Predoctoral Implant Education in U.S. Dental Schools

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Purpose: In 2002, a survey of American dental schools was conducted to determine the curricular structure, teaching philosophies, and materials used in predoctoral implant dentistry courses.

<u>Materials and Methods</u>: The questionnaire was mailed to the predoctoral implant dentistry director/ chairperson of 54 U.S. dental schools. Of these, 38 schools returned the completed survey resulting in a response rate of 70%.

<u>Results:</u> Eighty-four percent of the respondents indicated that an implant dentistry course is part of their school's requirements. Seventy percent indicated that this course is offered by either the Restorative or Prosthodontics Department in the third year of the predoctoral dental curriculum. For 75% of the schools, the duration of the course ranged from 3 to 6 months (mean of 5.5 months), 57% reported offering between 11 and 20 lecture hours (mean of 20.4 hours), and less than half of the schools (41%) have prosthodontists teaching the predoctoral implant dentistry course. In 78% of the schools, a laboratory course is offered in conjunction with the implant course. The majority of the schools (88%) allow predoctoral students to restore implant cases clinically. Seventy-three percent require some of the implant-related laboratory work to be completed by the students and the singletooth implant restoration is the most popular type of implant restoration for 78% of the schools.

<u>Conclusions</u>: Predoctoral implant dentistry educational programs vary from school to school, yet a large percentage of schools agree on certain topics.

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INDEX WORDS: dental education, implant dentistry education, survey, curriculum, implant dentistry course materials

THE PREVALENCE of implants used to rehabilitate partially and completely edentulous patients has been increasing, due to the success and predictability of implants in dentistry.¹ In 1988, the National Institutes of Health published a consensus development on dental implants that

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demonstrated the increased interest in and acceptance of implants in the dental field.² Since then it has been apparent that continuing education in this area is needed, and the eventual inclusion of this subject into the dental curricula was indisputable. A survey conducted by Bravitz in 1990³ revealed that dental education programs in the United States required lectures in implant dentistry in 89% of the respondents. In 1991, Arbree and Chapman⁴ found 65% of responding dental schools taught implant dentistry primarily through lectures and observations. Many authors have discovered that a surge of advanced education is needed in the field of implant dentistry.⁵⁻⁸

A need to establish standardized instruction in this field of interest has arisen. Hence, in 1991 a curriculum guideline for predoctoral implant dentistry was published.^{9,10} Authors have since reported on schools that have incorporated this subject into their curricula. One such study done in 1995,¹¹ looked into 3 schools (University of Texas Health Science Center at San Antonio

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Dental School, University of Washington School of Dentistry, and Ohio State University College of Dentistry) that have implemented a predoctoral curriculum. There were no minimal requirements established, however. Weintraub et al¹² reported in 1995 that 86% of U.S. schools were including implants in their dental education. It is apparent that more and more U.S. dental schools are incorporating implants in their curricula.

The aim of this survey was to determine the current trends in predoctoral implant dentistry in the curricula, course content, and departmental jurisdictions, and to determine what reported educational techniques and materials are being used by U.S. dental schools.

Materials and Methods

In April 2002, a questionnaire (see the Appendix) was mailed to the director/chairperson of the prosthodontic/restorative departments of 54 U.S. dental schools. The questionnaire requested information on the schools' predoctoral implant dentistry curricular content. Following a second mailing to schools that had not returned the questionnaire within a 3-month period, 38 of the 54 schools responded, yielding a response rate of 70%.

The survey contained 33 multiple-choice questions and asked respondents to circle all responses that applied to their programs. Some of the questions for this survey were originally designed and developed in an effort to evaluate other programs with regard to curricula, techniques, and materials used. Some of the questions were similar to previous surveys regarding pre-clinical fixed prosthodontics curricula¹³ and pre-clinical complete dentures curricula.¹⁴ The questions were pilot-tested on site by faculty members who approved of the questionnaire before it was mailed to other schools.

Results

Implant Dentistry Course as a Requirement in the Predoctoral Curriculum (Question 1): Thirty-two schools (84%) reported that they require the predoctoral students to take an implant dentistry course; 6 schools (16%) reported that they did not, because they did not have a program.

