Original Manuscript

Jane L. Forrest, RDH, EdD
Pamela Overman, BSDH, MS, EdD

Keeping Current: A Commitment to Patient Care Excellence through Evidence Based Practice

Abstract: The desire to improve the oral health of clients begins with the hygienist's commitment to keeping current with useful scientific knowledge. The challenge is mastering the skills to discriminate between the many claims and what actually has been shown to be effective. One approach is through evidence-based decision-making (EBDM), which helps practitioners find relevant clinical evidence when it is needed for treatment decisions and for answering client questions. The purpose of this article is to discuss EBDM and its use in practice, potential challenges, future developments and resources that will assist in keeping current.

Keywords: Evidence-based Decision-Making, Evidence-based Practice, Cochrane, PubMed, pre-appraised evidence, Clinical Decision Support

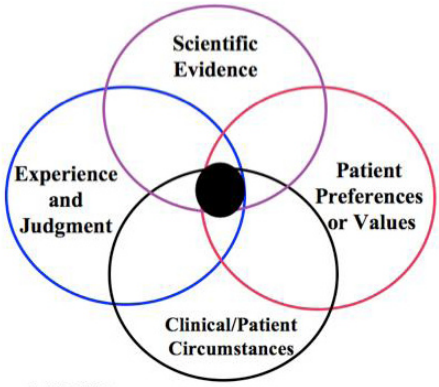
Introduction

The desire to improve the oral health of clients must start with the hygienist's commitment to keeping current with useful scientific knowledge. Most dental hygienists struggle with keeping up with the onslaught of information touting the latest innovations in oral health care. The challenge is separating the many claims from what actually has been shown to be effective in patient care. One approach is through evidence-based decision making (EBDM), which is specifically designed to help practitioners find relevant clinical evidence when it is needed to help make treatment decisions and to answer client questions.

What is Evidence-Based Decision Making?

EBDM is defined as "the integration of best research evidence with our clinical expertise and our patient's unique values and circumstances."[1] Thus, optimal decisions are made when all components are considered (Figure 1). EBDM is not unique to any specific health discipline and focuses on the decision-making process, which is why it is referred to here as EBDM or evidence-based practice (EBP) rather than evidence-based dentistry or evidence-based dental hygiene.

Figure 1: Evidence-Based Decision Making



Milestones in the Evolution of EBDM

1. The Birth of Evidence Based Medicine – McMaster University, Ontario Canada

In 1981, David Sackett, along with a group of clinical epidemiologists at McMaster University, published articles advising clinicians how to read clinical journals.[2] The group proposed the term "critical appraisal" and recognized its value in using the approach of identifying the best evidence to solve patient problems. This approach to medical care represented a fundamental change of practice and warranted a new term that would capture this difference. In 1990, Gordon Guyatt proposed the term "evidence-based medicine" (EBM).[3] The approach took hold and began to spread to other health care disciplines. In 2007, the development of EBM by researchers at McMaster University was recognized as one of the 15 greatest medical breakthroughs since 1840.[4] Table I provides a summary of the milestones in the evolution of EBDM.

