MO, USA.

Wright, G.Z. and Stigers, J.I. (2011). Chapter 3. In J. Dean, D. Avery and R. McDonald (Eds.), *McDonald and Avery's Dentistry for the Child and Adolescent*, 9th ed., pp. 22–45. Mosby Elsevier, Maryland Heights, MO, USA.

Chapter 17

The Dental Office

Jonathon E. Lee

Brian D. Lee

Gerald Z. Wright

Ari Kupietzky

When the pediatric dentistry (pedodontic) treatment triangle was first described, one corner of that triangle featured the "dentist, dental staff, and the office environment." Despite the recognition of its importance, little has been written about the office environment in the pediatric dental literature, yet young pediatric dentists, graduate students, and residents spend countless hours thinking about their future dental offices, dwelling on what should and what should not go into their offices.

One of the first to recognize the importance of the office environment was Dr. Walter Doyle, who teamed up with the architect Sarah Tait to co-author one of the first publications featuring office design in a pediatric dental text. They wrote that designing an office was analogous to planning a city. Two of the innovations that they stressed were an office that would be open and flowing, with few doors and a multi-chair open operatory concept. Tait and Doyle (1975) wrote the following to encourage dentists to think about their office.

> *What is dental environment?..... A place that allows teeth to grow and change in a healthy way.*
>
> *What is dental environment?..... A place that allows the child to grow and change in a healthy way.*
>
> *What is dental environment?..... A place that allows the doctor's staff to grow and change in a healthy way individually and collectively.*
>
> *What is dental environment?..... A place capable of its own growth and change with respect to the life it sustains and maintains.*

Since the "special effects" created within pediatric dental offices can be critical to some patients' attitudes, the office environment can be an important part of behavior management. But it is only the starting point. Behavior management also involves numerous techniques and strategies. It requires skills in communication, empathy, coaching, and listening. Having an office that accommodates these management techniques and strategies is part of the "art" of behavior management. There are many types of pediatric dental offices. Some could be considered basic, while others might be called "glitzy." Some offices are designed for more than one dentist; some might be designed for numerous dentists, hygienists, or expanded-duty dental assistants. The point of this chapter is to identify features that are unique to pediatric dental offices.

Pediatric dental offices are unique. That is why many hours are spent thinking about the office. Be cautious when selecting an office designer or consultant. A traditional dental supply company may suggest a design based upon a standard template. Relatively few office designers appreciate or understand the needs of a pediatric dentist. When designing an office, several important questions need to be asked.

- Does the image that your office projects promote cooperative patient behavior and patient-parent acceptance?
- Is the space provided sufficient for the optimal function of the practice?
- Does the office make it possible to use management techniques appropriately?
- Does the office permit you to practice in the style that most suits you?

Office designers may not focus on these issues. To attract young dentists, the focus is often a financial one. Sales pitches are often along the lines of "We design high-performance offices," or "Let us increase your

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.

productivity through a good design." No one denies the importance of earning a good living. However, treating patients properly, using appropriate management techniques with care and understanding, should lead to that outcome.

Patients differ. Dentists differ. And, offices differ.

Reception, Waiting, and Play Areas.

The reception, waiting, and play areas are interconnected, and each requires a great deal of planning. They are critical to the office operation—they are like a store front window. They set the tone for the office and create expectations for both the children and their parents.

Patients should see the receptionist counter as soon as they enter so they don't feel lost. In turn, the receptionist should be able to see all patients, no matter where they are seated, so nobody is forgotten. All pathways should be wide enough, and the receptionist's counter low enough, for children in wheelchairs. When determining how big the waiting room should be, one should take into account that pediatric patients tend to visit the dentist as families. Often one patient will be accompanied by parents, siblings, and sometimes even friends. For example, a general practice office waiting room size calculation would be:

1. Determine the number of patients expected to be seen during the busiest hour, multiplied by 2.5 to account for accompanying relatives and friends.
2. Subtract the number of exam rooms—that is, how many chairs will be needed.
3. Next, multiply the number of chairs by 20 square feet (1.86 m^2).

Accordingly, a solo practice with three exam rooms that peaks at six patients per hour should plan on a 240-square-foot (22 m^2) waiting room with twelve chairs. A pediatric dental office would need even more space.