Reason an Implant Dentistry Course is not Offered (Question 2): One (17%) out of the 6 schools not of-

 Table 1. Onset Year of Predoctoral Implant Dentistry

 Course

Answer	Number of Responding Schools (%)
Prior to 1990 1991 to 1993 1994 to 1996 1997 to 1999 2000 to 2001 2002 to present	$5 (16\%) \\10 (31\%) \\6 (19\%) \\7 (22\%) \\3 (9\%) \\1 (3\%)$

fering an implant dentistry course reported "lack of curriculum time"; another reported "emphasis on the post-doctoral program" and "lectures are incorporated in a restorative/prosthodontic course"; another school reported "lack of curriculum time," "lack of financial resources," and "lectures incorporated in a restorative/prosthodontic course." Three schools (50%) did not respond.

Year that the Implant Dentistry Course was First Offered (Question 3): The results are summarized in Table 1.

Department Offering the Implant Dentistry Course (Question 4): Table 2 summarizes the responses.

Year(s) Implant Dentistry Course was Offered (Question 5): The results are summarized in Table 3.

Duration of Implant Dentistry Course (Question 6): Twenty-four schools (75%) reported that the duration of the implant dentistry course was 3 to 6 months; 3 schools (9%) reported that the duration was more than 13 months; 2 schools (6%) reported that the duration was 7 to 12 months; 2 schools (6%) reported that the duration was less than 2 months. One school (3%) did not respond to this question. The mean number of months was 5.5,

Table 2. Department Offering the Predoctoral Implant Dentistry Course

Answer	Number of Responding Schools (%)
Restorative dentistry only Periodontics only Prosthodontics only Oral surgery only Periodontics, prosthodontics, and oral surgery Periodontics and prosthodontics	12 (38%) 1 (3%) 10 (32%) 1 (3%) 3 (9%) 2 (6%)
Restorative dentistry, periodontics, prosthodontics, and oral surgery Prosthodontics and oral surgery Other (implantology)	1 (3%) 1 (3%) 1 (3%)

Answer	Number of Responding Schools (%)
Freshman year only Sophomore year only	0(0%) 1(3%)
Junior year only	18(56%)
Sophomore and junior years	4(13%) 1(3%)
Junior and senior years Sophomore, junior, and	4 (13%) 1 (3%)
senior years Freshman, sophomore, junior,	2 (6%)
and senior years Freshman and senior years	1 (3%)

 Table 3. Year of Dental School Predoctoral Implant

 Course is Offered

the median was 4.5 months, and the range was 2 to 13 months.

Total Number of Lectures Given (Question 7): Twenty-three schools (72%) reported between 11 and 20 lectures; 4 schools (13%) reported between 6 and 10 lectures; 3 schools (9%) reported between 21 and 30 lectures; 2 schools (6%) reported between 31 and 40 lectures. The mean number of lectures was 15; the median was 15.5 lectures; the range was 6 to 40 lectures.

Topics Included in Lecture Series (Question 8): Eight schools (25%) reported that they included all the topics listed in question 8 of the survey in their lecture series; 4 schools (13%) reported that they included all of the listed topics except for the choice of "cranio-facial applications of implants." The remaining schools listed a combination of choices.

Lecture Hours Devoted to this Course (Question 9): Eighteen schools (57%) reported between 11 and 20 lecture hours for their predoctoral implant dentistry course; 7 schools (22%) reported between 21 and 30 hours; 3 schools (9%) reported less than 10 hours; 2 schools (6%) reported between 31 and 40 hours; 1 school (3%) reported between 41 and 50 hours; 1 school (3%) reported more than 50 hours. The mean number of lecture hours was 20.4; the median was 15.5 hours; the range was 10 to 50 hours.

Availability of Lectures on the Internet (Question 10): Twenty-three schools (72%) reported that their lectures are not available on the Internet for the students to review; 9 schools (28%) reported that their lectures are available on the Internet.

Textbook(s) as a Requirement for this Course (Question 11): Twenty-one schools (66%) reported they do not require a textbook for their course; 11 schools (34%) reported they do require a textbook for this course.

Textbook(s) which is/are Required for this Course (Question 12): From the 11 schools that required a textbook, 6 schools (55%) are using Worthington's Osseointegration in Dentistry: An Introduction as the required textbook; 3 schools (27%) are using Misch's Contemporary Implant Dentistry, and 2 schools (18%) are using Engelman's Clinical Decision Making and Treatment Planning in Osseointegration.

Recommended Textbooks (Question 13): Table 4 summarizes the textbooks recommended by the schools.

Adjunct Teaching Aids Utilized in this Course (Question 14): Table 5 summarizes the teaching aids used in this course.

Existence of Laboratory Course in Conjunction with Implant Dentistry Course (Question 15): Twenty-five schools (78%) reported that they have a laboratory course in conjunction with the implant course, and 7 schools (22%) reported they did not.

