

# The Building Blocks of Evidence-based Dentistry

• Susan E. Sutherland, DDS •

## A b s t r a c t

*The practice of dentistry is becoming more complex and challenging. Changing socio-demographic patterns, patients as knowledgeable health care consumers, rapid technical advances and the information "explosion" all place greater demands on clinical decision making. The need for reliable information and the electronic revolution have come together to allow the "paradigm shift" towards evidence-based health care to progress swiftly. Evidence-based dentistry closes the gap between clinical research and real world dental practice and provides dentists with powerful tools to interpret and apply research findings. Central to evidence-based practice is the systematic literature review, which synthesizes the best evidence and provides the basis for clinical practice guidelines.*

**MeSH Key Words:** dentistry; evidence-based medicine

© J Can Dent Assoc 2000; 66:241-4  
This article has been peer reviewed.

The practice of dentistry presents many challenges on a daily basis. Keeping up with new materials and techniques, dealing with the numerous demands of running a small business, and meeting a variety of professional obligations all compete for our time and attention. The greatest challenge, however, and the one dentists strive to meet to the highest degree, is the provision of quality oral health care in a skilled, compassionate and effective manner.

As you reflect on patients you have seen in recent weeks, some stand out, mainly because they presented "blips" in your otherwise smooth practice day. These encounters may have left you with a vague feeling of uneasiness, one that does not quite go away. You know that you try to keep up with the latest information through reading journals and attending CE courses, as time permits. Still, you wonder if you should have known more in dealing with these specific patient problems. For many of these clinical dilemmas, you are grateful for the network of specialists you can call for advice, whose opinions you value. But you do not always have the opportunity to discuss issues with others and you know that, not infrequently, even the experts are uncertain. You wish there was another way to address these clinical questions with more precision and confidence.

This scenario is familiar to most practising dentists. Clinical dentistry is becoming increasingly complex and our patients more knowledgeable. The Internet and the ready availability of health information have created consumers who

demand the "latest" tests and treatments. Socio-demographic characteristics, associated cultural customs and patient values are changing. Practitioners are overloaded with information, much of which is conflicting, inaccurate or unproven. The need for reliable information and the unprecedented ability to access it have come together to create a "paradigm shift" in the way health care is delivered.

This paper will examine the concept of evidence-based dentistry (EBD), including some of the barriers to and challenges of embracing this philosophy in practice, and will discuss how the "building blocks" of evidence-based care — systematic reviews and clinical practice guidelines — are used to integrate and summarize existing evidence for the use of practising dentists.

### The Evidence-based Paradigm

Evidence-based care is a global movement in all the health science disciplines. It represents a philosophical shift in the approach to practice — a shift that emphasizes evidence over opinion and, at the same time, judgement over blind adherence to rules. This approach provides a bridge between research and everyday patient care.

Evidence-based practice is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients."<sup>1</sup> It is a process which expresses a clinical problem as a question, employs a systematic framework to locate and evaluate relevant research and

integrates that information with clinical experience to guide clinical decisions.<sup>2</sup>

In understanding the concept of EBD, it is helpful to clarify what it is not. It is not a “cookbook” approach to practice. EBD requires the integration of the best evidence with clinical expertise and patient preferences and, therefore, it informs, but never replaces, clinical judgement.<sup>3</sup> Evidence-based health care recognizes the complex environment in which clinical decisions are made and the importance of individual patient circumstances, beliefs, attitudes and values.<sup>4</sup>

A common misconception is that evidence-based practice is not feasible or is ineffective in the absence of randomized controlled trials. Although randomized trials are the “gold standard” for judging therapeutic interventions, they may not be available or they may not be the appropriate research design to answer other types of clinical questions. Evidence-based practice is a practical approach to clinical problems. It involves tracking down the best available evidence, assessing its validity and using “rules of evidence” to grade the evidence according to its strength.<sup>5</sup>

EBD is not an ivory tower endeavour for armchair academics. Rather, it is the domain of practising dentists. Although many of the skills for literature searching and critical appraisal have not been taught in the past in traditional programs, most medical and dental faculties are now including the concepts of evidence-based practice in their curricula. There is an increasing body of literature to assist practising clinicians in the acquisition of the skills needed to use evidence to guide practice. It has been shown that evidence-based methods can be learned by clinicians of varying backgrounds, at any stage in their careers.<sup>6</sup>

