

MODULE 1

RESEARCH & EVIDENCE IN DENTISTRY – AN INTRODUCTION

Department of Pediatrics & Preventive Dentistry

College of Dental Sciences & Research Centre,

Gujarat University, Ahmedabad



IN THIS MODULE

- What is Research?
- What is a Research Centre?
- What is Evidence-based Dentistry?
- Why should I learn Evidence-Based Dentistry?
- How is research usually carried out?

How to cite this document: Research & Evidence in Dentistry – An Introduction.
Department of Pediatrics & Preventive Dentistry, College of Dental Sciences & Research Centre; 2023.

What is Research?

The perimeter of the word “research” can be understood based on two definitions:

- Systemic investigation towards increasing the sum of knowledge (Chambers 20th century dictionary)¹
- An endeavour to discover new or collate old facts, etc. by the scientific study of a subject or by a course of critical investigation (The Concise Oxford Dictionary)²

YEAR	WORD	MEANING
14 th century	Circare (Latin)	To go about
15 th century	Cercher (Anglo-French)	To travel about, investigate, learn
	Ricercare (Italian)	To seek again
1530s	Recherche (French)	Seek Out, Search Closely
1570s	Recerche (French)	Act of Searching
1630s	Research	Diligent scientific inquiry and investigation directed to the discovery of some fact
1690s	Research	Habit of making close investigations
1746	Re-Search	A repeated search
1768	Re-Search	To search again, examine repeatedly or anew
1923	Research	Work on a large scale towards investigation

Table 1 Compiled from data obtained through Merriam-Webster and Etymonline^{3 4}



What is a Research Centre?

A place where research is carried out is called a research institute or a research centre. The purpose of a research centre is to provide the students with a learning opportunity in order to actively engage themselves within academic forums and community outreach. These centres guide the students towards in getting involved beyond a single discipline, thereby promoting interdisciplinary works. Any research centre has four basic objectives to fulfil.⁵

- Research Training
- Research Dissemination
- Promote collaborative research
- Promoting research-based creative endeavours

What is Evidence-based Dentistry?

An under-graduate (UG) student for the major portion of his or her bachelor's course banks upon subject-specific textbooks in order to gain knowledge and information about the same. Textbooks are a wonderful source to strengthen the basics of a subject but they have their limitations. Not every textbook is updated and if updates do come, then by the time they are published, the updated versions also become outdated. There is no room in the healthcare sector for professionals who are devoid of the latest trends and updates in their respective field. Enter, evidence.

Evidence means proof. When a subject is spoken with strong evidence, it becomes a mandate for the listener to agree with it. Evidence has been the backbone in the court of law for time immemorial and has been strongly advocated in the medical profession since the 1990s. Gordon Guyatt and the Evidence-based Medicine Working Group at McMaster University in Ontario (Canada) first coined the term Evidence-based Medicine.⁶ Soon, Evidence-based Dentistry (EBD) became a new paradigm for dental professionals to incorporate current research into education and practice.

Evidence-based Dentistry (EBD) can be defined as an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to patient's oral and medical condition and history, with the dentists' clinical expertise and the patient's treatment needs and preferences (American Dental Association).⁷



When a topic is researched, the result from that investigation becomes a part of evidence. However, single evidence is not enough to justify this topic. Hence, researchers came up with various study designs and elements within these designs that helped in refining and enhancing the quality of research. Since there are many research designs, the stratification of these designs is termed as “Levels of Evidence.” **Refer to the learning resource “Hierarchy and Level of Evidence to know more*

This module will now transition into how research is of paramount importance for the dental surgeons of tomorrow. It will further coax them into realizing why it has become a mandatory skillset to acquire for the students in today’s world.

Why should I learn Evidence-based Dentistry?

Learning about EBD provides a range of benefits for students, academicians and clinicians. Here is a list of benefits you can derive by educating yourself about EBD.

1. Keeps you updated with the latest conditions, epidemiology and treatment modalities
2. Teaches you to search relevant scientific literature
3. Helps the dental surgeon in filtering the information overload by learning about advanced method of information-search digitally.
4. Helps you understand a research paper
5. Helps the clinician in defending the treatment modality he or she has opted for and thus gives a medico-legal protection.
6. Helps the clinician in standardizing a treatment modality based on scientific guidelines
7. Helps you stay relevant among your peers
8. Guides you in understanding research methodology
9. Opens up a new avenue for students to pursue in a world saturated with clinicians
10. Gives you **an edge over other medical professionals** by adding EBD to your knowledge base.



How is research usually carried out?

The execution of a research work is done under a certain protocol. It can be done solo or in a team. We shall now understand a basic research design in a step-wise manner.⁸

Step 1: Searching for a Research Gap

The start is often the most difficult aspect of research. It begins by the researcher searching the literature within his or her topic of interest. It starts from textbooks and later transitions into a search across the worldwide web. A digital search usually helps the researcher explore more aspects to his or her topic of interest than one can imagine. Let us understand this with an example.

The UG student is well versed with the topic of cavity preparation and by the end of the UG program understands the importance of Minimal Intervention Dentistry (MID). So how relevant are G.V. Black's principles of cavity design in a world of MID? Herein lies your research gap.

