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Editorial

Evidence-based medicine - What does it mean to the average practitioner?

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The practice of medicine is an artistic application of science (knowledge). More and more knowledge based on scientific research reduces the guesswork and results in good treatment outcomes.[1,2] Medicine has evolved from a teacher-disciple lineage (observation transfer) to scientific and validated evidence based transfer of information.

The evolution of human beings from quadrupedal to the present stage suggests that biology is not stationary and continues to evolve. Medical science, being a biological science, has also evolved and will continue to evolve. The evolution in medicine has led to improvement in life expectancy. The life expectancy was 25 years in 1 AD (Roman Empire) to 40-45 years in Europe, the US, and Japan in 1900 AD. Around 2000 AD, the life expectancy was 80 years or more in Japan and the West. Even in India, the life expectancy has risen to around 70 years from 40 years at independence. Diseases like smallpox and polio have been eliminated. The outcomes of serious clinical problems like fracture, coronary heart diseases, oncology, tuberculosis, and many more have improved. Through medical research the life expectancy has improved, the death rate has declined, and all health indices have improved. Due to better diagnostics, treatment outcomes have improved. India is a country of contrast; we have amongst us, the wealthiest and the poorest people. There are *sheesh-mahal* mansions to slums. Even in the health sector, the best treatment facilities are available to 20% population, while a significant population is unable to access basic health facilities. As a result, India continues to see the natural history of disease, and we see the living biology. The clinicians are confronted by the most daunting to the most simple clinical problems.

HOW IS EVIDENCE GENERATED?

Science grows when a clinician is confronted with a clinical problem. The cause of the clinical problem is identified, and treatment strategies are executed. The outcome appraisal based on scientific criteria to differentiate whether the outcome is actual or a chance occurance gives us evidence. Definitive evidence is the result of a longitudinal collection of similar evidence with longer follow-ups. Practices in medicine can be categorized as good or not good on the basis of evaluation based on accepted scientific criteria.

EVIDENCE-BASED MEDICINE

Evidence-based medicine (EBM) is a term coined in 1990 by Gorden Gyuatt from Canada, and it was described as "an attitude of enlightened skepticism towards the application of diagnostic, therapeutic, and prognostic technologies".

The definition is simplified in the present time as "The conscientious use of current best evidence from clinical care research in making health care decisions". In other words, it is the integration of clinical expertise and patient value (suitability in a given patient/infrastructure) with the best available research evidence.[3]

SKILLS NEEDED TO PRACTICE EBM

The skills required to practice EBM include: (a) defining a research question-based on a given clinical problem; (b) Retrieval of best research evidence from vast pool of medical literatures; (c) Appraisal of the retrieved evidence for its

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robustness; (d) Deciding the applicability of the best available research evidence in a given patient (clinical expertise).

i) ***Defining the research question***

This step is the key to facilitate the retrieval of the best research evidence. While defining the research question, one has to describe a population and the intervention intended to be undertaken. It needs to be compared with another common option of management with well-defined outcome measures and a defined follow-up. Hence, PICO (Population (P), intervention (I), comparison (O), and outcome O) is the key to frame a research question. For example, in the case of a displaced fracture neck or femur in the elderly, the two treatment options available are internal fixation of fracture and replacement arthroplasty (hemiarthroplasty or total hip replacement). The reoperation rate at one year is taken as an outcome measure. So research question could be "effect of arthroplasty and internal fixation on one year reoperation rate at one year follow-up."

ii) ***Retrieval of research evidence***

The research evidence is to be collected for the research question framed. We have required to retrieve the best research evidence on a given research question. It must be ensured that the retrieved literature is comprehensive and not selective, where few articles have been retrieved from general search engines, such as Google. The proper keywords (MESH terms) should be used, and literature should be searched on PubMed, Cochrane Library, and other well-established search engines.