Finally, evidence-based practice is not “old hat,” which everyone already uses in day-to-day practice. The fact that scientific research evidence has built the knowledge base and has always provided the foundation for sound practice of the profession of dentistry is not in dispute. However, the context for change, and what has made the practice of EBD possible, is the electronic revolution. The research evidence can now be readily accessed at the “user” level by dentists or patients. Because the quality of research reports and, therefore, the accuracy of the conclusions drawn, vary tremendously, tools are needed to help dentists to properly interpret and apply the evidence. The “information explosion” and the limited amount of time for keeping up with the literature has made the evidence-based approach valuable and effective for efficiently filtering what is truly important for clinical decision making from what is not.<sup>7</sup>

## Systematic Reviews

The foundation for the evidence-based approach is the systematic literature review, which differs significantly from the narrative review. Narrative reviews (the traditional review article) are usually broad in scope, written by experts and are often informal and subjective, supporting the author’s views. Reviews by different authorities may arrive at different conclusions, leaving the reader wondering what the “truth”

really is. While narrative reviews are useful for providing a general perspective on a topic and are appropriate for describing the history of a problem or its management,<sup>8</sup> their selection of studies is subject to bias and the overall conclusions may not be accurate.

Systematic reviews use explicit standards for evidence retrieval, assessment and synthesis. They are undertaken with the same rigour as one expects from the primary research, with each study in the review treated as a “unit of analysis,” using specific eligibility criteria for its inclusion.<sup>9</sup> The methodology of the review is thoroughly documented and reproducible. The strengths of systematic reviews include a clearly defined question, a comprehensive search strategy, explicit inclusion criteria, assessment of methodological quality of the included studies, synthesis of the data and a summary of the results.

The question driving the review should be focused.<sup>10</sup> A “well-built” question<sup>11</sup> will include four key elements: the population (for example, children in the primary dentition stage), the condition of interest (such as posterior crossbite), an exposure to a test or intervention (occlusal grinding to remove premature contacts) and a specific outcome (posterior crossbite in the permanent dentition). An example of a clear clinical question might be “Does removal of premature contacts by occlusal grinding of the primary teeth prevent posterior crossbite in the permanent dentition?”

When the results of two or more studies can be combined statistically, the review is called a quantitative systematic review or meta-analysis. Using this technique, statistical analysis of the results of multiple studies is done to obtain a single estimate of effect, leading to greater precision of the estimate and increased statistical power to detect the true effect of an intervention in the face of conflicting results.<sup>12</sup> It is not always possible or sensible to include a statistical analysis in a systematic review. Controlled clinical trials may not have been done, may be of poor quality or may be too different from each other in terms of the population studied, the intervention used or the outcome which was measured. When the results cannot be statistically combined, but still use rigorous scientific methods to minimize bias, the review is called a qualitative systematic review. This type of systematic review is highly valuable for summarizing the existing data, for helping us to understand discrepancies in the available evidence, for informing us of the lack of reliable studies and in helping to define future research strategies.

The term “overview” is often used to describe a systematic review, whether it is qualitative or quantitative. The preparation of a systematic review is a major undertaking, requiring considerable time and expertise.

## The Cochrane Collaboration

The Cochrane Collaboration is an international organization whose overall aim is to build and maintain a database of up-to-date systematic reviews of randomized controlled trials of health care and to make these readily accessible electronically. It has been called “an enterprise that rivals the Human Genome Project in its potential implications for modern

medicine"<sup>13</sup> and has also been described as being one of the most significant clinical advances since the creation of the National Institutes of Health in the U.S.<sup>14</sup>

The history of the Cochrane Collaboration dates back to the influential 1972 publication, *Effectiveness and Efficiency*,<sup>15</sup> by the British physician/epidemiologist Archie Cochrane. In this essay, Cochrane emphasized the use of scientific evidence, rather than intuition, expert opinion, anecdotal experience or tradition, in the evaluation of health care. In 1979, he wrote: "It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or sub-specialty, adapted periodically, of all relevant randomized controlled trials."<sup>16</sup> In 1992, the British National Health Service created the Cochrane Centre, at Oxford, UK, named in honour of Archie Cochrane, to facilitate the preparation and maintenance of systematic reviews for all areas of health care. Tremendous international interest followed and by 1993, centres had been established in Denmark, Canada, the United States and Australia. There are now fifteen Cochrane Centres worldwide.