Step 2: Asking a Question

After finding the research gap, one needs to formulate it into a question. Now that we know that we are interested in comparing the conventional cavity design technique with MID, we need to understand what aspect of these two cavity-designing techniques are we interested in re-searching.

This question formulation is done by constructing a research query based on PICO or its variations. **Refer to the learning resource "PICO & its variations" to know more.*

Example:

Population: Single surface occlusal caries

Intervention: Conventional Cavity Preparation Technique

Comparison: Minimal Intervention Dentistry

Outcome: Preservation of sound tooth structure

Step 3: Formulating a Hypothesis

A hypothesis is a hypothetical statement wherein the researcher proposes a prediction or an educated guess about the variables he or she is considering in the research topic. A research hypothesis is a single sentence that is put into test during the course of the research. **Refer the learning module “Classifying Research” in order to know about the different types of hypotheses.*

A hypothesis describes what the researcher expects the outcome to be. It thus helps the researchers define the borders of their research and thus gives direction to it.

Example: This study is done to assess the hypothesis that minimal intervention dentistry better conserves sound tooth structure than conventional cavity preparation design in single surface occlusal caries.

Step 4: Planning the research design

Now that we know what we want to research we have to choose the appropriate study design. The type of study design directly influences the level of evidence that you shall be presenting. In order to plan the research design, the researcher has to consider the following factors:

- Type of research (Descriptive? Experimental? Observational?)
- Type of data (qualitative or quantitative?) **Refer to the learning module “Classifying Research” to know more*
- Sample size determination: Minimum number of participants to appreciate the strength of a research
- Sampling strategy and allocation: How participants are to be divided for better comparison and whether or not the researcher or participant must be aware of the group they are being allocated to (Blinding).
- Elimination of bias: Methods employed to eliminate any bias or partiality to make the results of the research more transparent
- Study setting and feasibility: Where the study was carried out and whether or not the sampling was affected by it
- Statistical Analysis: Any research is incomplete without a statistical analysis that helps in ascertaining whether the null hypothesis is proven or not.



- Future directions: The study design should be such that it is replicable and the subsequent conclusions drawn must open up new possibilities for further research.

**Refer to the module “A brief overview of common research designs” to know more.*

Step 5: Gathering relevant tools

Indices or scales that a researcher uses to measure or quantify in a sample has to be standardized. These tools are called standardized when their validation and reliability has been proven in published literature.

For example, after the two types of cavity preparation techniques are performed, the remaining sound tooth structure can be measured by callipers or by digital scanning analysis. Since the latter is a more reliable method considering its accuracy in different planes, it will be the preferred tool in our study.

Step 6: Collecting and analysing data

Based on how the samples are allocated in our group we measure the remaining sound tooth structure with the help of our relevant “tool” and tabulate the data accordingly. This data is then subjected to statistical analysis which tells us whether the difference between the groups is significant or not.

Step 7: Drawing conclusions

Conclusions derived from any research can be either empirical, deterministic or sceptical, depending on the type of study.⁹

Empirical: Observations made are verified by scientific intervention

Deterministic: Discovering elements that contribute to a specific goal

Sceptical: Observations that are open to critical analysis

Step 8: Formulating recommendations

Research always begins with a hypothesis that is tested in order to explain or challenge past events while simultaneously predicting or describing new observations. The relevance of a research work is directly corresponding to the new scope it opens up for future research.



For example, the research example we have used can help future researchers to come up with newer ways to measure remaining sound tooth structure or newer techniques for designing a cavity in a case of single surface occlusal caries or compiling all the relevant research done in this field and subjecting them to a statistical analysis.

REFERENCES

1. Kirkpatrick EM. Research. In: Chambers 20th Century dictionary. Edinburgh: W & Chamber; 1987.
2. Allen RE. Research. In: The concise oxford dictionary. Delhi: Oxford Univ. Pr.; 1994.
3. Research definition & meaning [Internet]. Merriam-Webster. Merriam-Webster; [cited 2023Apr11]. Available from: <https://www.merriam-webster.com/dictionary/research>
4. Research (n.) [Internet]. Etymology. Douglas Harper; [cited 2023Apr11]. Available from: <https://www.etymonline.com/word/research>
5. Research Centres and Institutes. Abbotsford: University of the Fraser Valley; 2022.
6. Evidence-Based Medicine Working Group. Evidence-based medicine. A new approach to teaching the practice of medicine. JAMA. 1992 Nov 4;268(17):2420-2425.
7. American Dental Association. Professional Issues and Research, ADA Guidelines, Positions and Statements, ADA Policy on Evidence-based Dentistry. 2002.
8. Scientific writing in Health Research for Health and Allied Sciences [Internet]. National Institute of Epidemiology. Indian Council of Medical Research; 2021 [cited 2023Mar28]. Available from: https://nie.gov.in/icmr_sph/Scientific-writing.html
9. Polgar S, Thomas SA. Introduction to research in the Health Sciences. Edinburgh: Elsevier; 2008.

“There was a lot of things I wasn’t. I didn’t have the option of saying No to anything and I discovered the power of saying Yes. Because when you say No, you decide the outcome for yourself. When you say Yes, I discovered the world beyond Yes is a beautiful fantasy world.” – Harsha Bhogle