

PROSTHODONTICS - AN EMERGING FIELD IN EVIDENCE BASED PRACTICE***Dr. Areeba Zainab, Dr. Kunwarjeet Singh, Dr. Rajiv Kumar Gupta and Dr. Sidhartha Tomar*****Corresponding Author: Dr. Areeba Zainab**

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ABSTRACT

In the present era, both the patient and dentist have ready access to online information regarding various aspects of dentistry. While this information can help both the populations to better understand the problem, it can be very clumsy and time-consuming process to go through the limitless data available, with little or no validation and doubtful reliability. Therefore, it is of dire importance to formulate the data such that, only the most reliable and relevant information is made available to the clinician and the patient in a simple and user-friendly manner. Thus, evidence-based practice will not only reduce the time taken, but will also enhance the decision-making ability of the dentists, thus ensuring that the patients receive the best treatment possible for their problem.

INTRODUCTION

The Evidence based approach in dentistry (EBD) has integrated the clinician's expertise, patient's needs/expectations from the treatment, and current researches and studies which are most likely to be authentic and highly relevant to the problem in question.

As the science is progressing by every minute of the day, what was believed to be a reliable and best treatment option in the past, might be obsolete today, so it is required of the clinician to keep himself updated with all the current researches and recent advancements in the field of dentistry. But, with the abundance of data available to the dentist, it is impossible to keep up with this vast information. So, EBD helps the dentist to read in a more programmed and systematic manner wherein he will only focus on the literature that will help him reach a clinical decision for a particular patient, considering the uniqueness of every patient.

However, in Prosthodontics Evidence-based practice has not yet fully flourished, due to a number of reasons, most important being the vast volume of prosthodontic literature available.

The future of our discipline not only depends on the expertise of the clinicians, conduction of high-quality researches in the field of prosthodontics, which should be documented and made available to the clinician in a proper systematic manner. But our future also depends on the willingness of the clinicians to keep up with the current advancements in our field based on solid evidences and the willingness to apply the same as they develop treatment plans and deliver patient care.^[1]

American Dental Association (ADA) describes EBD as, "an approach to oral health care that requires the

judicious integration of systematic assessments of clinically relevant scientific evidence, relating the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences."^[2]

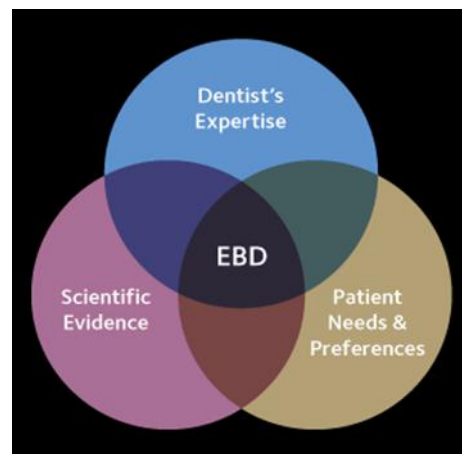


Fig. 1: Showing three aspects of evidence-based dentistry.

Origin of Evidence-Based Dentistry and Its Roots In Prosthodontics

David Sackett, who laid the foundation for Evidence based practice (EBP) defined it as, "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research."^[3]

David Sackett was a nephrologist and an epidemiologist at McMaster university, Ontario, Canada and was given the title of "Father of evidence based medicine".

Evidence based dentistry (EBD) has its roots in prosthodontics. In 1986, Jim Anderson, a prosthodontist at university of Toronto was granted a sabbatical year to study clinical epidemiology at McMaster University. After his sabbatical, Jim Anderson returned to Toronto to be the first to bring the McMaster model of clinical epidemiology to dentistry.^[3]

In 1989, a specially designed program was created to educate 10 prosthodontists regarding teaching methods and understanding evidence-based medicine. This group of prosthodontists then introduced the idea of evidence-based practice to prosthodontic program directors and educators in North America. They held 2 international research symposia sponsored by the American College of Prosthodontics and the editorial council of *The Journal of Prosthetic Dentistry (ECJPD)*.