Table 4. Recommended Textbooks for Predoctoral Implant Dentistry Course

Answer	Number of Responding Schools (%)*
(a) only	2 (7%)
(b) only	1 (3%)
(c) only	1 (3%)
(d) only	0 (0%)
(e) only	1 (3%)
(f) only	5 (16%)
ÀÍI	1 (3%)
(a)-(d), (f)	1 (3%)
(a), (f)	2 (7%)
(a), (c)	1 (3%)
(c), (f)	2 (7%)
(b), (d)	1 (3%)
(a), (c), (f)	1 (3%)
No response	13 (40%)

Notes: (a) Brånemark's Tissue Integrated Prosthesis Osseointegration in Implant Dentistry. Quintessence, 1985; (b) Engelman's Clinical Decision Making and Treatment Planning Osseointegration. Quintessence, 1997; (c) Misch's Contemporary Implant Dentistry. Mosby, 1999; (d) Renouard's Risk Factors in Implant Dentistry: Simplified Clinical Analysis for Predictable Treatment. Quintessence, 1998; (e) Spiekermann's Implantology. Thieme, 1995; (f) Worthington's Osseointegration in Dentistry: An Introduction. Quintessence, 1994.

*Rounding error; does not equal 100%.

Table 5. Adjunct Teaching Aids

Answers	Number of Responding Schools (%)
(e) only (a), (e) (b), (e) (c), (e) (d), (e) (c), (d) (a), (c), (e) (b),(d),(e) (c)-(e) (a)-(c), (e) (a), (c), (d), (e) (b)-(e) (a)-(e) No response	$\begin{array}{c} 1 & (3\%) \\ 1 & (3\%) \\ 1 & (3\%) \\ 2 & (7\%) \\ 1 & (3\%) \\ 2 & (6\%) \\ 5 & (16\%) \\ 7 & (22\%) \\ 1 & (3\%) \\ 1 & (3\%) \\ 4 & (12\%) \\ 2 & (7\%) \\ 3 & (9\%) \end{array}$

Notes: (a) cd-roms; (b) brochures; (c) videos; (d) manuals/catalogs (provided by implant companies); (e) prosthetic components demonstration kits.

Total Number of Laboratory Hours for this Course (Question 16):

Eight schools (32%) reported offering between 6 and 10 laboratory hours; 6 schools (24%) reported offering less than 5 laboratory hours; 4 schools (16%) reported between 11 and 15 hours; 4 schools (16%) reported more than 25 hours; 3 schools (12%) reported 16 to 20 hours. The mean number of laboratory hours was 12; the median was 8 hours; the range was 5 to 25 hours.

Use of Partially Dentate Dentoform/Model for Laboratory Course of Implant Dentistry (Question 17): From the 25 schools that offer a laboratory course, 22 schools (88%) reported using a partially dentate dentoform/model for the laboratory course, and 3 schools (12%) did not use a partially dentate dentoform/model.

Use of a Mannequin Head for Laboratory Course of Implant Dentistry (Question 18):

Of the 25 schools offering a laboratory course, 22 (88%) reported using a mannequin head, and 3 (12%) do not.

Live Demonstrations for Laboratory Course of Implant Dentistry (Question 19): Of the 25 schools that offer a laboratory course, 15 schools (60%) reported that they use live demonstrations for the laboratory course, and 10 schools (40%) do not.

Prerecorded Video Demonstrations for Laboratory Course of Implant Dentistry (Question 20): Of the 25 schools that offer a laboratory course, 7 schools (28%) reported that they use prerecorded video demonstrations for the laboratory course, and 18 schools (72%) do not.

Student-to-Faculty Ratio for Laboratory Course (Question 21): Ten schools (40%) reported a ratio of 10:1; 5 schools (20%) reported a ratio of less than 5:1; 5 schools (20%) reported a ratio of 5:1; 4 schools (16%) reported a ratio of 15:1; 1 school (4%) reported a ratio of greater than 15:1.

Prosthodontic Faculty Teaching Predoctoral Implant Dentistry Course (Question 22): Twenty-eight schools (88%) reported that some of the faculty who teach the implant dentistry course are prosthodontists, and 1 school (3%) reported that they are not. Three schools (9%) did not respond.