The main product of the Cochrane Collaboration is the Cochrane Library, an electronic library, issued quarterly, which contains databases of controlled trials and systematic reviews. The core work of the collaboration is done by the Collaborative Review Groups, which are formed by individuals who have a common interest in a health care problem and who work together through electronic means to prepare a systematic review on their chosen topic.<sup>17</sup>

The Cochrane Oral Health Group is based at the University of Manchester, UK. The Oral Health Group (OHG) has a growing and enthusiastic international membership. The group has now completed three reviews,<sup>18-20</sup> and has seven protocols registered, which are expected to be completed within the next year. In addition, three registered protocols are currently being refereed and 13 other topics are under discussion. The OHG maintains a Specialized Register of Trials, which contains over 6,800 records of clinical trials relating to oral health in an electronic database.<sup>21</sup> The registry has been built through electronic searches and through the diligent efforts of volunteer hand searchers. The hand search program began in the spring of 1998 and, to date, over 251 journal years have been searched. The yield of hand searching is remarkable, since 58% of the trials found had not been identified electronically (for example, by Medline), using high-yield search strategies.

### Clinical Practice Guidelines

Clinical Practice Guidelines (CPGs) are "systematically developed statements to assist practitioners and patients in arriving at decisions on appropriate health care for specific clinical circumstances."<sup>22</sup> The overriding purpose of guidelines is to enhance, not dictate, clinical decision making and to provide practical recommendations to help practitioners improve the care they offer to their patients.

Different approaches have been used to develop guidelines, including expert opinion, group consensus and evidence-

based methods.<sup>9</sup> Although experts may have a wealth of scientific knowledge, clinical experience and credibility, guidelines based on expert opinion are usually unstructured and informal, and are open to criticisms of bias and conflict of interest.

Guidelines derived from consensus meetings are more structured and formal. They represent the views of various stakeholders and may be useful for creating uniform practice policies, particularly in areas of controversy. However, the research considered may represent a biased sampling and the evidence is generally not available for scrutiny. Furthermore, it is in areas of clinical controversy that the evidence-based approach is most useful in assessing the evidence and identifying weaknesses.

Evidence-based clinical practice guidelines (EB-CPGs) are structured and formal, and use rigorous, explicit and reproducible methods to assemble and evaluate the evidence. These guidelines are based on systematic reviews and incorporate values and preferences of patients and practitioners. The process of creating a well-developed EB-CPG includes external review and comment by those who will be using the guidelines — for example, a wide range of clinicians, as well as patients or their representatives.<sup>23</sup>

The development of EB-CPGs in dentistry is in the beginning stages. A review in 1995 of guideline development by various dental organizations and specialties in the United States<sup>24</sup> revealed a lack of systematic analysis of the literature and a reliance on expert opinion acquired through unstructured and untested methods of consensus. Since that time, a number of initiatives have been undertaken. In Canada, in 1997, the Canadian Dental Association sponsored a Workshop on Clinical Practice Guidelines, where one of the objectives was to begin to develop a collaborative approach to guideline development and implementation over the next five years.<sup>25</sup> This led to the initial meeting of the Canadian Collaboration on Clinical Practice Guidelines in Dentistry (CCCD) in October, 1999. The collaboration, as the national, autonomous body responsible for EB-CPG development, will have broad representation from the dental profession. The planned structure incorporates administrative and methodological support and embraces the principles of evidence-based practice and sound guideline development.

There are many challenges in implementing evidence-based practice, producing high-quality systematic reviews and developing useful evidence-based guidelines. Barriers to using evidence-based methods in everyday practice include lack of appropriate skills for formulating clear questions, executing efficient electronic searches and evaluating the literature; however, these skills can be learned by anyone, at any stage of practice. What is needed is a desire and a commitment to implement this type of practice and practical, accessible CE programs and workshops in this regard. Our dental faculties and professional organizations should be the leaders in these endeavours. The practice of EBD is thought by some to be too time-consuming. As with any new skill, there is a learning curve to overcome and with experience, fuzzy clinical

problems will quickly become focused questions and the best evidence can then be tracked down efficiently.

Often cited as a barrier to EBD is the lack of good clinical research in the form of well-designed, adequately powered randomized trials. The rigorous methodology demanded by systematic reviews for organizing and analyzing the literature in an area provides a valuable tool for identifying areas where the evidence is weak and where research is needed and feasible. Overviews should be part of the development of future research agendas and, in fact, the presence of a prior systematic review will likely influence research funding decisions in the future (L. O'Toole, UK Medical Research Council, speaking at the 6th Cochrane Colloquium, October 1998).

Perhaps the greatest impediments to the evidence-based movement are the fear and mistrust on the part of practitioners that the evidence will be misused by decision makers, particularly third-party funders and regulatory bodies, and that the individual autonomy of dentists, in caring for their patients, will be threatened. Clearly, research evidence can be abused by anyone — dentists, patients, politicians, policy makers and funders — who selectively choose the evidence to support and promote their own views. This is another compelling reason why the profession must embrace EBD and provide the leadership needed to protect the scientific integrity of the evidence. Practising dentists must ensure, through direct involvement with the process, that guideline development methods are open and transparent and that the resulting guidelines are practical, useful and relevant.

