Evidence Based Practice of Modern Surgery-Basic Concepts

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Abstract
Evidence based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. That means the surgeon must act in a manner governed by a sense of duty which is scrupulous and diligent and use the evidence from best available literature in a precise way taking into account the patient’s clinical condition, social values and other circumstances. In this evidence based era, to practice the modern surgery, the surgeon must be aware of the evidence and the grades of recommendations there from, in support of his surgical procedure or surgical technique. It combines your clinical acumen and knowledge with clinical condition of your patient and the evidence from the literature regarding the disease of the patient.

Evidence Based Surgery (EBS) de-emphasizes the practice of unsystematic and unevaluated clinical experience, clinical decisions based just on patho-physiological rationale and the clinical practice based on individual intuitions. EBS rather stresses upon the examination of evidence from clinical research and following the recommendations drawn there from. The essence of EBM in the practice of surgery is hunting instead of collecting. Hunting for information is formulating questions during patient contact and searching for the most relevant information in the literature. Evidence based practice is equally important in Surgery as it is in Medicine because the Medical school knowledge quickly becomes dated or even forgotten. Practice of EBS is the best way to update oneself regarding the changing trends in the modern surgery. Also, the practice of EBS also minimises the inter-institutional variations in clinical care.

Keywords: Evidence Based Medicine; Evidence Based Surgery; Critical Appraisal; Clinical Literature; Levels and Grades of Evi-

Introduction
Although testing of medical interventions for efficacy and safety existed since 11th century as is evident from Avicenna’s ‘The Canon of Medicine’ [1,2]. However, it was only in the 20th century that evidence based practice of medicine started to impact almost all fields of health care. The term ‘Evidence Based Medicine (EBM)’ is widely credited to have been coined (1990) by Dr. David Eddy of Kaiser Permanente [3]. Evidence based medicine (EBM) is the overall management of patients’ health care issues using an optimal integration of best available evidence from research with clinical expertise whilst respecting patient values and expectations [4,5]. Traditionally, surgi-
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cal practice has been experiential and based on the contemporary understanding of basic mechanisms of disease [6]. It was considered both as a science and an art. Throughout the world, the surgeons have been traditionally performing procedures by adopting techniques taught by their teachers and mentors [7]. However, this practice of keeping one’s learning process limited only to the teachers’ surgical techniques and one’s own mistake and mishaps is no longer acceptable in the era of evidence-based practice of surgery [7]. According to the Centre for Evidence-Based Medicine (CEBM), evidence based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients [8,9]. That means the surgeon must act in a manner governed by a sense of duty which is scrupulous and diligent and use the evidence from best available literature in a precise way taking into account the patient’s clinical condition, social values and other circumstances. The evidence based management of any disease depends upon the triad [10] of patient based factors, doctor based factors and the evidence from the medical research (Figure 1).

![Triad of evidence based medicine](image)

*Figure 1: Triad of evidence based medicine.*

The essential elements of applying EBM by a surgeon to a surgery related health care issue includes the ability to perform a thorough search of literature to find the best current available evidence, appraise whether this information is valid and relevant and use it in combination with his clinical expertise, up to date knowledge and consideration for patients values and expectations to diagnose and manage the patient effectively [11]. In other words, Evidence-Based Medicine (EBM) is the process of systematically reviewing, appraising and using clinical research findings to aid the delivery of optimum clinical care to patients. It seeks to assess the quality of evidence that is relevant to the risks and benefits of any diagnostic or therapeutic operative procedure. In this evidence based era, to practice the modern surgery, the surgeon must be aware of the evidence and the grades of recommendations there from, in support of his surgical procedure or surgical technique. It combines your clinical acumen and knowledge with clinical condition of your patient and the evidence from the literature regarding the disease of the patient. Evidence based practice has became the need of the hour and in this article we will try to discuss the basics of evidence based surgical practice for the benefit of surgeons, novice to EBS.

**EBM enabled practice of surgery**

Any surgical practice that applies up-to-date information and evidence from relevant and valid research about the usefulness of various diagnostic tests or surgical procedures is said to be EBM-enabled surgical practice. EBM-enabled surgical practice is also referred as

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Evidence Based Surgery (EBS). But mere application of EBS in itself simply is not good enough because the end results need to be validated by performing outcomes analysis on continuous basis. Evidence Based Surgery (EBS) de-emphasizes the practice of unsystematic and unevaluated clinical experience, clinical decisions based just on patho-physiological rationale and the clinical practice based on individual intuitions. EBS rather stresses upon the examination of evidence from clinical research and following the recommendations drawn there from. The essence of EBM in the practice of surgery is hunting instead of collecting. Hunting for information is formulating questions during patient contact and searching for the most relevant information in the literature. The application of EBS helps us to formulate evidence based guidelines from relevant basic science and clinical studies. In this way practice of EBM or EBS acts as a bridge between the clinical literature and the patient care (Figure 2).