When considering play areas, do not begin with the numbers game. Play can happen intensely in 1 square foot or in 1000 square feet. Maybe the first question to ask is, "What will the play experience mean within the framework of the child's experience in this dental office?" Is play a diversion from the dental experience, or a simulation? Is it an introduction to the dental experience? What are the limitations of the play experience? Is the noise undesirable? Should the play be segregated from other areas? Is play a potential resource for the pediatric dental office that is vitally concerned with preventive and interceptive dentistry? Are parents involved in the play area? Is the atmosphere of the waiting room one of calmness, or perhaps excitement? Should the child waiting for an appointment be stimulated by a video game—perhaps magnifying hyperactivity—or should their time in the waiting room be relaxing and calming? The play area is a potential resource, for not only play, but for learning and behavior management. Make the most of it.

Excellent products are exhibited at dental meetings for waiting and/or play areas. How will they fit in the dental office? Will they cater to older children and teens, or will they be used by younger children or preschoolers? When thinking about the play area, several considerations are:

- The space has to be developmentally appropriate.
- The safety factor is a prime consideration.
- All toys or products should be hygienic.
- Equipment should be tough and long-lasting.

With these thoughts in mind, consider Figure 17-1. This waiting room area was designed with many of the elements mentioned above, and includes a reading section, a toddler/young child play area, and a teenager video game corner. Figure 17-2 is another example of a waiting area that accommodates both children and their parents. The play area is designed for younger children and preschoolers, and is separated from the general sitting area. A novel approach to waiting room play areas is a "cave" for children. Toys, games, and magic mirrors all can be contained within the cave (Figure 17-3). The area within the cave may be room-sized or significantly smaller. Its function is to allow a division between the play area and the general waiting area. In addition, it gives the children a sense of privacy and fun. The cave concept can also be used in smaller offices with limited space; prefabricated play houses are commercially available and serve the same purpose.

Figure 17-1. This waiting room area design has many elements mentioned in the text, including a reading section, a toddler/young child play area, and a teenager video game corner, which is isolated by glass.

Offices shared by multi-disciplinary dentists may have mobile play stations that can be displayed during the pediatric dentist's office hours and removed at other times so as not to label the waiting room as exclusively pediatric in nature. The module shown in Figure 17-4 is designed for small children and can be set anywhere, allowing parents to supervise. Note that it appears hygienic, safe, and tough and long-lasting.

Figure 17-2. A waiting area that accommodates both children and their parents. The play area is designed for younger children and preschoolers and is separated from the general seating area. Courtesy of Drs. Walker, Ritchie, Kutsch, Gill. Richland, WA.

In general, noisy games should be discouraged or used only in separate rooms. Sounds of children playing may not only be a nuisance to other patients in the waiting room, but also may disrupt and interfere with the receptionist and front desk. It is also advisable for an office employee to be able to see the play area, since many parents may allow their children to play unsupervised.

Games may be divided into non electronic/electronic, younger/older children-oriented, physically interactive, or passive. Electronic games may be touchscreen or include handheld joy sticks or steering wheels. They may be enclosed in protective casings to prolong their working life. Touchscreens have the advantage of being more user-friendly and less likely to break.

To encourage child-parent interaction, a reading corner may be constructed (Figure 17-5). The use of display shelves similar to book store displays is suggested to make the books more desirable (Figure 17-6). Among the books are ones with dental themes and children's classics familiar to both parents and children (inset). Book set collections are available from vendors, making them easy to purchase.

Another parent-child activity may be a desk station to be used for homework. Siblings may get their homework done while waiting for the other family members' treatments. The same desk may be used by parents as an office in the morning while their child is undergoing a

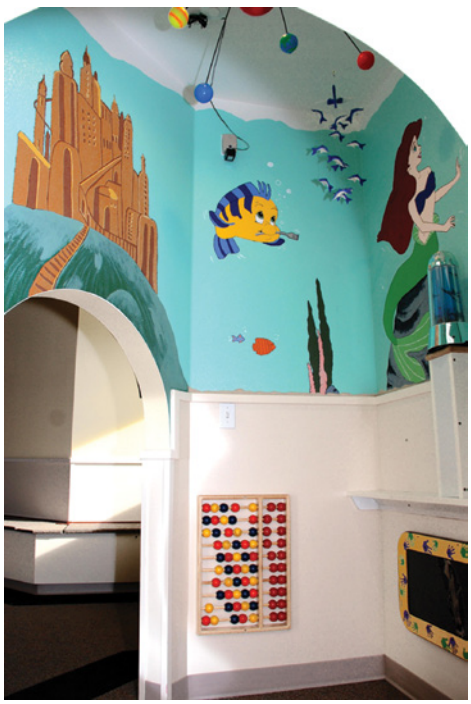

Figure 17-3. Inside view of "cave" area depicted in Figure 17.2. Toys, games, and magic mirrors all can be contained within the cave. The cave area gives the children a sense of privacy and fun. Courtesy of Drs. Walker, Ritchie, Kutsch, Gill. Richland, WA.

