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Review Article

Evidence Based Dental Practice: A Review

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ABSTRACT

People from childhood to the elderly will seek dental care at some point of time, either for a check-up or for treatment following clinical symptoms. Dentists have an obligation to provide the most effective treatment available and use the best methods of disease prevention and diagnosis while taking financial cost and their expertise in consideration. To make clinical decisions, dentists rely on a wealth of resources including own clinical experience, textbooks, journal articles and previous educational experience. To practice modern dentistry and to educate upcoming dental care professionals, evidence-based dentistry forms an important asset. For a specific clinical question, the practice of evidence-based guidelines based on scientific evidence ensures highest standards of acceptable therapeutic care. Evidence-based dental practice is a systematic approach for obtaining the best available clinically relevant scientific evidence with the ultimate goal and intent of increasing effectiveness and efficacy in clinical decision-making. It optimizes both the patient's benefit through the best utilization of dentist's experience and clinical expertise and on making full use of the most reliable and valid research outcomes. Evidence-based dentistry contrasts with traditional dentistry as it relies on practice based on the evidence for its systematic stringency, coupled with its fundamental validity as a patient-centred optimization of clinical modes of interventions.

Introduction

Dentistry is not just a science but also an art. It is a science because the fundamental building blocks of knowledge are based on the scientific process of research which includes basic, applied and clinical research. It is an art as it draws on the experience and personal observation of the clinician, because science cannot account for the complexity of all variables in any particular situation. The basis for meaningful dental care is provided by the synthesis of scientific understanding and clinical observation.[1]

The two important fields of dentistry are to be considered: (1) the knowledge (i.e. the science) and (2) the application of this knowledge (different specialties and clinical practice) to practice evidence-based dentistry. It relates the science to the clinical practice through the use of scientific methods in order to reach the best treatment for a specific clinical situation/patient. Evidence-based Dentistry (EBD) is the integration and interpretation of the best currently available research evidence combined with personal experience which allows dentists to make decisions that will improve clinical practice and academic researchers to keep abreast of new developments in the field of healthcare.[2]

EVIDENCE-BASED DENTISTRY

David Sackett laid the foundation of evidence-based practice by defining it as **"integrating individual clinical expertise with the best available external clinical evidence from systemic research"**.[3]

As Sackett's definition states, EBD relies first on clinical expertise. In a perfect world full of quality prospective studies, one would only have to pull up a well-performed meta-analysis or systematic review of the evidence on the clinical question to solve the problem in hand.

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Unfortunately, these studies are too few and clinicians must apply the best available evidence to make a decision.

The **American Dental Association (ADA)** definition captures the core elements of EBD; and is defined as **" an approach to oral health care that requires the judicious integration of systemic 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"**.[2]

Need for Evidence-based Dentistry

1) The world in which we practice dentistry has changed at an astonishing rate due to two phenomena: the *information explosion* and the *consumer movement*. Also, the nature of the relationship between the patient and the clinician has changed; patients are now partners in the decision-making process which have been fortified by the extraordinary advancement in internet.
2) Traditionally the primary sources of information were teachers, textbooks and, occasionally, journal articles, but the methods of delivery of information have changed over time. There is an increasing trend toward web-based courses and instruction, as well as computer-based interactive learning. To provide the best known treatment to patients seeking oral healthcare the practice of evidence-based dentistry has become inevitable.[4, 5]

EVIDENCE-BASED DENTAL PRACTICE

Evidence-based Dental Practice is the *integration of an individual practitioner's experience and expertise, with the clinical appraisal of relevant available external clinical evidence from systematic research and with consideration for the patient's needs and preferences*.[6]

To incorporate an evidence-based approach in dental practice, the practitioner's experience is primary since it is his/her responsibility to consider clinically relevant evidence and informed patient's preferences while defining the best course of treatment.[7, 8]

EBD PROCESS

EBD is a conscious process to identify the best and most up-to-date research that addresses a patient's clinical problem. The research is used in conjunction with the patient's values, aspirations and preferences, combined with the practitioner's own clinical proficiency and judgment, to offer more effective ways of managing clinical problems.[9]

EBD is a structured process consisting of:

1. Creating a structured question from a clinical problem.
2. Searching for research evidence.
3. Critically appraising the evidence so as to make a judgment on its validity.
4. Applying the evidence to practice using judgment and an assessment of one's own clinical proficiency and incorporating patient's values, aspirations and preferences.
5. Reflection: Evaluating the process.