iii) ***Appraise the evidence***

The retrieved evidence is to be appraised for robustness of the studies and quality of evidence. Randomized control trials (RCTs) or Meta-analysis of RCTs are labelled as level 1 evidence, while Prospective Cohort Studies are level 2, Case Control Studies are level 3, and Retrospective Case Series are level 4. Individual opinion is described as the lowest level, 5. Level-1 studies have less bias while Level-5 evidence has the most bias. We also need to practice how to analyze these studies for their robustness. Bhandari and his team have published very simple checklists for randomized trials,[4] metanalysis,[5] prospective cohort study,[6] case series,[7] and diagnostic tests.[8]

Poorly conducted RCTs (Level-1) are inferior to well-conducted Cohort studies or level 4 retrospective studies. Robust RCT should have valid results. The interventionist should be well-trained in performing both types of interventions. It is important to know how subjects were randomized. Some questions to be asked are: Was the randomization concealed? Were they aware of allocation? Were the outcome assessors aware of allocation? Were the subjects analyzed? Were they initially randomized into enrolment? Was the follow-up completed? and How were the trial results measured? Similar criteria have been described for other types of studies. The clinician has to be confident about the quality of evidence to provide the expected outcome, only then it can be applied to a given patient.

iv) ***Patient value (applicability of evidence on a given patient)***

On retrieval of literature, we may get variable evidence. While making a decision on a patient, we need to assess the patient's expectations, available infrastructure, and the expertise of a surgeon/clinician to achieve the best treatment outcome. This is the clinical expertise of the clinician to use evidence for the best clinical outcome.

Above denotes that the evidence cycle starts with a patient where a question is asked about clinical problem, literature is acquired, and appraised. After assessing the patient's requirement and the feasibility of its applicability in a given circumstance, the treatment option is based on the best available evidence.

MYTHS AND BARRIERS TO IMPLEMENT EBM

Though EBM is almost 35 years old, some myths/false notions surround its universal acceptance. Some of the common myths and barriers to its implementations are:

1) High-quality evidence based on basic science and surrogate outcomes are used to practice EBM.
2) EBM is a method to suggest cookbook, overtly dogmatic, inflexible, and one-size-fits-all treatment options, and there is no place for clinical expertise.
3) EBM is only research evidence, only RCT or just percent, P value and other statistic tests.
4) EBM can be based on any evidence available.

These myths have no basis. To practice EBM, studies on patient-oriented factors, such as morbidity, mortality, and quality of life, are used to make a clinical decision. The disease-oriented evidence, such as physiologic variables and blood tests, are not used for clinical decisions. The EBM practice provides an opportunity to tailor best research evidence to a patient based on clinical judgement by a capable physician and not a cookbook option of treatment. EBM practice is based on the best available evidence that requires evaluation of all available evidence and grading its quality and its applicability in a given patient and not any evidence

Barriers to practice EBM

The most common barrier is the availability of too many articles on the digital platform. It is to be understood that data available on the internet may not be authentic and instead may be industry-driven. We have to learn how to identify the best quality evidence. We have to practice how not only to retrieve but also to appraise the best available evidence.

Another common barrier to implementing EBM is a lack of adequate outcome effectiveness studies, particularly in developing/resource-crunch countries. In India, we face a vast variety of clinical challenges and see complex clinical conditions to be treated in variable infrastructures and with variable expertise. For many clinical problems, we do not have research-based evidence generated from the West, and not too many Indian researchers are publishing research. **Unless we create evidence on clinical conditions unique to our country, we will not have the best available evidence. We have to publish to generate evidence of clinical conditions unique to us**. It is important that we publish our data. In certain clinical situations where we do not have robust data, we need to use guidelines developed by government agencies or WHO.

We should continue to be updated about literature and be prepared to change the practice as evidence changes. One such platform is OrthoEvidence, for example, bringing best evidence summaries in surgery to help surgeons and clinicians stay up to date. There are similar platforms in medicine.[9]

To conclude, evidence-based medicine allows us an opportunity to rationalize the best treatment option to a patient by integrating the best available research evidence.

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