CONDUCTING A SEARCH OF THE LITERATURE

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The explosion of dental literature over the past decade in absolutely unparalleled in the history of dentistry. Never before has so much literature been in print, and never before has the clinician been expected to have current knowledge of such a variety of materials and techniques to provide the best possible dental care. It is impossible for a clinician to read everything that is published on a monthly basis or to be expert in all aspects of dentistry. Frequently, however, the clinician needs to be able to draw on published reports to recommend treatment modalities to patients without relying solely on the dentist's own individual experience or other empiric methods. The purpose of this article is not to provide concise information on how to conduct an overview of the literature, but rather to show how to search the literature for articles that may be appropriate in answering a particular question related to patient care. A review of the methodology of conducting an overview has been published elsewhere.[1–3]

Perhaps the most time-consuming portion of any review of the published literature on a given subject is the actual literature search itself. Several sources should be included in a comprehensive search of the literature. These sources are traditional references (such as *Index Medicus* or *Index to Dental Literature*), peer-reviewed dental journals in print, CD-rom, and on-line electronic formats, electronic databases such as PubMed, MEDLINE, and Grateful Med, and contacts with appropriate source individuals.

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TRADITIONAL REFERENCE SOURCES

Unless the clinician has access to a health sciences library, the use of traditional source materials such as *Index Medicus* or the *Index to Dental Literature* may be limited. Determining under which traditional headings in the *Index to Dental Literature* a particular topic is listed can also be time-consuming. Each volume of these indices generally covers the topics published in a single year, and searching through the array of these indices is often daunting. When reviewing these indices, the reader is urged to begin with the most current year's index and to work backward in time, unless the exact publication date of an article on a particular subject is known. The exception for this technique might be a search for a treatment material or method that is antiquated or no longer practiced, such as the gold foil technique or the clinical use of a particular all-ceramic crown material that is no longer manufactured. For these historical searches, review articles might be useful initial sources for the topic of interest.

PEER-REVIEWED JOURNAL SOURCES

Most information today is acquired from the multitude of dental and medical journals to which dentists subscribe. Most often, membership in a professional organization entitles the member to receive the organization's designated journal on a quarterly, bi-monthly, or monthly basis. Not all these journals, however, are peer-reviewed. Peer review generally implies that a submitted manuscript is blindly reviewed by one or more experts on the general topic of the manuscript, that suggestions for improving the manuscript are returned to the authors, and that, following revisions, the manuscript is again reviewed and copy-edited for clarity before being accepted for publication. Provided that the reviewers are skilled in the precepts of evidence based dentistry and apply those precepts when reviewing the manuscript, one can generally expect that most peer-reviewed articles are accurate. Subscribing to a periodical generally entitles the member to have access to the publisher's on-line journal source. This on-line source gives the reader access to all published manuscripts from that journal, including all back issues that have been entered into the on-line source. Generally, the suscriber logs onto the publisher's website, enters the specific journal log-in information, selects a password, and begins the search process. Key words can often be used to search the databases and generate a list of related articles published by particular journal. After reviewing the titles, the reader can select the articles of interest; often, an abstract of the article is available for review. Finally, many publishers allow the reader to select and review the entire article on-line, including all tables and figures. One advantage of this technique is that it allows free access to the journal as long as the clinician subscribes to it (individually or through membership in a sponsoring professional organization); it also allows

the clinician to discard old journal issues that may be consuming valuable space in the office or home. The disadvantage of this search technique is that it allows a search for articles in only one particular journal, rather than providing a more comprehensive listing of all articles published on any given topic. This technique may prove too limiting when treatment decisions require a more comprehensive approach. Several journals typically underwrite dental conferences or symposia and often provide a CD-rom or on-line review of the conference proceedings, for an appropriate fee. This review may serve as an additional source of information for the busy clinician. Finally, several journals provide CD-rom disks of their published manuscripts for persons without internet access.

ELECTRONIC DATABASES

One of the easiest and most cost-effective methods to search the literature is through the use of the PubMed service from the federal government. This service can be accessed on the internet at *http://www.ncbi.nlm.nih.gov/PubMed*. The PubMed system was developed by the National Library of Medicine, located at the National Institutes of Health (NIH), and through the National Center for Biotechnology Information (NCBI). PubMed serves as an excellent search tool for accessing dental, medical, and biomedical literature citations and provides links to full-text journals at the web sites of participating publishers. Publishers participating in the PubMed service electronically submit their articles just before or at the time of publication. In addition to the biomedical literature, PubMed provides access and links to various databases, such as those that contain DNA and protein sequences, population-study data sets, and assemblies of complete genomes through their integrated system. For the practicing clinician, PubMed provides free access to MEDLINE and Internet Grateful Med, the bibliographic databases that serve as an excellent source for obtaining current literature citations.