Table I: The milestones in the evolution of EBDM

Year	Point of Interest	Description
1972	Archie Cochrane writes Effectiveness & Efficiency: Random Reflections on Health Services.	• Acknowledgement of the medical professions lack of evidence behind many of the commonly accepted health care interventions at the time. Promoted the use of scientific evidence to evaluate health services.
1979	Archie Cochrane publishes an essay in which he states, "It is surely a great criticism of our profession that we have not organized a critical summary... of all relevant randomized controlled trials."	• Move towards gathering and organizing the research related to a specific topic and developing systematic reviews. Cochrane's call for an organized database of RCTs served as an impetus for the formation of the Cochrane Collaboration.
1981	Canadian Medical Association Journal (CMAJ) publishes a series of articles by David Sackett on how to read clinical journals.3	• David Sackett, MD, at McMaster University, Ontario, Canada suggests bringing critical appraisal to the bedside, changing the philosophy of medical practice so that it is based on knowledge and understanding of the literature supporting clinical decisions.
1990 to 1991	Gordon Guyatt coins the term "Evidence-Based Medicine" and uses it in a publication, the ACP Journal Club.4	• Gordon Guyatt, MD, at McMaster University uses the term "Evidence-Based Medicine" to represent the fundamental change of medical practice initiated by his mentor, David Sackett.
1993 to 2000	JAMA publishes a series of articles, Users' Guides to the Medical Literature.	• Gordon Guyatt and the EBM Working Group expand the Sackett CMAJ 1981 series and produce a series of 32 papers on 25 topics ,describing different types of medical questions and the study designs that may answer them.
1992 to 1993	First Cochrane Centre opens in Oxford, UK	• The first Center becomes registered. Renamed the UK Cochrane Centre in 1993; the first of 52 Centers located around the world.
1993	Canadian Cochrane Centre opens	• The Canadian Center becomes registered
1993	First Cochrane Center in the U.S. opens in Baltimore	• Baltimore Center moves to New England and then becomes the United States Cochrane Center in 2002
1993	Formal launch of the Cochrane Collaboration in Oxford, UK	• A collaboration of Cochrane Centers is formally established
1993	NLM begins to identify clinical trials in MEDLINE using Cochrane Collaboration information	• National Library of Medicine agrees to re-tag clinical trials using information from the Cochrane Collaboration
1994	Cochrane Oral Health Group established	• The Cochrane Oral Health Group is one of the first groups to register and is currently located at the University of Manchester.
1998	Evidence Based Dentistry journal established	• Published by Nature, http://www.nature.com/ebd/index.html
1999	National Center for Dental Hygiene Research receives EBDM grant and establish the EBDM website, www.usc.edu/ebnet	• Jane L Forrest and Syrene Miller receive HRSA, BHP, DHHS Grant to train interdisciplinary teams in EBDM and how to integrate it into Dental Hygiene curricula.
2001	Journal of Dental Hygiene publishes the White Paper on the EBDM Model for Dental Hygiene Education, Research & Practice	• Jane L Forrest receives contract from ADHA to prepare the White Paper on Evidence Based Decision Making for dental hygiene.
2001	American Dental Association adopts definition of Evidence-Based Dentistry	• ADA definition: Evidence-based dentistry (EBD) is an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences.

Table I: The milestones in the evolution of EBDM (continued)

Year	Point of Interest	Description
2001	Journal of Evidence Based Dental Practice launches its first issue	• Published by Elsevier, http://www.jebdp.com/
2002	JAMA publishes the book, Users' Guides to the Medical Literature, A Manual for EB Clinical Practice.	• The JAMA journal series is edited to serve as the basis for the book, and expands it to include understanding sources of bias, how to better teach EBM, and key concepts in applying research to patient problems.
2003	1st International Conference on Evidence-Based Dentistry for dental professionals	• Sponsored by The Journal of Evidence-Based Dental Practice, editor Michael G Newman, Mosby, Elsevier and the Task Force On Design and Analysis
2005	2nd International Conference on Evidence-Based Dentistry for dental professionals	• Sponsored by The Journal of Evidence-Based Dental Practice, editor Michael G Newman, Mosby, Elsevier
2007	ADA Establishes Center for Evidence Based Dentistry	• Center develops resources to help dentists integrate clinically relevant scientific evidence at the point of care. The Center facilitates access to the best available scientific information related to oral health care, and develops evidence-based resources for use in clinical practice.
2007	ADHA establishes Policy on Evidence Based Practice	• The practice of EB DH requires the integration of individual clinical expertise and client preferences with the best available external clinical evidence from systematic research. 1-07
2007	EBM recognized as one of the 15 greatest medical breakthroughs since 1840.	• British Medical Journal publishes Medical Milestones 2007 identifying EBM by researchers at McMaster University as one of the 15 greatest medical breakthroughs since 1840.
2008 to Present	1st EBD Champions Conference to train dental practitioners held in 2008 and now is an annual program, which also includes opportunities for dental hygienists to attend	• The goal of the Champion's Program is to develop a network of dentists/hygienists that will serve as a resource to their local communities by promoting the application of an evidence-based approach to patient treatment and prevention of disease. Sponsored by the ADA, and initially with support from the Journal of Evidence-Based Dental Practice/Elsevier and P&G.
2008	3rd International Conference on EBD	• Sponsored by the Journal of Evidence-Based Dental Practice (JEBDP), in partnership with the American Dental Association and P&G.
2009	ADA Center for Evidence Based Dentistry Website	• Provides systematically assessed evidence as tools and resources to support clinical decisions. Sections include Systematic Reviews & Summaries, ADA Clinical Recommendations and Resources.
2009	Evidence-Based Decision Making: A Translational Guide for Dental Professionals	• Textbook for use in dental hygiene and dental education programs, as well as in private practice. Discusses the concepts and skills needed for EB Practice through the use of cases, application activities and quizzes. Jane L Forrest, Syrene Miller, Pam Overman & Michael Newman authors.
2009	ADA/Forsyth Course on EBD	• The ADA Center for Evidence-Based Dentistry collaborates with The Forsyth Institute (Cambridge, MA) to offer a one-week intensive course on evidence-based dentistry (EBD).
2013	ADA CODA Standards for Accrediting Dental and Dental Hygiene Programs	• Implementation of new CODA standards requiring critical thinking, problem solving and EB patient care
2013	Cochrane Collaboration Celebrates 20 years	
2013	Dental Hygiene Celebrates 100 Years as a Profession	