The practice of evidence-based dentistry relies on the earliest retrieval of the best information when it is needed, assessing the quality and deciding the relevance of the same to make a clinical decision in day-to-day practice.[10, 11]

LEVELS OF EVIDENCE

Many research designs are available in health care research, and there are ideal research designs to answer particular clinical questions. The quality of different

research designs employed can be placed in a "*hierarchy*." The position of each research design depicts the strengths and weaknesses each. When the ideal design is used, the strength of the conclusions are great and this exemplifies the "*best available evidence*" for making a treatment decision.[12] Understanding "*strength of evidence*" is the heart of evidence-based health care. Clinicians can determine a treatment plan based on the best available evidence from relevant clinical literature by using the hierarchical analysis of research (Table 1).[13, 14]

Table 1: Levels of Evidence

Level 1a	Systematic review of randomized controlled trials
Level 1b	Individual randomized, controlled trial (with narrow-confidence intervals)
Level 2a	Systematic review of cohort studies
Level 2b	Individual cohort study (including low-quality randomized controlled trial; e.g., <80% follow-up)
Level 2c	"Outcomes" research; ecologic studies
Level 3a	Systematic review of case-control studies
Level 3b	Individual case-control study
Level 4	Case series (and poor quality cohort and case-control studies)
Level 5	Expert opinion without explicit critical appraisal, or based on physiology, bench result research, or "proof of principle study"

TYPES OF RESEARCH STUDIES

To evaluate research studies critically, clinicians must have a working knowledge of the principles of scientific research and an understanding of the various types of research studies.

All clinical research studies are encompassed under the broad heading of **epidemiologic studies**. Epidemiologic studies include studies that follow the natural course of disease or treatment effects as well as studies in which the investigators intervene in assigning a treatment for a particular condition or in using a preventive agent to decrease likelihood of disease (Figure 1).[15 – 20]

SOURCES OF EVIDENCE

The evidence is available from a wide range of sources. To keep up with recent advances in the field of dentistry is a daunting task for any practitioner. Each of them has advantages and disadvantages. Whatever the sources, if professionals are to be evidence-based, they should remember that the evidence found should be appraised critically before applying it to the patient.[21 – 24]

1. Colleagues: The first option for most as most healthcare professionals remember learning to carry out various procedures from senior colleagues or from a peer who has had experience of the procedure.
2. Books: A good source of comprehensively established information in which the information is laid out in well-defined sections with an index of terms making them useful as quick references for basic background information.
3. Journals: One method of keeping track of the latest advances in the field of interest as they have more up-to-date information than books because articles are generally published within months of submission.

4. Internet: A revolutionized way through which most people work as they can access information from any number of sources electronically.

Electronic searching: Tracking down literature through electronic searching is an art which can be learned through practice but at times even the experienced researchers do miss relevant literature; so a thorough knowledge and understanding of the rules for effective searching through databases should be acquired by one.

1. MEDLINE: This is the *US National Library of Medicine's (NLM) premier bibliographic database* that contains over 11 million references to journal articles and can be accessed free of charge.
2. PubMed system: Developed by the *National Library of Medicine*, located at the *National Institutes of Health (NIH)*, and through the *National Centre for Biotechnology Information (NCBI)*, serves as an search tool for accessing dental, medical, and biomedical literature citations and provides links to full-text journals at the web sites of participating publishers.[25,26]
3. Cochrane Collaboration: An international non-profit, independent organization dedicated to making up-to-date, accurate information about the effects of healthcare readily available worldwide. It produces and disseminates systematic reviews of healthcare interventions and promotes the search for evidence in the form of clinical trials and other studies of interventions.[27, 28]

Search Engines: Helps in selective retrieval of information from countless websites, which otherwise be an almost impossible task.