Figure 17-4. Offices shared by multi-disciplinary dentists may have mobile play stations that can be displayed during the pediatric dentist's office hours and removed at other times so as not to label the waiting room as exclusively pediatric. Courtesy of Playscapes. Waunakee, WI.

sedation visit. Parents may set up their laptops and phones while waiting. Lastly, a simple drawing corner with old-fashioned crayons and markers can be set up easily. Patients may be encouraged to present their drawing to the dentist and have it proudly displayed on a designated bulletin board.

The waiting room area may also be used for practice management. An informational video may be played constantly played for parents and children. The film may present office policies and services. A computer kiosk can be used to fill out medical history and other forms electronically, which are then submitted directly into the computer network. It goes without saying that WiFi internet access should be available in this area for the use and benefit of parents and patients.

Figure 17-5. To encourage child-parent interaction, a reading corner may be constructed. The use of bright modern art may be pleasing to both adults and children. It can make the room more energetic.

Office Themes

Many modern offices use themes, setting up the waiting room, play room, and treatment rooms like amusement parks. Many themes, like the jungle, space, or medieval castles, appeal to children of different ages. Using a theme often makes it easier to decorate, since the design has a clear direction. However, a theme can become outdated relatively fast. Some people choose to have a multigenerational and timeless theme, which provides an environment for all age groups, including parents.

Hallway Designs

Belcher (1898) was the first to write that children should be separated from their parents for the first visit. Parents were told that it was against "office policy" for them to accompany their children into the operatory. Until about 1980, this became an inviolate rule for many. Although the no-parent policy generally has changed (as discussed in Chapter Four), it still continues in some practices. Nonetheless, contemporary practice surveys have shown the trend is for parents to accompany children into the operatory, especially during the first visit. Now, more than ever, they form a greater part of the pediatric dentistry treatment triangle.

Dental offices have to be designed to accommodate current trends. Typical of the open office design is the "Z" shaped hallway connecting the reception/waiting area with the treatment areas (Figures 17-7 and 17.8). Interestingly, dentists with this type of hallway design notice that children tend to wander into the clinical area

(a) (b)

Figure 17-6. Using shelves similar to book store displays makes the books more desirable (a). Among the books are those with dental themes and children's classics familiar to both parent and child (b).

Figure 17-7. Typical of the open office design is the "Z"-shaped hallway connecting the reception/waiting area with the treatment areas.

Figure 17-8. "Z"-shaped hallway: treatment rooms may be color-coded with a predominate color, with the patient, dentist and dental assistants' chairs matching the walls and/or doors. Patients are asked to go to the green or purple room. Children can easily recognize the room and feel more at ease.

by themselves–no coaxing necessary. Parents, too, seem more relaxed and tend to remain in the reception area after one or two visits. They take comfort knowing that their children are not behind closed doors and can often hear their children interacting with the dental team. A writing board may be strategically placed on a wall within the Z hallway. Children are attracted to the writing board. They play, write, or draw (teeth!) before their dental appointment, and sometimes leave messages of thanks to the dental team as they leave the office. In some offices, a pocket door is installed along the hallway. If excessive noise results from an uncooperative child in the treatment area, the door can be drawn closed.

The Bridging Room

Not so long ago, it was common practice for many dentists to see a new patient in the dental operatory. Entering an operatory and placing a child immediately in the dental chair can be a frightening experience. Pediatric dentists now prefer that the first visit take place in a non-treatment room. Such a room serves as a bridge between the reception/waiting area and the treatment areas (Figure 17-9). A bridging room is much more than the traditional consultation room. It is a multi-purpose room for performing:

Figure 17-9. The bridging room: Note calming décor, educational aids, toys for children, and appropriate seating for parents and children. A wash basin should also be present (not shown). Courtesy of Drs. Becker, Hays and Hayes. Bremerton, WA.