Overcoming these barriers, exploiting the potential of information technology and applying sound scientific principles to everyday practice will allow dentists to meet the greatest challenge of practice — the provision of high quality, effective oral health care. ♦

---

*Dr. Sutherland is a full-time active staff member of the department of dentistry at Sunnybrook and Women's College Health Sciences Centre in Toronto.*

*Correspondence to: Dr. Susan E. Sutherland, Department of Dentistry, Suite H126, Sunnybrook and Women's College Health Sciences Centre, 2075 Bayview Ave., Toronto, ON M4N 3M5.*

*E-mail: susan.sutherland@swchsc.on.ca*

*The author has no declared financial interests.*

---

## References

1. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. *BMJ* 1996; 312:71-2.
2. Jadad A. *From trials to decisions: the basis of evidence based health care. Randomized controlled trials*. London: BMJ Books; 1998. p. 93-107.
3. Sackett D, Richardson W, Rosenberg W, Haynes R. *Evidence-based medicine: How to practice and teach EBM*. London: Churchill Livingstone; 1997.
4. Browman GP. Evidence-based paradigms and opinions in clinical management and cancer research. *Sem Oncol* 1999; 26(Suppl 8):9-13.
5. Sackett DL. Rules of evidence and clinical recommendations for the management of patients. *Can J Cardiol* 1993; 9:487-9.
6. Rosenberg W, Donald A. Evidence based medicine: an approach to clinical problem-solving. *BMJ* 1995; 310:1122-6.
7. Glowniak JV, Bushway MK. Computer networks as a medical resource. Accessing and using the Internet. *JAMA* 1994; 271:1934-9.

8. Cook DJ, Mulrow CD, Haynes RB. Systematic reviews: synthesis of best evidence for clinical decisions. *Ann Intern Med* 1997; 126:376-80.
9. Browman G. Evidence-based cancer care and clinical practice guidelines. *Am Soc Clin Oncol* 1998; (Spring Educational Book). p.451-7.
10. Counsell C. Formulating questions and locating primary studies for inclusion in systematic reviews. *Ann Intern Med* 1997; 127:380-7.
11. Richardson WS, Wilson MC, Nishikawa J, Hayward RS. The well-built clinical question: a key to evidence-based decisions. *ACP J Club* 1995; 123:A12-3.
12. Palmer AJ, Sendi PT. Meta-analysis in oral health care. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999; 87:135-41.
13. Naylor D. Grey zones of clinical practice: some limits to evidence-based medicine. *Lancet* 1995; 345:840-2.
14. Dickersin K, Manheimer E. The Cochrane Collaboration: evaluation of health care and services using systematic reviews of the results of randomized controlled trials. *Clin Obstet Gynecol* 1998; 41:315-31.
15. Cochrane A. *Effectiveness and efficiency: Random reflections on health services*. London: Nuffield Provincial Hospitals Trust; 1972.
16. Cochrane A. 1931-1971: A critical review, with particular reference to the medical profession. *Medicines for the Year 2000*. London: Office of Health Economics; 1979. p. 1-11.
17. Jadad AR, Haynes RB. The Cochrane Collaboration — advances and challenges in improving evidence-based decision making. *Med Decis Making* 1998; 18:2-9.
18. Harrison J, Ashby D. Orthodontic treatments for posterior crossbites (Cochrane Review). *The Cochrane Library. Issue 4*. Oxford: Update Software; 1999.
19. Chan ESY, Thornhill M, Zakrewska J. Interventions for treating oral lichen planus (Cochrane Review). *The Cochrane Library. Issue 4*. Oxford: Update Software; 1999.
20. Clarkson J, Worthington H, Eden O. Prevention of oral mucositis or oral candidiasis for patients with cancer receiving chemotherapy (excluding head and neck cancer) (Cochrane Review). *The Cochrane Library*. Oxford: Update Software; Issue 1, 2000.
21. Cochrane Oral Health Group. Oral Health Group Newsletter. Issue 4; July 1999.
22. Field M, Lohr K. Clinical practice guidelines: Directions for a new program. Institute of Medicine. Washington, DC: National Academy Press; 1990.
23. Jadad A. *From individual trials to groups of trials: reviews, meta-analyses and guidelines. Randomized controlled trials*. London: BMJ Books; 1998. p. 78-92.
24. Bader JD, Shugars DA. Variations, treatment outcomes, and practice guidelines in dental practice. *J Dent Educ* 1995; 59:61-95.
25. Canadian Dental Association. Report on the CDA Workshop on Clinical Practice Guidelines. 1997.