2. The Cochrane Collaboration – Advocacy for Using Evidence

Concurrently, another approach contributing to EBP was developing in England based on the work of Archie Cochrane, a British epidemiologist, who advocated for the use of randomized controlled trials (RCTs) as a means of reliably informing health care practice.[5] Later, after realizing that reading independent RCTs might provide conflicting information, he promoted organizing a database of RCTs and synthesizing their findings around specific health conditions.[6] This eventually led to the development of the Cochrane Collaboration, a world-wide independent, not-for-profit organization comprised of 52 review groups, making it the largest organization committed to preparing systematic reviews to facilitate medical decision-making. These systematic reviews (and meta-analyses), known as Cochrane Reviews, are published online in The Cochrane Library.

The Cochrane Oral Health Group is one of the 52 review groups. Since 1994, the Oral Health Group has published 132 systematic reviews and is investigating 66 new protocols.7 Many of the 132 reviews support the preventive and therapeutic care provided by dental hygienists, and therefore Cochrane Reviews are a very important resource for keeping current. Also, the impact of the Oral Health Group's publications puts it in the top 3 journals of dentistry, behind the Journal of Clinical Periodontology and the Journal of Dental Research.[7]

3. Tools to Tame PubMed

Since 1997, PubMed has provided free access to the MEDLINE, the largest scientific database, and the number of citations has steadily increased to over 22 million. As the peer reviewed literature has been digitally stored and made accessible, its growth has made it nearly impossible for practitioners in every field to keep current. Fortunately, PubMed has recognized this problem and has developed evidence-based short-cuts called filters to help retrieve different article types, such as those based on study designs. This, in turn, allows the user to be very efficient in searching for Systematic Reviews (SRs) and Meta-Analyses (MAs) and Practice Guidelines (PGs), the highest levels of evidence.

In addition to doing a traditional PubMed search, a valuable feature for busy professionals is PubMed Clinical Queries, which directly uses evidence-based filters. For example, typing in the search terms on the Clinical Queries page automatically finds citations for SRs, MAs, reviews of clinical trials, evidence-based medicine, consensus development conferences and PGs. Thus, both PubMed search mechanisms allow for searching electronically across hundreds of journals at one time and being able to filter the results to the highest levels of clinically relevant evidence. In addition, PubMed has a mechanism that allows the user to receive email notifications when new articles are published on a specific topic of interest making it more convenient to stay current on that topic.

4. CODA Adopts EBP Accreditation Standards for Dental Hygiene

Another evidence-based practice milestone is reflected in the CODA Accreditation Standards for Dental Hygiene Programs requiring students to master the skills required for EBDM.[8] Graduating dental hygienists must be competent in providing patient-centered treatment and evidence-based care in a manner minimizing risk and optimizing oral health (Standard 2-17,).[8] This has implications for both the curriculum and faculty development. EBDM will require much greater emphasis placed on research in an already jam-packed curriculum and translating classroom learning into application on the clinic floor.