- the functional inquiry
- examination of very young children in a knee-to-knee position
- implementation of pre-appointment strategies
- demonstration of management techniques
- demonstration of oral hygiene procedures

To accommodate these functions, a bridging room has to be slightly larger than the traditional consultation room and must be equipped properly. If knee-to-knee examinations are performed, then appropriate seating for parent and child as well as examining instruments, a wash basin, and appropriate lighting is needed. If pre-appointment techniques are intended, then audio-visual equipment or modeling dolls have to be available. If oral hygiene instruction is given in this room, then supplies need to be available. It is helpful to have the oral hygiene

Figure 17-10. Oral hygiene area: note the age-appropriate counter levels.

Figure 17-11. Oral hygiene area for a large "jungle"-themed office. Courtesy of Imagination Dental Solutions, Calgary, Alberta, Canada.

area nearby (see Figures 17-10 and 17.11) if that is the preferred choice of venue for demonstrations. In summary, a bridging room serves many important functions in the dental office, and some offices have more than one.

An alternative to the bridging room, especially for offices with limited floor space, is the concept of "bridging chairs" (Figure 17-12). Using this concept, two colored chairs are placed in the treatment room opposite the doorway. The patient is invited into the room and immediately asked to choose a chair. The child is pleasantly surprised that she is not asked to sit in the dental chair. The parent sits next to the child in the second chair. The patient is happy to sit on the regular chair, eyeing the imposing dental chair. Other children may react by saying they want to sit on the big chair (since they were told not to sit on it). The initial contact and communication is made with the patient by facing the child sitting on the regular chair. Eventually the child moves on to the dental chair. However, the warming-up period is done with the dental chair in view. This is an advantage over a bridging room, where the child may begin to feel at ease and is then asked to move into another room. This method also works well with infant visits. In such instances, the infant sits on a parent's lap on a regular chair and a knee-to-knee examination is performed (See Figure 5-4 in Chapter Five).

Treatment Areas

Surveys have shown a change in the parent-accompanying-child trend. Traditionally, US dentists treated children alone and the parent waited in the reception area. However, while surveying southeastern United States pediatric dentists, Carr and Wilson (1999) noted that the majority of pediatric dentists allowed parents in the operatory. The main reasons for the change were parental influences and legal and ethical concerns of the practitioners. An AAPD survey of members (Adair et al. 2004) found that parental presence in the operatory appeared to be a common practice for some procedures, but not all. Parental presence in the operatory seems more widespread outside of the United States (Crossley and Joshi 2001). Most UK pediatric dentists (80%) supported parental accompaniment during the course of treatment. Since modern dental operatories need to accommodate parents in a contemporary office, the pediatric operatory will need more floor space than the general dentist's treatment room. In addition to the patient, one or two assistants, and the dentist, space will be needed for one or two parents and sometimes an accompanying sibling, and possibly a baby stroller.

Treatment areas have to be designed for children with cooperative behavior, potentially cooperative behavior, and those who lack cooperative abilities. Designs have changed greatly over the past twenty-five years, and they differ significantly from those of most general dentists in some interesting ways.

Many pediatric dental offices feature open operatories, as opposed to closed operatories. An open operatory contains space for treating several children at one time. Both a dentist and a dental hygienist may be treating patients at the same time. Concomitant treatments offer an opportunity for children to learn from one another, and it can be very efficient. The degree of separation between patient chairs may vary with the practitioner's philosophy and style. Walls between patient chairs may be just high and long enough to screen patients from each other when seated upright, as well as reclined (Figure 17-13). This configuration allows the clinician to monitor the remaining treatment chairs while

Figure 17-12. An alternative to the bridging room, especially for offices with limited floor space, is the concept of "bridging chairs." Courtesy of Dr. Kupietzky.

Figure 17-13. Many pediatric dental offices feature open operatories, as opposed to closed operatories. An open operatory contains space for treating several children at one time. Walls between patient chairs may be just high and long enough to screen patients from each other when seated upright, as well as reclined.

Figure 17-14. This open bay has no separations at all between patients. Courtesy of Drs. Walker, Ritchie, Kutsch, Gill. Richland, WA.

seated at the head of the patient, and it may be ideal for the pediatric or orthodontic practice (Unthank 2006). Other designs include counters as partitions, or no separation at all (Figure 17-14).