Percentage of Prosthodontic Faculty (Question 23): Eight schools (25%) indicated that they have 76% to 100% prosthodontists teaching the predoctoral implant course; 7 schools (22%) indicated 41% to 50%; 6 schools (19%) indicated 51% to 75%; 3 schools (9%) indicated 11% to 25%; 2 schools (6%) indicated 26% to 40%; 1 school (3%) indicated 5% to 10%; 1 school (3%) indicated less than 5%. Three schools (9%) did not respond to this question.

Faculty who are Board-Certified Prosthodontists (Question 24): Twenty-one schools (66%) indicated that the faculty teaching this course are boardcertified prosthodontists, and 7 schools (22%) indicated that the faculty are not board-certified prosthodontists. Four schools (12%) did not respond to this question.

Ratio of Faculty who are Board-Certified Prosthodontists (Question 25): Ten schools (31%) indicated that the ratio of the faculty who are board-certified prosthodontists to the faculty teaching implant dentistry was less than 2:6; 4 schools (13%) indicated that the ratio was 2:6; 3 schools (9%) indicated the ratio was 3:6; 1 school (3%) indicated the ratio was 4:6; 1 school (3%) indicated 6:6. Two schools (6%) did not respond to the question, and one of the schools responded that it could not answer this question because it had faculty from both the Periodontics and Oral Surgery department teaching this course.

Implant Systems used Surgically in Predoctoral Implant Programs (Question 26): The results are summarized in Table 6.

Implant Systems used in Restorative Phase in Predoctoral Implant Program (Question 27): The results are summarized in Table 7.

Answer	Number of Responding Schools (%)*
(a) only	3 (9%)
(b) only	1 (3%)
(c) only	4 (13%)
(d) only	5 (16%)
(e) only	0 (0%)
(f) only	0 (0%)
(g) only	5 (16%)
(h) only (Life Core)	1 (3%)
(a) (b) $(\operatorname{Line}\operatorname{core})$	2(6%)
(a), (d)	$\frac{1}{1}(3\%)$
$(\mathbf{a}), (\mathbf{c})$	2(6%)
(b), (c)	$\frac{1}{1}(3\%)$
(c), (d)	1(3%)
(a) (d) (f)	1(3%)
(a), (d), (b) (Calcitek)	1(3%)
(a)-(d) (f)	1(3%)
(a) - (d) , (r)	1(3%)
(a), (b), (d), (g), (b) (Imtec)	1(3%)
No response	1 (3%)

Table 6. Implant System Used for Surgical Phase

Notes: (a) Nobel Biocare (Yorba Linda, CA); (b) 3I (Implant Innovations Palm Beach, FL); (c) ITI (Straumann, Waldenburg, Switzerland); (d) Steri-Oss (Yorba Linda, CA); (e) Astra Tech (Lexington, MA); (f) Friatec (Friadent, Mannheim, Germany); (g) Paragon (Centerpulse AG, Zurick, Switzerland); (h) others, Life Core Biomedical (Chaska, MN), Imtec (Ardmore, OR), Calcitek (Centerpulse, Carlsbad, CA). *Rounding error; does not equal 100%

Required Presence of Students During Surgical Placement of Implants (Question 28): Nineteen schools (59%) reported that students are required to be present during the implant surgery, and 13 schools (41%) reported that they are not required to be present. Two schools that indicated "yes" for this question commented, "students place the implants." One school that indicated "no" for this question commented, "it is recommended that the students be present during the surgery."

Restoration of Implants by Predoctoral Students (Question 29): Twenty-eight schools (88%) reported that students are restoring implant cases and 4 schools (12%) indicated that they are not.

Types of Implant Restorations Treated by Predoctoral Students (Question 30): The responses to this question are summarized in Table 8.

Connection of Natural Teeth with Implants Advocated for Fixed Partial Dentures (Question 31): Thirty schools (94%) reported that they did not advocate the connection of natural teeth with implants for a fixed partial denture; 1 school (3%) reported that it does advocate this philosophy; 1 school (3%) indicated "yes and no, it is a very complicated answer."

Answer	Number of Responding Schools (%)
(a) only	5 (16%)
(b) only	1 (3%)
(c) only	5 (16%)
(d) only	5 (16%)
(e) only	0 (0%)
(f) only	0 (0%)
(g) only	5 (16%)
(h) only (Life Core sustain)	1 (3%)
(a), (b)	1 (3%)
(a), (c)	1 (3%)
(b), (c)	1 (3%)
(a), (d), (f)	1 (3%)
(b), (g)	1 (3%)
(a)-(d), (g)	1 (3%)
(a)-(d), (f)	1 (3%)
(a), (b), (d), (g), (h) (Imtec)	1 (3%)
No response	2 (6%)

Table 7. Implant System Used for Restorative Phase

Notes: (a) Nobel Biocare (Yorba Linda, CA); (b) 3I (Implant Innovations Palm Beach, FL); (c) ITI (Straumann, Waldenburg, Switzerland); (d) Steri-Oss (Yorba Linda, CA); (e) Astra Tech (Lexington, MA); (f) Friatec (Friadent, Mannheim, Germany); (g) Paragon (Centerpulse AG, Zurick, Switzerland); (h) other (Life Core Biomedical, Chaska, MN), (Imtec, Ardmore, OR).