In 2000, in the first 7 issues *The Journal of Prosthetic Dentistry* published a series of 8 articles written by the 10 attendees and associates to be used as guides to

understanding and appraising the validity of clinical research and its applicability to the patient in question.

In 2002, Gary Goldstein was the guest editor and author of, "Evidence-based dentistry" in *Dental Clinics of North America*.

The American Dental Association Centre for Evidence-Based Dentistry was established in 2007, and *The Journal of Evidence-Based Dental Practice* was first published in 2002.

Principles of Evidence-Based Dentistry (Ebd)

Evidence-based decision making (EBDM) is about solving clinical problems and involves 2 fundamental principles:

1. Evidence alone is never sufficient to make a clinical decision, and
2. A hierarchy of evidence exists to guide clinical decision making.

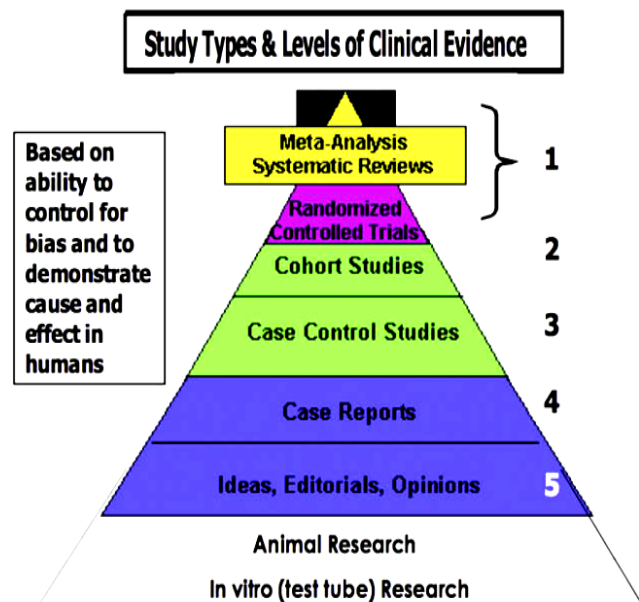


Fig. 2: Study types and levels of clinical evidence Modified Evidence Pyramid.

The Evidence Based Decision Making (EBDM) Process

The process of EBD consists of the following steps:

1. Formulating well-structured searchable clinical question.
2. Determining the level of evidence that best answers the question.
3. Searching for best available evidence
4. Critically appraising the evidence for its validity and usefulness.
5. Applying information of the patient.
6. Evaluating the efficacy of EBD application on a patient.

1. Formulation of well-structured clinical question

Instead of reviewing the dozens of journals, EBD suggests focusing your readings specific to issues related to patients. The clinical question is structured in the form of Patient/population (P), Intervention (I), Comparison (C), Outcome (O), and Type of Studies (S) (PICOS).

The clinical question can be divided into four types: therapy or prevention, harm or etiology, diagnosis, and prognosis.

Table 1: Formulating PICO question.

Question: example question: Therapy: What is the effect of antibiotic in preventing pain and complications after root canal therapy in patients with diabetes mellitus?	Patient/population (P)	Intervention or exposure (I)	Comparison (C)	Outcome (O)
	Patients with diabetes mellitus	Use of antibiotics after root canal therapy	No antibiotics/placebo after root canal therapy	Reduction in pain and complication
Harm or etiology: Does bottle feeding at night cause caries in children?	Children on bottle feeding	Bottle feeding at night	No bottle feeding at night/water consumption only	Incidence of caries
Diagnosis: Is laser fluorescent technique able to diagnose proximal caries more accurately than bitewing radiographs?	Patients with high caries rate	Laser fluorescent	Bitewing radiographs	Diagnosis of proximal caries
Prognosis: Are patients with apical periodontitis at higher risk of failure of root canal therapy than the patients without apical periodontitis?	Patient with and without apical periodontitis	Root canal therapy	NOT APPLICABLE	Success and failure of the treatment

2. Determining the level of evidence

Different types of research studies are better suited to answer different categories of clinical questions. The

best evidence that we should look for depending on the type of question is presented in Table 2.