Some have questioned the benefit of the open operatory, suggesting that it may upset children. Indeed, research by Ishikawa et al. (1990) found that children can be bothered by exposure to crying and that the younger age groups (children under four years of age) tend to be bothered more than older age groups. It is incumbent upon a pediatric dentist to recognize that not all children will benefit from an open operatory. If a child cries in an open operatory and could possibly upset a younger patient nearby, the clinician should explain to the observing child what is occurring, and why. Make it a learning experience. Conversely, it is believed that many children benefit from being in the

(a)

(b)

Figure 17-15. Open bay area with X-ray: As long as patients and staff are separated from the X-ray source by at least six feet or the required local regulation, conventional open bay pass-through X-ray heads or hand held X-ray systems can be used in the open bay operatory. (Check local regulations.)

open operatory. It is analogous to a group of children lining up at the school to receive "a shot." Most behave quite well. They do not want to appear apprehensive in front of their peers.

Many offices limit the bay area to recall examinations and dental prophylaxis, orthodontics, and sealant placement. Some dentists also have an issue with taking X-rays in open bay areas. However, as long as patients and staff are separated from the X-ray source by at least six feet or the required local regulation, conventional open bay pass-through X-ray heads or hand held X-ray systems can be used in the open bay operatory (Figure 17-15).

Personal preferences often dictate operatory design. There are dentists who prefer the privacy of an individual, closed operatory. Additionally, some parents do not appreciate what may appear to them to be an assembly-line mode of treatment used in open bay areas. The dentist's attention is seen as being directed more toward the other patients and less toward their own child.

Figure 17-16. The cart system is most suitable for children. This cart is side-positioned.

Another point regarding the treatment room is the choice of dental unit delivery system (Figure 17-16). The dental unit can either be supplied as a cart or an over-the-patient arm. Each system has advantages and disadvantages, and one may be more suitable for a pediatric practice. The over-the-patient delivery system is the most commonly used in general practice dental clinics today (Georgetown University 2011). It allows for an efficient use of space, and both the dentist and the dental assistant have immediate access to the switches and/or instruments. However, there are drawbacks to this system in a pediatric practice. The array of visible instruments may upset children and make them feel confined, and if a child is aggressive they could harm themselves with the instruments and the bar over the chair.

The cart system seems most suitable for children. The dental chair is not surrounded by frightening instruments; rather, it is simple and non-threatening. Carts may be either rear-positioned or side-positioned. All of the components can be introduced stage-by-stage. This system can be used with a dental chair, but it is most appropriate for use with the custom bench, described below. In contemporary practices, the cart system is used in conjunction with four-handed dentistry. A dental assistant is required to pass instruments to the dentist. Most cart systems function without a cuspidor. Cuspidors may not be suitable for child patients—they can be used as a delaying tactic when the child constantly asks to sit up and rinse. In addition, a child may become upset when expectorating into the cuspidor and seeing blood. Advantages of the cart system include the fact that: the instruments are less visible to patients, it easily converts to left- or right-handed, it is the least expensive system, and there is open space above the patient, which may be needed if active restraint is required during treatment. Disadvantages include the fact that: cords can become tangled and operators or assistants can injure themselves by rubbing against sharp burs if the cart is improperly placed. The cart system is more prevalent in North America, but is less common in Europe.

Another unique feature of many pediatric dental treatment areas is the custom bench. Sometimes referred to as "ironing boards," they have replaced the conventional dental chair in many pediatric dentistry practices. The advantages of the custom bench are:

- They are relatively inexpensive, compared to conventional dental chairs.
- The dentist can lean on it, providing support and relieving pressure on the back.
- There is no tipping back, like a dental chair, which can raise a child's anxiety level.
- The operator can be in close proximity to the child patient.

Unlike conventional dental chairs, custom benches can be designed to contain storage areas (Figure 17-17). They also can hold video sound wiring and contain nitrous oxide lines. Custom benches can also be made adjustable, allowing a patient to sit more upright. Box 17.1 describes the construction of a custom bench. Pediatric dental benches are also available professionally manufactured (Figure 17-18). One advantage of the custom bench is the taper in the design, which makes it more ergonomically favorable. Another advantage is cost. Custom benches can usually be fabricated at a fraction of the cost of their commercial counterparts.

Distracting child patients—diverting their attention from what may be perceived as an unpleasant procedure—can be very important in child management. The dentist may employ the distraction technique by telling a story or choose to use external distraction. External distraction is independent of the dentist or staff. Traditionally, clinicians have employed two types of distractors: audio systems with ear phones or video tapes (or television), the advantage of videotapes being that children are able to select their favorite programs. However, with ever-evolving technology, distractors have drastically changed in their size and content, offering an almost unlimited selection of entertainment. New technological innovations include: hand-held music and video players (MP3, MP4), personal hand-held video games, video glasses, and multimedia viewing monitors.