Implant Laboratory Work Being Mandatory (Question 32): Twenty-four schools (73%) reported that predoctoral students are required to do implantrelated laboratory work, and 8 schools (27%) reported that performance of laboratory work is not required.

Table 8. Types of Implant Restorations Treated by Students

Answer	Number of Responding Schools (%)
(a) only	4 (13%)
(b) only	0 (0%)
(c) only	2 (6%)
(d) only	0 (0%)
(e) only	0 (0%)
(a), (b)	5 (16%)
(a), (c)	3 (9%)
(a), (b), (c)	6 (19%)
(a), (b), (d)	1 (3%)
(a), (c), (d)	1 (3%)
(a)–(d)	4 (12%)
(a)–(e)	1 (3%)
No response	5 (16%)

Notes: (a) single tooth implant restorations; (b) implantsupported fixed partial denture restorations; (c) implantretained overdentures; (d) implant-supported overdentures; (e) fixed-detachable/high water restorations.

Table 9.	Mandatory .	Implant	Laboratory	Procedures
Performe	d by Students	5		

Answer	Number of Responding Schools (%)
(a) only (b) only (c) only (d) only (e) only (a), (c) (a)-(c) (a), (c), (d) (c)-(e) (a)-(d)	$\begin{array}{c} 1 \ (4\%) \\ 0 \ (0\%) \\ 4 \ (17\%) \\ 0 \ (0\%) \\ 0 \ (0\%) \\ 3 \ (13\%) \\ 4 \ (17\%) \\ 2 \ (8\%) \\ 1 \ (4\%) \\ 3 \ (13\%) \\ 1 \ (4\%) \\ 3 \ (13\%) \\ 1 \ (4\%) \end{array}$
$\begin{array}{l} (a)-(c), (e) \\ (a)-(c), (h) \\ (a), (c), (d), (f) \\ (a), (c), (e), (f) \\ (a)-(c), (f), (h) \\ (a)-(c), (e), (h) \end{array}$	$ \begin{array}{c} 1 (4\%) \\ 1 (4\%) \\ 1 (4\%) \\ 1 (4\%) \\ 1 (4\%) \\ 1 (4\%) \\ 1 (4\%) \end{array} $

Notes: Eight out of the 32 schools do not require implant laboratory procedures; (a) pouring models; (b) fabricating transitional dentures; (c) fabricating surgical/radiographic stents; (d) fabricating laboratory processed provisionals; (e) fabricating custom abutments; (f) fabricating the bar for a bar and clip type prosthesis; (g) fabricating framework for a high water or fixed-detachable restoration; (h) fabricating definitive restorations (i.e., crowns, overdentures, etc.).

Mandatory Implant Laboratory Procedures Performed by Students (Question 33): Table 9 summarizes results for the mandatory implant laboratory procedures performed by the students.

Discussion

Incorporation of implant dentistry into the predoctoral dental curriculum has steadily increased in the past several years. We have witnessed an increase in inclusion of this subject matter in the dental curricula from 33% in 1974¹⁵ to 73% in 1989³ to 86% in 1995¹² to 89% in 1997.¹⁶ A continued increase in schools implementing implants in the predoctoral curriculum was projected by Bavitz;³ however, the current study revealed that only 84% of the responding schools had an established implant course in 2002. This number is lower than projected and could be a result of not having all the schools respond to the current survey. The schools that did not offer a predoctoral implant course had either implant-related lectures incorporated into their restorative and/or prosthodontic courses. Some schools reported lack of curriculum time to accommodate this course.

Among the schools with a predoctoral implant course, the majority of schools (70%) offered the course under the jurisdiction of the prosthodontic and restorative departments.