Table 2:

Type of question	Best study design
Diagnosis	Cross-sectional or prospective, blinded comparison to gold standard
Therapy	Randomized controlled trial > cohort study > case-control > case series
Prognosis	Cohort study > case-control > case series
Harm/etiology	Cohort study > case-control > case series

3. Searching evidence

Formulating the question is a key step in the process of searching for evidence to inform clinical decisions. Primarily there are three steps for searching evidence:

1. Identifying keyword and MeSH (Medical Subheading) terms.
2. Looking for secondary sources.
3. Searching for primary sources.

There are two types of research studies: first is **primary research**, which includes

Experimental and observational, clinical trials, surveys, and secondary research, which draws conclusions from primary studies.

Secondary research consists of systematic reviews, meta-analysis, evidence-based practice guidelines, critically appraised topics, decision analyses/decision tools, and consensus development reports.

The search should be started by searching pre-appraised literature (secondary research) before performing database searches for primary literature

4. Appraising evidence

Studies are also subjected to biases and confounders. A good research should be designed to minimize this bias and confounding by using the control group, randomization, and blinding. Once an article is

identified, it should be critically appraised. Critical appraisal involves a structured approach to examining evidence to assess its value and clinical relevance to modern practice.

According to the Centre for Evidence-based Medicine, University of Oxford (CEBM), the search should be able to address the following four important points:

- Does this study address a clearly focused question?
- Did the study use valid methods to address this question? The validity of a research study is related to randomization of groups to ensure that both groups have similar baseline characteristics and the instruments used to measure outcomes should be valid and reliable.
- Are the valid results of this study important?
- Are these valid, important results applicable to my patients?

5. Application of patients' information

This is the most crucial step to apply all acquired knowledge from evidence to specific circumstances to each patient. We have to look for the following questions before applying the results to our patients:

- What are the characteristics of the participants of the study?
- Are they similar to my patients.

- Are the settings similar to our setting? Is the treatment available?
- What alternatives are available?
- Are the benefits outweighing the risks and harms?
- Are the outcomes appropriate to the patient?

6. Efficacy evaluation of EBD application on a patient

This is the final step to evaluate the EBD approach and its efficacy to patients. It is assessed that whether certain evidence causes changes to better and that to the extent confirmed by research. If a patient’s response is different, it needs to be investigated that why some patients did not respond to the changes in an expected way and what can be done to change it.^[4]

Need For Evidence Based Practice In Prosthodontics

With rapid advancements in dental materials and dental technology and improved understanding of clinical outcomes, a surfeit of research has been published in prosthodontics and dental implant-focused literature (Box 1).^[4]

Furthermore, a surplus amount of published research exists in interdisciplinary fields that are of critical importance to prosthodontics. It is well known that not all published literature is scientifically valid and clinically useful. Therefore, a critical analysis of the quality of published research and consolidation of the excess scientific information is necessary to render them significant and useful.^[5]

Considerations in Prosthodontics

An important difference between medical and dental models of care is the level of control a patient has about

how, when, and whether it is even necessary to treat a dental condition. This is especially true in the discipline of prosthodontics. Prosthodontics is a unique dental specialty that encompasses art, philosophy, and science and includes reversible and irreversible treatments. Therefore, an absolute extrapolation of evidence-based concepts from medicine to prosthodontics is not possible. Treatment outcomes, which are a core element of prosthodontics, however, render themselves well for application of principles of EBD.^[6]

There are 3 predominant items that are important to understanding challenges in reporting treatment outcomes in prosthodontics.

1. Defining the Outcomes of Clinical Interest.
2. Duration Needed to Appropriately Study the Outcomes.
3. Minimum Sample Needed to Study the Outcome of Interest?