Using Evidence in Practice

The EBDM movement has come very far in a relatively short time, however, the challenge for all health care practitioners, including dental hygienists, is to integrate EBDM into clinical practice. For example, how would one respond to a client who questions how adequate an oral cancer screening was performed since neither of the adjunctive devices that she saw on a popular daytime TV show were used? Or, how would one respond to clients who refuse to have radiographs taken because a report on the evening news discussed a possible association between dental x-rays and Meningiomas? Finally, how does one respond to a client who has always taken an antibiotic prior to treatment and now questions why he no longer needs to be premedicated? Knowing how to answer these questions requires skills in:

1. Efficiently finding the most current scientific information
2. Understanding the research design, the data/findings, and the level of evidence that was obtained
3. Knowing how to present this information in a way that the client understands it and can make an informed decision

While EBDM is now incorporated into dental hygiene education, this is a fairly recent occurrence. Many will still be unfamiliar with the skills to practice EBDM.

Table II: Pre-Appraised Evidence Resources

Level 6 Clinical Decision Support Systems: Interactive Drug Databases	
ClinicalKey, Elsevier	http://www.clinicalkey.com
Lexi-Comp, Inc. Comprehensive drug database; Interactions	http://www.lexi.com
Natural Standard – Integrative Medicine with Evidence Based Grading system	http://www.naturalstandard.com/
UpToDate	http://www.uptodate.com
Level 5 Summaries: Clinical Practice Guidelines	
American Academy of Pediatric Dentistry (AAPD)	http://www.aapd.org/media/policies.asp
American Academy of Periodontology	http://www.perio.org/resources-products/posppr2.html
ADA Clinical Recommendations	http://ebd.ada.org/ClinicalRecommendations.aspx
ADHA, Position Papers and Consensus Statements	http://www.adha.org/profissues/index.html
American Heart Association	http://my.americanheart.org/professional/Statements-Guidelines/Statements-Guidelines_UCM_316885_SubHomePage.jsp
Centers for Disease Control and Prevention	http://www.cdc.gov/OralHealth/guidelines.htm
PubMed (Article type - Limit to Practice Guideline)	http://pubmed.gov
Scottish Intercollegiate Guidelines Network	http://www.sign.ac.uk/guidelines/index.html
The evidence-based dental library	http://www.ebdlibrary.com
Level 4 Synopses of Systematic Reviews: Critically appraised Systematic Reviews	
ADA Center for Evidence-based Dentistry (Critical Summary)	http://ebd.ada.org/SystematicReviews.aspx
Database of Abstracts of Reviews of Effects (DARE)	http://www.crd.york.ac.uk/crdweb/SearchPage.asp
PubMed (Look for Comments on Systematic Reviews)	http://pubmed.gov
Evidence Based Dentistry journal	http://www.nature.com/ebd/index.html
Journal of Evidence-Based Dental Practice	http://www.jebdp.com
Level 3 Systematic Reviews:	
ADA Center for Evidence-based Dentistry	http://ebd.ada.org/SystematicReviews.aspx
Cochrane Database of Systematic Reviews	http://www.thecochranelibrary.com
PubMed (Article type filter - Limit to Systematic Review)	http://pubmed.gov
Evidence Based Dentistry journal	http://www.nature.com/ebd/index.html
Journal of Evidence-Based Dental Practice	http://www.jebdp.com
Level 2 Synopses of Individual Studies: Critically Appraised RCTs	
Database of Abstracts of Reviews of Effects (DARE)	http://www.crd.york.ac.uk/crdweb/SearchPage.asp
PubMed (Limit to RCT or Clinical Trial. Look for Comments)	http://pubmed.gov
Evidence Based Dentistry	http://www.nature.com/ebd/index.html
Journal of Evidence-Based Dental Practice	http://www.jebdp.com
Level 1 Original Studies: Individual Research Studies (Original studies and not pre-appraised)	
PubMed (Article type filter - Limit to RCT or Clinical Trial)	http://pubmed.gov
Journal Publications i.e. JDH, IFDH Journal, dental specialty groups, etc.	http://www.adha.org/publications/index.html http://jada.ada.org/ http://elsevier.com

Table IV: Strategies for Getting Started on Integrating Evidence Based Decision Making