From our current survey, it is evident that by 1999 the majority of dental schools (88%) were offering an implant dentistry course in their curriculum. Some schools (12%) have offered the course since 2000. The topics included in the implant courses varied from school to school. A slight majority (56%) of schools offered the implant course in the third year of dental school. This could be due to the fact that by the third year students have a working knowledge in operative dentistry, fixed partial dentures, and removable partial dentures. The curriculum guidelines for predoctoral implant dentistry⁹ define the predoctoral implant course prerequisites, including operative, fixed partial dentures, and removable partial dentures. Traditionally, by the third year, students are treating patients, and they are able to use the information from the implant course more readily.

Most of the lectures were given by prosthodontists, who organized about 11 to 20 lectures for the course (72%), and were anywhere from 3 to 6 months in duration (mean of 5.5 months). The mean number of lecture hours for the predoctoral implant course (mean of 20.4 hours) compared to the number of lecture hours for predoctoral complete dentures (mean of 28 hours)¹⁴ and fixed partial dentures¹³ (mean of 42 hours) was lower. Perhaps there will be a shift in the future with an increase in the number of lecture hours devoted to the implant course, due to implants' predictability and effectiveness in treating partially dentate and completely edentulous patients.

Since 1995 there has been more hands-on training offered to the students, from 41% of the schools¹² to 78% in this survey. With the existence of several implant companies, the study did not show a predominant implant system taught and utilized among the different schools. Nobel Biocare (Yorba Linda, CA), ITI (Waldenburg, Switzerland), Sterioss (Yorba Linda, CA), and Paragon (Centerpulse AG, Zurich, Switzerland) implant systems showed similar prevalence of use (16%) for both surgical and restorative phases of treatment (except for the surgical phase of ITI used by 13% of the schools). Educators and implant companies have recognized the need for furthering dental implant education for the students and have collaborated to come up with laboratory sessions to get the predoctoral students acquainted with implants. Implant companies often provide the implant components and demonstration kits that students use for hands-on training.

From this survey, it is evident that predoctoral students are also involved in implant-related laboratory work. Ninety-six percent of the schools have students fabricate surgical and radiographic stents, 79% have students pour models, and 29% have them make provisional restorations. The rationale behind the delegation of these laboratory steps to the students could be that these procedures are not only relatively simple, but also are of educational value. This trend is in agreement with what was reported by Nimmo et al¹⁷ for fixed prosthodontics. This educational process is designed to relate to private general practice and provide the learner with additional opportunities to develop competency in patient care.¹⁷ In addition, Huebner¹⁸ found that the inclusion of laboratory and clinical experience in the predoctoral curriculum has resulted in significantly greater participation in implant dentistry at the general practice level once students graduate.

In the past decade, there has been a significant increase in predoctoral students restoring implants as part of their clinical experience, from 5 schools (11%) in 1990^3 to 28 schools (88%) in this survey. The majority of the implant restorations (75%) completed by students are limited to single tooth restorations. It would not be surprising if implant restorations become a requirement prior to graduation in the near future.

The increase in prevalence of use and predictability of implants in the clinical practice, coupled with an increase in patient inquiry about implant restorations, makes one thing certain: implants are here to stay. In 2002, Maalhagh-Fard et al¹⁹ found a strong correlation for recent graduates between offering and restoring implants in their practice when an implant course was taken as part of their dental school curriculum. Dental institutions are realizing this and have been incorporating not only lectures and laboratory work, but also clinical experience in their students' predoctoral education so their graduates can be familiar with implant dentistry when they join the dental profession.

Conclusions

A survey of predoctoral implant dentistry curricula in all U.S. dental schools garnered a 70% response rate. The majority (84%) of responding schools required students to complete an implant dentistry course as part of their predoctoral training. Information acquired from the responding schools included quantitative curriculum structure and materials and educational techniques used. Tabulation of the responses revealed variability among schools in terms of certain aspects of the curriculum and the type of implants systems utilized. The data also revealed some common trends as evidenced by the large percentage of schools agreeing on:

- *1.* quantity of lecture hours offered;
- 2. course duration and the year the course was offered;
- *3.* qualifications of the faculty;
- 4. departmental jurisdiction;
- 5. lack of a required textbook;
- 6. unavailability of lectures on the Internet;
- 7. incorporation of laboratory course in conjunction with the implant course;
- hands-on dentoform training with mannequin heads and demonstration kits used in the laboratory course;
- 9. use of live demonstrations for the laboratory course;
- *10.* presence of students during implant surgery;
- 11. required implant-related laboratory work;
- 12. not connecting natural teeth to implants; and
- *13.* single tooth implant restorations performed at the predoctoral level.