Meta-search engines: Saves time as these searches multiple databases instead of multiple websites. Though the search results are organized, the quality of the searches is still dependent on the quality of the databases.

1. Google (www.google.com): Largest search engine available on the web which evaluates sites according a system called *Page Ranking*.
2. MetaCrawler (www.metacrawler.com): One of the earliest meta-search engines which search the major search engines including *Google*, *Yahoo!*, *AltaVista*, *Ask Jeeves*, *LookSmart*, *Overture* and *FindWhat*. The search results are integrated and ranked according to relevance with summaries for each.
3. BIOME (biome.ac.uk): Created by a team of information specialists and subject experts based at the *University of Nottingham Greenfield Medical Library*. This is a collection of subject gateways that provides access to resources in the health and life sciences.
4. SUMSearch (sumsearch.uthscsa.edu): Searches the internet much like a meta-search engine but also does contingency searches; i.e. that if there are too many hits from a particular site, an additional four searches are done until it finds an optimum number of hits.
5. EviDents (medinformatics.uthscsa.edu/EviDents): A straightforward program with a series of boxes to help focus search.[29]
6. Centre for Evidence-based Dentistry website (www.cebd.org): Developed to promote evidence-based dentistry (EBD) and to provide its users who have an interest in the subject with a comprehensive range of high-quality resources to enable them to understand and practice evidence-based dentistry.[30]
7. TRIP Database: Answers clinical question's using the principles of evidence-based medicine and identifies them in a variety of ways with regular

systematic searches of the internet and regular collaboration with clinical answering services. [31, 32]

ADVANTAGES OF EVIDENCE-BASED APPROACH

1. Improvement in effective use of research evidence in clinical practice
2. Uses resources more effectively
3. Relies on evidence rather than authority for clinical decision-making
4. Monitors and develops clinical performance [33, 34]

EVIDENCE-BASED DENTISTRY – KNOWLEDGE, ATTITUDE AND AWARNESS: A LITERATURE REVIEW

A study was conducted by Iqbal M and Glenny AM (2002)[35] to assess general dental practitioner's understanding of and attitudes towards evidence-based practice (EBP) in North West of England. The study concluded that evidence-based practice was not a concept that every dentist was familiar with; however, the general dental practitioners surveyed expressed a desire to find out more information on evidence-based dentistry.

To explore the awareness, attitudes and barriers to its implementation by future Saudi dentists (final year dental students and interns) a study conducted by Fedorowicz Z et al (2004)[36] concluded that EBD was not currently part of many undergraduate curricula, but only a minority of respondents were aware of the concept and a few had attended a course. A large number claimed to be using EBD, but the results revealed an incomplete understanding as the majority did not consider patient's values a component of EBD.

Rabe P et al (2007)[37] identified dental professional's attitudes and awareness on evidence-based dentistry (EBD) and elucidated perceived barriers and views on how to move towards EBD. The study showed that dental professionals in the county of Halland, in Sweden, had a welcoming attitude towards EBD and indicated an open attitude for learning more about the interpretation of evidence from scientific publications. The most commonly perceived barriers towards EBD were 'lack of time' and 'poor availability of evidence'.

DeRouen TA et al (2008)[38] described an educational program designed to prepare practicing dentists to engage in practice-based research in their practices – a trend receiving more emphasis and funding from the National Institute of Dental and Craniofacial Research (NIDCR). The Northwest **P**ractice-based **RE**search **C**ollaborative in **E**vidence-based **DENT**istry (**PRECEDENT**), an NIDCR-funded network, developed a one-day educational program to educate practitioners in principles of good clinical research. The study concluded that dentists were interested in participating in practice-based research and viewed training in research methodology as helpful to becoming better practitioner-investigators.