MEDLINE is PubMed's premier bibliographic database covering medicine, dentistry, nursing, veterinary medicine, preclinical sciences, and the health care system. MEDLINE contains more than 11,000,000 citations dating back to the mid-1960s and contains bibliographic citations and author abstracts from more than 4000 biomedical journals published in the US and 70 foreign countries. Only about 80% of the current journals participate in the MEDLINE citation service, however, so some information may not be provided. When one accesses the MEDLINE system and types in the keyword *dentistry*, the system lists more than 243,500 citations of the dental literature. These citations are listed according to key words (or under Medical Subject Heading [MeSH]) provided by the authors and publishers.

Internet Grateful Med provides free access to MEDLINE, AIDSLINE, AIDSDRUGS, AIDSTRIALS, BIOETHICSLINE, DIRLINE, HISTLINE, OLD-

MEDLINE, POPLINE, TOXLINE, SPACELINE, SDILINE, HSRPROJ, HealthSTAR, and ChemID. Internet Grateful Med allows the use of Loansome Doc Document Delivery service, through which the entire text of published journal articles can be individually ordered. This service is conducted through a local or regional library, and a fee (which depends on the library used, but can be $8.00 or more per order) is charged for the service. If a limited number of articles is required, however, this service may be more cost-effective than ordering a journal subscription.

The clinician must take this vast array of electronic information and limit it to the area of interest. Clearly, search strategies must be employed to reduce the volume to a usable size for the busy reader. The first step is to develop a logical question. As with any evidence based assessment of the literature, the hierarchy of literature categories comes into play. Thus, the use of ramdomized, controlled-clinical trials (RCT), prospective clinical trials, retrospective analysis, cross-sectional trials, and case based assessments must be appropriately selected in the key word selection. Simple additions or deletions of letters or words can make huge differences in the number of citations that MEDLINE lists.

Recently, the author conducted two searches of the dental literature to determine (1) the success rates of single-tooth implant therapy, and (2) an outcome assessment of root canal therapy. Listed in Tables 1 and 2 are the search strategies employed, along with the number of citations MEDLINE provided for each search strategy. The addition of an "s" to one word or changing a key word from "treatment" to "therapy" had a significant effect on the number of citations listed. Similarly, the addition of *RCT*, *prospective trial*, and *retrospective trial* affected the outcomes for the two individual search strategies employed. Occasionally, it is necessary to use trial and error to limit the search to a manageable list.

At last check, from the 243,500 dental citations, use of the key words *dentistry and RCT* yielded a total of 20 citations; *dentistry and prospective trial* yielded 48 citations; *dentistry and retrospective trial* yielded 38 citations; *dentistry and cross-sectional studies* yielded 735 citations; and *dentistry and case-controlled studies* yielded 20,507 citations. Thus, it can be

Table 1. RESULTS OF SEARCH STRATEGIES FOR SINGLE-TOOTH IMPLANT THERAPY

Search Strategy	No. Medline Citations Listed
Single-tooth implant treatment	208
Single-tooth implant treatment and RCT	0
Single-tooth implant treatment and prospective trial	0
Single-tooth implant treatment and retrospective trial	0
Single-tooth implant therapy	161
Single-tooth implants therapy	36
Outcome of single-tooth implant therapy	39
Outcomes of single-tooth implant therapy	8
Treatment outcomes of single-tooth implant therapy	30

RCT = randomized, controlled trial.

TABLE 2. RESULTS OF SEARCH STRATEGIES FOR OUTCOME ASSESSMENT OF ROOT CANAL THERAPY

Search Strategy	No. Medline Citations Listed
Outcome of root canal therapy	179
Outcome of root canal therapy and RCT	0
Outcome of root canal therapy and prospective trial	1
Outcome of root canal therapy and retrospective trial	0
Outcomes of root canal therapy	20
Outcome of endodontic therapy	120
Outcomes of endodontic therapy	14
Outcome of root canal treatment	189
Outcomes of root canal treatment	20
Outcome of endodontic treatment	125
Outcomes of endodontic treatment	15

RCT = randomized, controlled trial.

concluded that the field of dentistry has a long way to go to provide the clinician with an adequate amount of conclusive evidence for planning treatment interventions in patient care.

Once the list of citations has been produced, each can be opened to review an abstract of the article (if available) for initial review. If a useful article is found, one can improve search results by selecting the *related articles* link to find others that MEDLINE has assessed. The entire text of the article can then be ordered through a link to the publisher (if available), or through the Loansome Doc Document Ordering service described previously. When the entire article has been obtained, however, it is essential that the precepts of evidence based dentistry be accurately applied to determine whether the research methods, use of control groups, appropriate sample size, and appropriate statistical tests have been suitably employed so that the article provides a valid presentation of data. Otherwise, to paraphrase the ancient Romans, "caveat lector" or, "Let the reader beware!"

References

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