The questions with the most variable responses were:

- *1.* lecture topics taught;
- 2. textbooks recommended;
- 3. implant systems used both surgically and restoratively in the course; and
- 4. quantity of laboratory hours offered.

Appendix: Questionnaire sent to U.S. Dental Schools

Implant Dentistry Survey of Predoctoral Programs

Instructions: Please circle all responses that apply to your school's Implant Dentistry Curriculum. More than one answer may be selected.

- *1.* In your curriculum, do you require the predoctoral students to take an implant dentistry course?
 - (a) yes
 - (b) no
- 2. If a predoctoral implant course is not offered, why?
 - (a) lack of curriculum time
 - (b) lack of financial resources
 - (c) emphasis on postdoctoral program
 - (d) lectures incorporated in a restorative/prosthodontic course
 - (e) lack of qualified faculty
 - (f) should not be in predoctoral curriculum
 - (g) concerns about long-term patient management
- 3. If you do offer the implant course to the predoctoral students, when did you start including the Implant Dentistry course as part of the curriculum?
 - (a) prior to 1990
 - (b) 1991 to 1993
 - (c) 1994 to 1996
 - (d) 1997 to 1999
 - (e) 2000 to 2001
 - (f) 2002 to present
- 4. Which department offers the implant dentistry course to the predoctoral students?
 - (a) department of restorative dentistry
 - (b) department of periodontics
 - (c) department of prosthodontics
 - (d) department of oral surgery
 - 5. In what year of dental school is this course offered?
 - (a) 1st year
 - (b) 2nd year
 - (c) 3rd year
 - (d) 4th year
- 6. What is the duration of this course?
 - (a) <2 months
 - (b) 3 to 6 months
 - (c) 7 to 12 months
 - (d) > 13 months
- 7. What is the total number of lectures given?
 - (a) <5
 - (b) 6 to 10
 - (c) 11 to 20
 - (d) 21 to 30
 - (e) 31 to 40
 - (f) >41
- 8. Which of the following topics are included in the lecture series?

- (a) historical overview of dental implantology
- (b) concept of osseointegration classification and types of dental implants
- (c) classification and types of dental implants
- (d) implant biomechanics/biomaterials
- (e) implant surface treatment
- (f) anatomy and/or histology of the hard and soft tissue/implant interface
- (g) implant patient education
- (h) dental presurgical assessment of the implant patient
- (i) medical presurgical assessment of the implant patient
- (j) radiographic/image evaluation and analysis of the implant patient
- (k) treatment planning for an implantsupported fixed partial denture
- (l) treatment planning for an implantretained overdenture
- (m) treatment planning for partially edentulous cases
- (n) treatment planning for fully edentulous cases
- (o) treatment planning for the single tooth implant restoration
- (p) screw-retained versus cemented implant restoration
- (q) occlusion on implant restorations
- (r) craniofacial applications of implants
- (s) implant site selection
- (t) implant stage 1 and 2 surgical procedure
- (u) implant postsurgical care
- (v) adjunct surgical techniques for implant therapy (soft and hard tissue augmentation, sinus elevation techniques)
- (w) implant surgical complications and management
- (x) failing/ailing implants
- (y) implant prosthetic complications and management
- (z) current research and developments in implantology
- 9. How many lecture hours are devoted to this course?
 - (a) <10
 - (b) 11 to 20
 - (c) 21 to 30
 - (d) 31 to 40
 - (e) 41 to 50

- (f) > 50
- *10.* Are any of the lectures available on the Internet for the students to review?
 - (a) yes
 - (b) no
- 11. Are there any required textbook(s) for the implant course?
 - (a) yes
 - (b) no
- *12.* Which textbook(s) is/are required for the implant dentistry course?
 - Brånemark, PI, Zarb, GA, Albrektsson, T. Tissue Integrated Prosthesis Osseointegration in Implant Dentistry. Quintessence, 1985
 - (b) Engelman, MJ. Clinical Decision Making and Treatment Planning in Osseointegration. Quintessence, 1997
 - (c) Misch, C. Contemporary Implant Dentistry (ed 2). Mosby, 1999
 - (d) Renouard, F, Rangert, B. Risk Factors in Implant Dentistry. Simplified Clinical Analysis for Predictable Treatment. Quintessence, 1998
 - (e) Spiekermann, H. Implantology. Thieme, 1995
 - (f) Worthington, P, Lang, B, LaVelle, WE. Osseointegration in Dentistry: An Introduction. Quintessence, 1994
- 13. If there are no required textbooks for the course, are there any recommended book(s) for the implant dentistry course?
 - Branemark, PI, Zarb, GA, Albrektsson, T. Tissue Integrated Prosthesis Osseointegration in Implant Dentistry. Quintessence, 1985
 - (b) Engelman, MJ. Clinical Decision Making and Treatment Planning in Osseointegration. Quintessence, 1997
 - (c) Misch, C. Contemporary Implant Dentistry (ed 2). Mosby, 1999
 - (d) Renouard, F, Rangert, B. Risk Factors in Implant Dentistry. Simplified Clinical Analysis for Predictable Treatment. Quintessence, 1998
 - (e) Spiekermann, H. Implantology. Thieme, 1995
 - (f) Worthington, P, Lang, B, LaVelle, WE. Osseointegration in Dentistry: An Introduction. Quintessence, 1994
- 14. Are there any adjunct teaching aids utilized in the course?