Defining the Outcomes of Clinical Interest

Key issues in defining clinical outcomes in prosthodontics are multifaceted due to the inherent nature of the treatment. Some examples of these issues include differentiating success versus survival, complications versus consequences, and prosthesis outcomes versus patient-centered outcomes. Another important characteristic is defining the appropriate endpoint of a clinical study. Hujoel and DeRouen.^[7] have categorized clinical endpoints (outcomes) as surrogate endpoints and true endpoints. Both types of outcomes are important in prosthodontics, because surrogate outcomes are helpful for preliminary evidence and true outcomes are helpful for definitive evidence (Table 3).

Table 3: Understanding differences between surrogate and true outcomes in clinical trials in prosthodontics	
Surrogate Outcomes	True/Definitive Outcomes
Includes measures that are not of direct practical importance but are believed to reflect outcomes that are important as part of a disease/treatment process	Reflects unequivocal evidence of tangible benefit to the patient
Examples Pocket depth Open margins Peri-implant bone level Prosthesis retention/support	Corresponding examples Tooth/implant survival Secondary caries Implant survival Patient satisfaction
Endpoints are “softer” and easier to measure and studies are relatively inexpensive.	Endpoints are “harder” and difficult to measure and studies can be more expensive.
Do not have a direct impact on changes in clinical practice or changes in public health policies.	Can have a direct impact on changes in clinical practice and/or changes in public health policies.

BOX 1: The need for evidence-based prosthodontics

- Enable the recognition of best available scientific evidence in prosthodontics.
- Consolidate the scientific information overload in prosthodontics and related literature.
- Scrutinize the scientific basis for existing prosthodontic treatments.
- Improve current and future treatments.
- Encourage improvement in the quality of clinical research as well as in reporting.
- Distinguish and advance the specialty of prosthodontics.

Duration Needed to Appropriately Study the Outcomes

The time period needed to study a clinical outcome of interest depends on the definition of a treatment outcome, surrogate or true endpoint desired, treatment effect desired, and adverse events related to a treatment under investigation.^[8] Currently, there is no consensus in prosthodontics on definitions for preliminary, short-term, or long-term studies. Therefore, it becomes the prerogative of the investigator, editor, and reader to decide if the result of a study reports on short-term or long-term outcomes. Often, a study with a follow-up period of up to 6 years is described as “long-term follow-up” where only a meager number of samples have actually made it to a 6-year follow-up and the rest have a follow-up of less than 2 years. It is understood that preliminary and short-term studies have high clinical impact when they report failures of a particular treatment; only long-term studies can have high clinical impact for treatment success. Treatment success reported in short-term studies, however, can lay the justification whether additional research is needed.^[8]

Minimum Sample Needed to Study the Outcome of Interest?

The sample size of a study depends on the difference in treatment effect desired. In prosthodontics, it is difficult to obtain large sample sizes from a single study center because of the elective and expensive nature of prosthodontic treatment, which has led to a large body of published research in the prosthodontic literature with small sample sizes. For a study to have a large clinical impact and provide sufficient evidence to change a particular clinical practice, sample size is critical. Currently, there is no consensus in prosthodontics on definitions for sample sizes as small, moderate, and large. The validity of defining such sample sizes is currently unknown.^[10,11,12]

Levels of Evidence and Prosthodontics

Evidence in medicine, as discussed before has been popularly categorized into 5 hierarchical levels and widely represented as a pyramid with the “weakest/lowest level of evidence” at the base and the “strongest or highest level evidence” at the apex (Fig. 2).

This gradation has been used by several health agencies across the world. Although the 5 hierarchical levels of evidence and the pyramidal representation may be popular in medicine, the applicability of this paradigm to prosthodontics is questionable because few articles in prosthodontics comprise RCTs and large cohort studies, implying that most current clinical practices in prosthodontics are all based on “weak evidence.”^[9,10]

Additionally, 2 critical elements of importance to prosthodontics that are omitted from the evidence-based pyramid are sample size and duration of a study. As previously discussed, these 2 elements can significantly affect the way evidence has an impact on clinical

practices. For example, results from a cohort or a case-control study with a very large sample size and/or a long-term follow-up on all-ceramic crowns can have a better impact on clinical decisions compared with results from an RCT with a small sample and a short-term follow-up.^[4,13]

In this scenario, in spite of RCT regarded as the “strongest evidence,” it would fail to be used by clinicians for confident decision making. Furthermore, major medical breakthroughs have originated from cohort and case-control studies, which are considered by many as “weaker” forms of evidence.^[12]

Therefore, an alternative approach for prosthodontics literature is suggested. The suggested paradigm involves a horizontal spectrum encompassing 3 stages of evidence (Fig. 4)

- Preliminary evidence
- Substantive evidence, and
- Progressive evidence.