The effectiveness of distraction techniques has received attention from behavioral science investigators. Hinotsume et al. (1993) studied video film effectiveness and found that 90% of children between the ages of two and five years exhibited a high degree of interest in videos. There was an overall tendency of better behavior in children watching videos, compared

(a)

(b)

Figure 17-17. The custom bench can be made adjustable to seat a patient upright (a). It also can be designed with storage areas, and can contain video sound wiring and nitrous oxide/oxygen lines. Dimensions for the construction are contained in Box 17.1. Courtesy of Dr. Weinberger, London, ON, Canada.

Figure 17-18. Pediatric dental benches are also available professionally manufactured. The unit and nitrous oxide machine are built into the base of the bench. Courtesy of Dr. Sabbadini. Pinole, CA.

Box 17.1 Detailed description of custom bench construction

It is possible to construct a custom bench from 3/4-inch plywood. The following dimensions can serve as a guide.

- Total length is 66 inches.
- Height is 21 inches to the under-surface of the bench. When seated with the thigh parallel to the floor, the thigh should brush lightly against the under-surface. In offices with multiple clinicians, the stool can be adjusted to compensate for height differences.
- The width for the body is 21 inches.
- From the bottom end, the width begins to taper at 49 inches.
- The tapered portion is 27 inches.

3-inch foam covers the plywood, with a vinyl outer covering over the foam. Most benches are constructed so that the top is parallel to the floor. However, some prefer the bench to tip downward slightly, about seven degrees.

to those without video distraction. The merit of audio devices for distraction was explored by Aitken et al. (2000) with three groups of children between four and six years of age. The children had two visits each and heard relaxed or upbeat music or no music at all. While 90% enjoyed the music, there was no significant difference in their behaviors. Prabhaar et al. (2007) compared audio and audiovisual distraction techniques in managing pediatric dental patients. They studied sixty children, four to eight years of age, and concluded that audiovisual distraction was a more effective procedure than audio distraction for managing the anxious pediatric dental patient.

The effect of distraction on pain threshold has also received attention. Studies have concluded that video distraction is ineffective in reducing pain during cavity preparation (Bentsen et al. 2001) or tooth scaling (Bentsen et al. 2003). Its practical use may lie in reducing general anxiety during less painful medical or dental procedures. Playing video clips during the inhaled induction of children undergoing ambulatory surgery was found to be an effective method of reducing anxiety (Mifflin et al. 2012).

One difficulty in interpreting the results of these studies and comparing them to one another is that no two studies use the same software. A video or film that engages one group of children may have no attraction to another group. Nonetheless, the studies point to a beneficial result using distractors, and they should be part of the behavior management armamentarium in a contemporary dental office.

Proper placement of video screens is important. With the child lying down and facing the ceiling, the monitor should be situated so that the child looks straight up—the line of vision is usually ninety degrees to the ceiling (Figure 17-19). However, it can be more effective to place the monitor slightly farther back, so that the child actually has to tip the head backward slightly. This encourages opening the mouth. In addition, a child with a nitrous oxide nasal mask will be able to view the otherwise blocked monitor. Conversely, placing the monitor at the foot of the bench or chair is discouraged. The patient has to tip the head and chin downward to observe the video. One problem with placing the monitor in the ceiling is that it does not allow patient viewing while sitting up. A third position is approximately two feet to the dentist's side of the long axis of the patient chair and about seven feet above the floor (Unthank 2006). This position aligns with the patient's mid-calf. This placement is ideally suited for patient viewing in a lying or sitting position.

Not everyone likes to have monitors in the operatory. Some dentists limit them to recall examination chairs. They contend it interferes with eye-to-eye communication with the patient during restorative treatment, making the visit a continuous learning experience. Another consideration is that many children have their own hand-held devices and prefer to entertain themselves. A child holding a device such as an iPod or smart phone may have less hand movement, resulting in less interference with the dental procedures (Figure 17-20).

Figure 17-19. Proper placement of video screens is important. With the child lying down and facing the ceiling, the monitor should be situated so that the child looks straight up—the line of vision usually is ninety degrees to the ceiling. Courtesy of Dr. Witkoff. Denver, CO.