1. Read articles on EBDM and/or complete online CE courses that provide an overview EBDM and how to search PubMed.
   a. A 2-part series in JEBDP explains EBDM and the skills needed to use an EBDM approach.
      - Forrest JL, Miller SA. Translating Evidence Based Decision Making into Practice: EBDM Concepts and Finding the Evidence. J of Evidence-Based Dental Practice, June 2009; 9(2):59-72.
      - Miller SA, Forrest JL. Translating evidence-based decision making into practice: appraising and applying the evidence. Journal of Evidence-Based Dental Practice, 2009;9(4):164-182.
   b. Complete 2 online continuing education courses on EBDM and Searching the Literature Using PubMed:
      - Forrest JL. Evidence-Based Decision Making: Introduction and Formulating Good Clinical Questions. Listed under Electives, http://www.dentalcare.com/en-US/home.aspx
      - Forrest JL, Miller SA. Strategies for Searching the Literature Using PubMed. Listed under Electives, http://www.dentalcare.com/en-US/home.aspx

2. Complete the PubMed Tutorial. Short YouTube videos explain different aspects of PubMed, which helps in taking full advantage of the databases: http://www.nlm.nih.gov/bsd/disted/pubmedtutorial/

3. Review research designs and levels of evidence. Provides graphical display of designs and explanations.
   a. Guide to Research Methods, the Evidence Pyramid http://library.downstate.edu/EBM2/2100.htm

4. Begin listing patient problems or questions and apply the EBDM process.
   a. Could be related to new technology, drug therapies, dosing regimens, techniques or products; use of materials, equipment or instruments for new situations; or for cases in which there is an inadequate response to therapy.
   b. Follow steps for online searching to answer the questions
   c. Evaluate the evidence found:
      - What level of evidence was found?
      - Was it what you expected?
      - Did you apply it to your decision-making? If not, why not?
      - What were the patient outcomes?
   d. Evaluate the process:
      - Was the PICO process followed?
      - Were MeSH terms used?
      - Which search strategy was used and which one was more efficient?

Mastering the skills of EBDM can help dental hygienists identify the best evidence to solve patient problems. However, other challenges may be encountered. Even when a search yields a citation that seems perfect to answer a clinical question, much of the scientific literature is not available for free. Partnering with an academic institution may assist with access to full text. Once the best evidence is found, translating the findings into clinical practice is another potential barrier. One of our human traits is to hold cognitive biases. When new evidence goes against current beliefs, we find ways to discount that evidence. When there is conflicting evidence or uncertainty, we tend to stick with what we have always done. Academic institutions are wrestling with these barriers as they work to make their educational programs models of evidence based practice. EBDM is evolving and improving to help clinicians overcome these barriers.

Future Developments to Support Clinical Decision Making

A recent development in EBDM is clinical decision support (CDS). CDS systems have their greatest potential at the point-of-care, i.e., chairside, using an electronic dental record integrated with a large patient database and algorithms that help sort and present evidence-based recommendations. These types of systems are more advanced in medicine, where as patient-specific information is entered, individual patient characteristics are automatically linked to the current best evidence that matches his or her specific circumstances. This can assist the

Table III: Skills and Abilities Needed to Apply an Evidence-Based Decision-Making Process[1]

1. Convert information needs and problems into clinical questions so that they can be answered.
2. Conduct a computerized search with maximum efficiency for finding the best external evidence with which to answer the question.
3. Critically appraise the evidence for its validity and usefulness (clinical applicability).
4. Apply the results of the appraisal, or evidence, in clinical practice.
5. Evaluate the process and your performance.

clinician by suggesting appropriate care or warning about adverse effects.[9]

CDS systems provide clinicians with knowledge and person-specific information (such as computerized alerts and reminders) rather than general guidelines.[10] "The goal of CDS is to provide the right information, to the right person, in the right format, through the right channel, at the right point in workflow to improve health and health care decisions and outcomes."[11] In dental hygiene, the best CDS are drug databases, which can be accessed chairside over the internet by computer and mobile devices. By linking to one of several drug database websites, detailed information about a particular drug and drug interactions can be obtained. As with all patient information, one must be careful when using personal/mobile devices so that confidentiality is maintained to prevent any HIPAA violations of protected patient information.