A qualitative study by Hannes K et al (2008)[39] explored the obstacles that Flemish (Belgian, Dutch-speaking) dentists experience in the implementation of EBP in routine clinical work. Three major categories of obstacles were identified. These categories relate to obstacles in 1) evidence, 2) partners in health care (medical doctors, patients, and government), and 3) the field of dentistry. The study suggested that educators should provide communication skills to aid decision making, address the technical dimensions of dentistry,

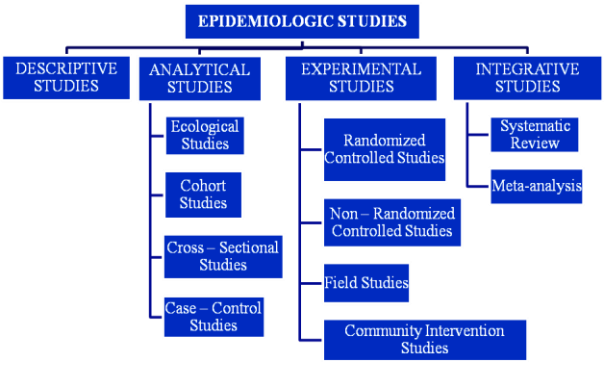

Figure 1: Types of Research Studies

promote lifelong learning, and close the gap between academics and general practitioners (dentists) in order to create mutual understanding.

To assess dentist's knowledge and use of evidence-based practice (EBP), including their attitudes toward and perceptions of barriers that limit the use of EBP, Yusof ZYM et al (2008)[40] conducted a study in the state of Selangor, Malaysia. The study concluded that a majority of the respondents had knowledge of and positive attitudes towards EBP. However, due to barriers, a majority of them preferred colleagues, textbooks, and referrals for advice instead of seeking evidence from electronic databases.

By assessing the awareness, knowledge and practice of evidence-based dentistry (EBD) amongst dentists working in the public sector in Kuwait, Haron et al (2012)[41] concluded that training in EBD was felt necessary by a majority of the group studied, and this may be facilitated if dental centres had access to evidence-based sources to remove some of the possible barriers to implementation of EBD.

Using self-administered questionnaires on dental school faculties in Iran, Sabounchi SS et al (2013)[42] conducted a cross-sectional study to assess their knowledge and attitude towards basic principles and methods of EBD. This study suggested that the level of actual knowledge of dental faculties about basic principles of EBD was moderate in Iran. However, faculties overall interest and positive attitude towards learning EBD was encouraging. Therefore, it was highly recommended that degree/certificate continuing educational programs to be planned.

Exploring the knowledge, perceptions, and behaviour of private practice dentists in the state of Iowa with respect to evidence-based dentistry and determining the influence of the dentist's education and the scope of his or her practice on those opinions and habits, Straub-Morarend CL et al (2013)[43] reported that awareness, understanding, and adoption of an evidence-based approach to their practice of dentistry by majority of the respondents. Recent graduates were more likely to report insufficient time as the primary obstacle to practicing evidence-based dentistry. Dental specialists indicated a higher level of comfort in assessing scientific information, as well as implementing current reliable, valid published research in practice, than general practitioners

Teich ST et al (2013)[44] conducted a study to determine how third-year dental students at one U.S. dental school select articles to provide supportive evidence related to treatment planning. This study proposed to incorporation of specific learning objectives related to EBD principles throughout the curriculum and a simplified method to search for best available evidence that has the advantage of not requiring knowledge and training in rigorous formulation of clinical questions.

A cross-sectional study by Al-Ansari A and Eltantawi M (2014)[45] aimed to assess the factors affecting the implementation of evidence-based practice (EBP) was conducted among a group of dentists in Saudi Arabia. The study concluded that factors that significantly affected the implementation of EBP were 1) having some knowledge of terms related to EBP, 2) reporting lack of EBP skills as a barrier, and 3) reporting resistance to change as a barrier.