Limitations of Evidence-Based Prosthodontics

There are some well-known limitations to EBD, and prosthodontics is no exception.

Such limitations include: (1) Applicability of research to a specific patient population, (2) Publication biases, (3) Paucity of current data, (4) Cost, and (5) Ethics.^[15]

Prosthodontics is a unique specialty encompassing art, philosophy, and science and an absolute extrapolation of evidence-based concepts widely described in medicine is impossible.

Establishing exceptional evidence, however, for prosthodontic treatment outcomes is paramount for the present and future of the specialty.

One of the most popular criticisms for applying concepts of EBD to prosthodontics is that the information gained from clinical research may not directly answer the principal clinical question of what is best for a specific patient. This is because it is acknowledged that the homogeneity and characteristics of patients participating in clinical trials may be significantly different from those seen in dental offices.^[15,16]

It is important to recognize, however, that EBD does not advocate absolute adoption of clinical evidence but calls for an integration of the clinical evidence along with the dentists’ clinical expertise and patient needs and preferences. EBD does not provide a cookbook that dentists must follow nor does it establish a standard of care.^[9] According to the ADA, the EBD process must not be used to interfere in the dentist/patient relationship nor be used entirely as a cost-containment tool by third-party payers.^[9]

Current and Future Perspectives of Ebp In The Field Of Prosthodontics

Compared with the traditional model of care, EBD is relatively new and, with progress in time, multiple clinical questions for which currently there is weak evidence or minimal/insufficient evidence should be resolved. Long-term survival and success of treatment, core components of the specialty of prosthodontics, is an important arena for channeling efforts and resources to help further distinguish the specialty of prosthodontics. To facilitate this process, however, it is important to establish a consensus in prosthodontics on defining the 3 core elements previously described: defining prosthodontic outcomes, duration needed for a meaningful understanding of prosthodontic outcomes, and sample size needed to make meaningful conclusions. Because prosthodontics is a unique specialty, a consensus is necessary to establish explicit guidelines for reporting of prosthodontic outcomes (suggested acronym, GROPO).¹⁷ Similar to numerous guidelines described in medicine, these guidelines can be exclusive to prosthodontics and ensure that investigators provide standardized reporting of their studies in order for them to be clear, complete, and transparent and allow integration of their evidence into clinical practice. In order to teach and understand evidence-based prosthodontics, clinicians need to attain new skills pertaining to computer-based knowledge systems. These skills are necessary for asking, acquiring, appraising, applying, and assessing scientific evidence for the pertinent clinical situation. Current popular resources include Web sites of PubMed/Medline, ADA Center for EBD, Cochrane Library, and Center for Evidence-Based Dentistry. The 2 popular journals dedicated to EBD are *Journal of Evidence-Based Dental Practice* and *Evidence-Based Dentistry*. Another important avenue for practicing prosthodontists is participation in practice-based research networks (PBRNs), which has gained national momentum in the United States. A dental PBRN is an investigative alliance of academic researchers and practicing dentists.¹⁸

The accord provides clinicians with an opportunity to propose or participate in research studies conducted in their own offices that address everyday issues in oral health care. These clinical studies, conducted in participating dental offices with consenting patients, help expand the profession's evidence base and further refine care.¹⁹

Perhaps a PBRN focused on prosthodontics and/or prosthodontists can be assembled in the near future that can provide answers to specific clinical questions chosen by the specialty and for the specialty of prosthodontics.²⁰

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