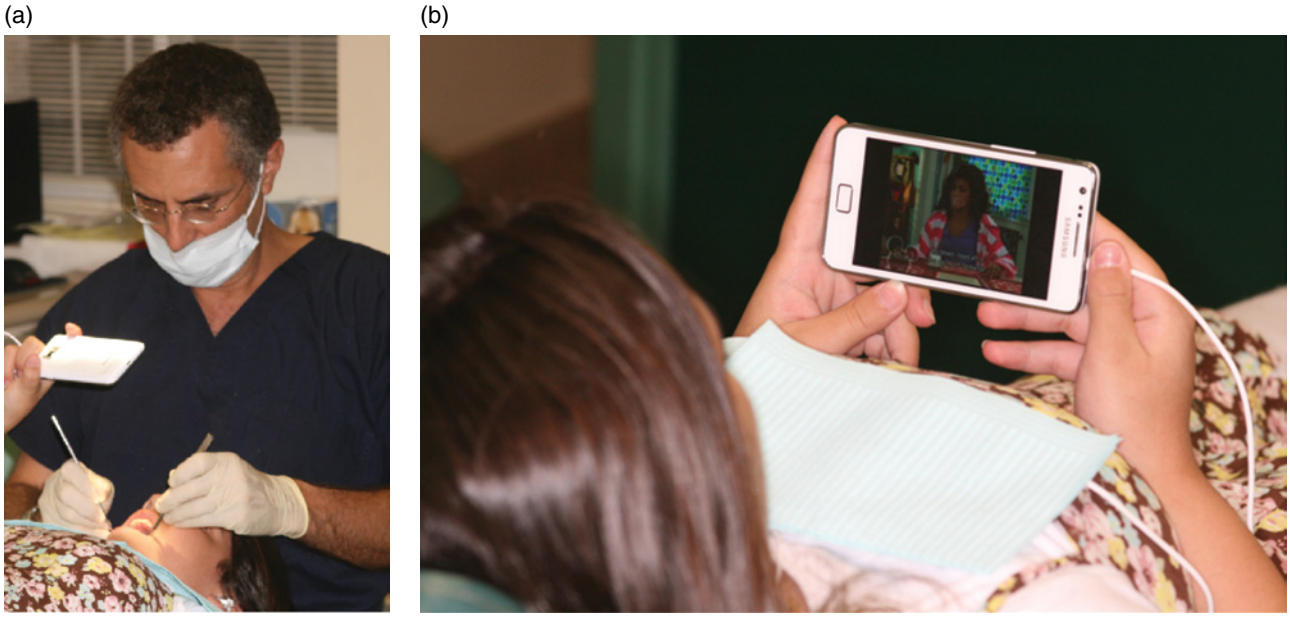

Figure 17-20. Many children have their own hand-held devices and prefer to entertain themselves. A child holding a device such as an iPod or smart phone may have less hand movement, resulting in less interference with the dental procedures.

Careful office planning is required to enable the pediatric dentist to treat an array of behaviors in the treatment area. Therefore, most dentists using open bays will have a designated "quiet" room or soundproof, closed operatory. The most common use of the quiet room is to serve as a treatment area for resistant patients; i.e., those who are potentially cooperative or who lack cooperative abilities, and who might create a disturbance in the office. Sedation is primarily the treatment for these children, and it is far better to treat them in the privacy of an isolation room. However, telling a parent that their child will be treated in the "quiet room" rather than in the open bay may cause a "stigma." To overcome this stigma, the office personnel should refer to this multipurpose room as the 1) Private Operatory, 2) Family Suite, 3) Sedation Suite, or 4) Orthodontic Records Room.

Parents also can become quite apprehensive if they are unaware of what is transpiring in the room. For this reason, a viewing area for parents is desirable. This can be accomplished with windowed or glass doors (Figure 17-21). They provide an opportunity for parents to observe their children's treatments, and they may increase parents' tolerances for these techniques (Peretz and Zadik 1999). The glass also serves as a sound barrier.

Figure 17-21. Sedation is conducted in this room. Glass doors offer a sound barrier and allow parents to view from a distance. The double doors accommodate wheel chairs or stretchers. Courtesy of Dr. Weinberger, London, ON, Canada.

The Office Décor

Many dentists engage the services of a professional to assist with the decoration in an office. While they may create very tasteful finishing for the new office, they are not dental professionals. Get input from the members of the dental team, who contribute greatly to the success or failure of the office.