The infrastructure to support EBDM at the point of care is evolving. However, until electronic patient records are fully integrated with a CDS system, evidence resources can be accessed via the internet. Table II presents examples of resources that support CDS. Levels 2 through 6 provide access to preappraised evidence, which means that the research evidence has undergone a filtering process to include only those studies that are of higher quality, and they are regularly updated so that the evidence accessed through these resources is current.[12]

Getting Started

Recognizing that clinicians have time constraints and yet want to provide the best possible care to their patients, an evidence-based approach provides an effective strategy for keeping current. It also requires understanding new concepts and developing new skills (Table III). Many of the resources listed in Table IV can assist in learning these concepts and skills, and are free. For example, the PubMed tutorial presents information on its key features in short segments, some of which are YouTube videos. The online CE course on "Strategies for Searching the Literature Using PubMed" walks the user step-by-step through how to conduct a traditional and Clinical Queries search. For those who have not had a research design course or who need a refresher, the Guide to Research Methods, the Evidence Pyramid provides a graphical display and explanation of research designs and levels of evidence.

Understanding evidence-based methodology and distinctions between different types of research allows clinicians to better judge the validity and relevance of reported findings. Being able to search electronically across hundreds of journals at the same time using PubMed overcomes the challenge of finding relevant evidence when it is needed to make a well-informed decision. Ideally, accessing new research that is valid, easy to read and preappraised will make keeping current the norm for practice, and in the future, further development of CDS will help clinicians implement EBDM in real time by linking electronic patient records with evidence based resources.

Jane Forrest, RDH, EdD, is the Section Chair of Behavioral Science and Practice Management, and the Director of the National Center for Dental Hygiene Research & Practice, Ostrow School of Dentistry of the University of Southern California. Pamela R. Overman, BSDH, MS, EdD, is the associate dean for academic affairs and professor of dentistry at the University of Missouri-Kansas City School of Dentistry.

References

1. Straus SE, Glasziou P, Richardson WS, Haynes RB. Evidence-Based Medicine: How to Practice and Teach It, 4th Ed. London, England: Churchill Livingstone Elsevier. 2011.
2. Sackett DL. How to read clinical journals: I. why to read them and how to start reading them critically. *Can Med Assoc J*. 1981;124(5):555-558.
3. Guyatt G. Evidence-based medicine. *ACP Journal Club*. 1991;114:A-16.
4. Dickerson K, Straus SE, Bero LA. Evidence based medicine: increasing, not dictating, choice. *BMJ*. 2007;334 (Suppl 1):s10.
5. Cochrane, AL. Effectiveness and Efficiency: Random Reflections on Health Services (2nd ed.), London: Nuffield Provincial Hospitals Trust, 1989. (Originally published 1972; temporarily out of print; new edition scheduled for early 2013).
6. Cochrane A. 1931–1971: a critical review, with particular reference to the medical profession. In: Medicines for the Year 2000. London: Office of Health Economics, 1979. 1-11 p.
7. About Cochrane Oral Health Group. Cochrane Oral Health Group [Internet]. [cited 2013 March 28]. Available from: http://ohg.cochrane.org/cochrane-oral-health-group
8. Commission on Dental Accreditation. Accreditation Standards for Dental Hygiene Education Programs, 2007. American Dental Association [Internet]. [cited 2013 March 28]. Available from: http://www.ada.org/sections/educationAndCareers/pdfs/dh.pdf
9. Making Health Care Safer: A critical analysis of patient safety practices. Agency for Healthcare Research and Quality [Internet]. [cited 2013 April 9]. Available from: http://archive.ahrq.gov/clinic/ptsafety
10. Osheroff JA, Pifer EA, Teich JM, Sittig DF, Jenders RA. Improving Outcomes with Clinical Decision Support: An Implementer's Guide. Chicago: Healthcare Information and Management Systems Society Press; 2005.
11. Oshreroff JA, Teich JM, Middleton BF, Steen EB, Wright A, Detmer DE. A Roadmap for National Action on Clinical Decision Support, June 13, 2006. American Medical Informatics Association [Internet]. [cited 2013 March 28]. Available from: http://www.amia.org/public-policy/reports-and-fact-sheets/a-roadmap-for-national-action-on-clinical-decision-support
12. DiCenso A, Bayley L, Haynes RB. Accessing preappraised evidence: fine-tuning the 5S model into a 6S model. *ACP Journal Club*. 2009;151:JC3-2-JC3-3.