- (a) cd-roms
- (b) brochures
- (c) videos
- (d) manuals/catalogs (provided by implant companies)
- (e) prosthetic components demonstration kits
- 15. Do you have a laboratory course in conjunction with the implant course?
 - (a) yes
 - (b) no
- *16.* What is the total number of laboratory hours for this course?
 - (a) <5
 - (b) 6 to 10
 - (c) 11 to 15
 - (d) 16 to 20
 - (e) 21 to 25
 - (f) > 25
- 17. Do you utilize a partially dentate dentoform/model for the laboratory course?
 - (a) yes
 - (b) no
- *18.* Do you use a mannequin head for the laboratory course?
 - (a) yes
 - (b) no
- *19.* Do you have live demonstrations for the laboratory course?
 - (a) yes
 - (b) no
- *20.* Do you use prerecorded video demonstrations for the laboratory course?
 - (a) yes
 - (b) no
- *21.* What is the student-to-faculty ratio for the laboratory?
 - (a) <5:1
 - (b) 5:1
 - (c) 10:1
 - (d) 15:1
 - (e) >15:1
- 22. Is/are any of the faculty who teach the course prosthodontists?
 - (a) yes
 - (b) no
- 23. What percentage of the faculty are prosthodontists?
 - (a) <5%
 - (b) 5% to 10%
 - (c) 11% to 25%
 - (d) 26% to 40%

- (e) 41% to 50%
- (f) 51% to 75%
- (g) 76% to 100%
- 24. Are any of the faculty board-certified prosthodontists?
 - (a) yes
 - (b) no
- 25. If so, what is the ratio of the faculty who are board-certified prosthodontists to faculty teaching implant dentistry?
 - (a) <2:6
 - (b) 2:6
 - (c) 3:6
 - (d) 4:6
 - (e) 5:6
 - (f) 6:6
- 26. Which implant system(s) is/are utilized surgically in the predoctoral program?
 - (a) Nobel Biocare
 - (b) 3I
 - (c) ITI
 - (d) SteriOss
 - (e) Astra Tech
 - (f) Friatec
 - (g) Paragon
 - (h) Other
- 27. Which implant system(s) is/are utilized restoratively in the predoctoral program?
 - (a) Nobel Biocare
 - (b) 3I
 - (c) ITI
 - (d) SteriOss
 - (e) Astra Tech
 - (f) Friatec
 - (g) Paragon
 - (h) Other
- 28. Are predoctoral students required to be present during surgical placement of implants?
 - (a) yes
 - (b) no
- 29. Are the predoctoral students restoring implant cases?
 - (a) yes
 - (b) no
- *30.* What types of cases are the predoctoral students restoring?
 - (a) single tooth implant restorations
 - (b) implant-supported fixed partial denture restorations
 - (c) implant-retained overdentures
 - (d) implant-supported overdentures

- (e) fixed-detachable/high water restorations
- 31. Do you advocate a fixed partial denture prosthesis that connects natural teeth and implants?
 - (a) yes
 - (b) no
 - *32.* Are predoctoral students required (is it mandatory) to do any implant related laboratory work?
 - (a) yes
 - (b) no
- *33.* If implant related laboratory work is mandatory, which procedures do they do?
 - (a) pouring models
 - (b) fabricating transitional dentures
 - (c) fabricating surgical/radiographic stents
 - (d) fabricating laboratory processed provisionals for implants
 - (e) fabricating custom abutments
 - (f) fabricating the bar for a bar and clip type prosthesis
 - (g) fabricating framework for a high water or fixed-detachable restoration
 - (h) fabricating definitive restorations (i.e., crowns, overdentures, etc.)

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