While the walls do not need to be shockingly painted in bright blue or bold magenta, the office should consider colors that are warm and welcoming, like yellow or light blue. Carpeting is also an issue. For hygienic reasons, many offices avoid carpeting. However, if considering carpeting, many carpets can be flecked with different colors or include squares or dots of colors without being overwhelmingly busy or too bright. Treatment rooms may be color-coded with a predominate color—the patient, dentist and dental assistants' chairs match the walls and/or doors (Figure 17-8). Patients are asked to go to the green or purple room. Children can easily recognize the room and feel more at ease.

After the walls have been painted and the flooring is in place, thought has to be given to decorating the walls. Consider the ages of the patients in the practice. Many pediatric dentists err by decorating only for young children. Think of the older children, too. Colorful decorations, such as vintage posters or bright modern art, can be pleasing to both adults and children and can make the room more energetic (Figure 17-5). Animation cells are appealing to all ages. Placing a stuffed animal in a "hiding" spot, such as in the corner of an exam office, can be fun for children to discover and can easily be removed when treating adults. Wall space may be created for the older age group. They are encouraged to bring in one of their school banners. They enjoy participating!

Poster decoration is an important part of the office décor. Posters can be purchased from dental societies or associations. However, having the office staff design and create posters for the office is much more personal, and they are appreciated by children and parents. If possible, posters should be user-friendly and impart information such as why we take x-rays, or the need for urgent care following dental trauma.

Patients differ. Dentists differ. And offices differ.

References

Adair, SM. et al. (2004). A survey of members of the American Academy of Pediatric Dentistry on their use of behavior management techniques. *Pediatric Dentistry*, 26, 159–66.

Aitken, J.C. et al. (2000). The effect of music distraction on pain, anxiety and behavior in pediatric dental patients. *Pediatric Dentistry*, 24, 114–118.

Belcher, D.R. (1898). Exclusion of parents from the operating room. *British Journal of Dental Science*, 41, 1117.

Bentsen, B., Svensson, P., Wenzel, A. (2001). Evaluation of effect of 3D video glasses on perceived pain and unpleasantness induced by restorative dental treatment. *European Journal of Pain*, 5, 373–8.

Bentsen, B., Wenzel, A., Svensson, P. (2003). Comparison of the effect of video glasses and nitrous oxide analgesia on the perceived intensity of pain and unpleasantness evoked by dental scaling. *European Journal of Pain*, 7, 49–53.

Carr, G.K. et al. (1999). Behavior management techniques among pediatric dentists practicing in the southeastern United States. *Pediatric Dentistry*, 21, 347–353.

Crossley, ML. and Joshi, G. (2002). An investigation of paediatric dentists' attitudes towards parental accompaniment and behavioural management techniques in the UK. *British Dental Journal*, 192, 517–21.

Georgetown University. (2011). Chapter 2. Facilities and staffing: Equipment and supplies. *Safety Net Dental Clinic Manual*, National Maternal and Child Oral Health Resource Center, Retreived from: http://www.dentalclinicmanual.com/chapt2/2_1.html

Hinotsume, S. et al.(1993). The influence of video films on child patient behaviour during dental treatment. *The Japanese Journal of Pediatric Dentistry* (in Japanese, English abstract), 31, 850–858.

Ishikawa, T., Nakashima, M., Shitozawa, K. (1990). The emotional reaction on other child patients caused by the crying of the uncooperative child patient. *Shoni Shikagaku Zasshi*, 28, 1066–74.

Mifflin, KA., Hackmann, T., Chorney, J.M., (2012). Streamed Video Clips to Reduce Anxiety in Children During Inhaled Induction of Anesthesia. *Anesthesia & Analgesia*, 115, 1162–1167.

Peretz, B. and Zadik, D. (1999). Parents'' attitudes toward behavior management techniques during dental treatment. *Pediatric Dentistry*, 21, 201–204.

Prabahaar, A.R., Marwah, N., Raju, O.S. (2007). A comparison between audio and audiovisual distraction techniques in managing pediatric dental patients. *Journal of the Indian Society of Pedodontics and Preventive Dentistry*, 25, 177–182.

Tate, S. and Doyle, W.(1975). The Office Environment. In: Wright, G.Z., *Behavior Management in Dentistry for Children*. 246–260. W.B. Saunders Co., Philedalphia, PA, USA.

Index

Note: Page numbers followed by f and t refers to figures and tables; bold page numbers refer to boxes

Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.