A cross-sectional study using a self-administered questionnaire by Ashri N et al (2014)[46] to determine and compare different levels of awareness and attitude toward Evidence-Based Practice (EBP) among dental and medical practitioners in Riyadh, Saudi Arabia concluded that EBP has not been used to its maximum, despite excellent attitude toward its usage among both physicians and dentists. More efforts should be put into strengthening the skills and use of EBP among all medical practitioners, particularly among dentists, working in Saudi Arabia.

Navabi N et al (2014)[47] conducted a cross-sectional survey by means of a questionnaire among dentists attending the 52nd National Annual Congress of the Iranian Dental Association in Tehran in April 2012 with the objective to assess the knowledge and use of evidence-based dentistry (EBD) among Iranian dentists. The study concluded that EBD was not a familiar concept to the Iranian dentists; the majority of them preferred consultation with colleagues over seeking evidence from electronic databases.

During 2012 to 2013 academic year, Bahammam MA and Linjawi AI (2014)[48] conducted a study among dental and medical final year students and new graduates at King Abdulaziz University, Jeddah, Saudi Arabia. The study reported that the knowledge and attitudes among the junior health care physicians were considered below the required competency standards. These findings highlight the urgent need for changes in the current educational strategies to assure successful implementation of EBP in Saudi Arabia.

BARRIERS TO EVIDENCE BASED DENTAL PRACTICE

Common barriers to implementation of evidence-based practice are resistance and criticism from colleagues, difficulty in changing current practice model, and lack of trust in evidence or research.[49]

Patient-associated barriers: Patient needs and preferences may be affected by dental advertising, financial considerations, and access to online information, which may be of questionable quality. These requests at times conflict with accepted guideline recommendations; thus to accommodate such patient preferences, dentists may be unable to implement proven interventions.

Healthcare organization associated barriers: Some barriers are inherently part of the oral healthcare training and delivery system. *First*, although dental students are taught how to access and interpret scientific evidence in didactic courses, their knowledge may not be reinforced by supervisors in clinical settings. *Second*, dentists in solo or small practices are slow to adapt, in part, because they are relatively free of peer influence. This resistance to change is not limited to dentists; changes in treatments may require behavioural adaptations among staff as well. *Third*, although guidelines most likely to be used regularly focus on prevention, financial reimbursement does not promote preventive procedures. *Fourth*,

guideline developers sometimes present recommendations that may not be actionable due to the need for additional equipment, skill, or training.

Internal Barriers Faced by Clinicians: Given the rate of change in clinical dentistry and availability of continuing education courses, clinicians practice in the same fashion as they were taught. Though a more conservative and less profitable procedure may be evidence-based, clinicians still need to deal with the temptation of providing a more profitable procedure as many of the procedures and decisions are financially based.

External Barriers Faced by Clinicians: Factors not under the clinician's control; for example, necessary access to certain equipment or changes in facility design may be cost prohibitive, insufficient staff support, poor reimbursement, escalating practice operational costs, and increased liability impact practice of evidence-based dentistry.

EVIDENCE BASED METHODS OF LEARNING

To encourage future health care practitioners to apply the evidence-based methodology of patient care, four common educational methods are available. [50]

1. Evidence-based learning (EBL)
2. Problem-based learning (PBL)
3. Case-based learning (CBL)
4. Patient-based learning (Patient BL)

CONCLUSION

As a global movement in all the disciplines of health sciences, evidence-based care represents a shift in the practice – judgment based on scientific evidence overpowering blind adherence to rules. EBD approach empowers clinicians to question and consider the use of current best evidence in decision-making on the management of individual patients. It offers many benefits, ranging from more efficient and effective healthcare delivery to improve treatment standards and outcomes.

As patients are now better informed and have higher expectations, EBD ensures that the chosen treatment is supported by the current evidence base; it also plays an important part in dento-legal risk management. For the clinician in everyday practice, EBD offers greater personal satisfaction in the knowledge that the patient's healthcare requirements are met by a treatment that is backed by scientific evidence.

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