![Figure 2: Evidence-based guidelines as a bridge!](image)

**What to do with the evidence?**

After the thorough search and critical appraisal of the literature, the use of the evidence will depend upon the type of the evidence drawn from the literature analysis. If the evidence deciphers that something works, is good and benefits the patient, then apply the same for the patient care. However, if the evidence depicts that something does not work, is harmful or does not benefit the patient; don’t do it.

However to be clinically useful, the evidence should be ‘Patient-Oriented Evidence that Matters (POEM)’. That matters to you, the clinician, because if valid, will require you to change your practice. Secondly it also needs to be ‘Disease-Oriented Evidence that Matters (DOEM)’. Again, it matters to you, the clinician, because if valid, will require you to change your practice for the benefit of your patient.

**Advantages of using EBS**

The trend in the surgical world in last two decades is favouring towards the adoption of the evidence based practice rather than the individualised or institution based practice. Because the EBM enabled surgical practice (EBS) has following advantages:

- Improves the overall quality of patient care.
- Helps to improve quality of life of the patients in post-operative period.

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- Tends to decrease the postoperative complication rates by comparing the literature on surgical procedures and techniques and adopting the best available procedure for a particular disease.
- Helps to setup guidelines for making clinical decision.
- Also recognize the value of clinical expertise.
- Recognizes the limitations of available research.
- Generates new ideas for future research.
- Identifies the validity of research and its applicability to the surgical problem.
- Helps in easy sharing of clinical decision making between the surgeon and the patient.
- Helps to stop ineffective or harmful practices for patient care.
- Encourages self directed professional learning.

Why do we need evidence-based practice of surgery (EBS)?

In order to improve the overall care of surgical patients, one needs to strictly adhere to the evidence based guidelines. Evidence based practice is equally important in Surgery as it is in Medicine because the Medical school knowledge quickly becomes dated or even forgotten. Practice of EBS is the best way to update oneself regarding the changing trends in the modern surgery. Also, the practice of EBS also minimises the inter-institutional variations in clinical care. In addition to this, because of the following newer needs of the health care systems, the practice of EBS becomes must:

- Many innovations in health care and quick adoption of innovations and scientific gadgets.
- Rising costs in health care and to avoid treatments with unknown efficacy and undesirably hefty costs.
- To avoid legal pitfalls.
- Increasing complexity of patient care.
- Information needs of patients.

How to get the evidence?

It requires an understanding of critical appraisal of the best available clinical literature and the basic epidemiologic principles of study design, point estimates, relative risk and odds ratios, confidence intervals, bias, and confounding. By using this information, clinicians can categorize evidence, assess causality and make evidence-based recommendations. Simply describing the practice of EBS can be divided into five steps (five ‘A’) i.e. Assess the clinical situation, Ask a reasonably answerable question, Acquire a good amount information from literature about this clinical situation and this question, Appraise this information and try to get an answer to your question and finally Apply this answer to your clinical situation (Figure 3).
EBM or EBS is a life-long learning process. Practice of EBS is just not a static one time evaluatory process but rather it is a continuous and dynamic scrutiny of clinical literature in order to improve the health care with every coming day. Practice of EBS and its dynamic evaluation and continuous appraisal can be briefly described in the following steps:

- Convert the need for information into an answerable question.
- Convert the clinical questions into a searchable format.
- Develop efficient clinical data searching skills and track down the best evidence to answer the clinical question.
- Critically assessing and appraising the relevant evidence for validity, relevance and usefulness.
- Critical appraisal of the relevant evidence with respect to the patient’s unique characteristics and evaluating its usefulness in clinical practice.
- Applying the information in clinical practice.
- Assessment of treatment success
- Discovering areas where more research is needed.
- Benchmarking by quality indicators.
- Regularly evaluate one’s own effectiveness in practicing EBS.

**Figure 3: Five steps of practice of EBS.**
Formulation of clinical questions

The first step of the practice of EBS is the formulation of good clinical question. Good questions are the backbone of practicing EBS. But it takes reasonably good practice to ask the well-formulated EBS-oriented (hopefully answerable) questions. The clinical situation can be converted into a searchable question using ‘PICO’ format i.e. Patient's problem (population); Intervention (or test); Comparison (control group) and Outcome. “Patient or Problem” refers to the person presenting with the problem or more simply, to the problem itself. Both concepts are important in searching the literature. “Intervention” refers to the action taken in response to the problem. This is often a drug or surgical procedure, but it can take many forms. “Comparison” refers to the benchmark or the standard against which the intervention is measured. Often it refers to another treatment, no treatment, or a placebo. “Outcome” refers to the anticipated result of the intervention. The formulation of an answerable clinical questions can be understood by the following example:

P...Patient...in a patient after colonic resection...
I...Intervention...does double layer anastomosis...
C...Comparison...as compared to single layer anastomosis...
O...Outcome...lead to less anastomotic leak rates?

To start with the practice of EBS, a surgeon should start with posing simple questions to himself and try to find out the reasonably correct answer based on good quality evidence and higher grades of recommendations. Simple and common types of clinical questions in surgical practice can be as under:

- What is the reason for tenderness in acute appendicitis?
- What is the drug of choice for a ureteric colic?
- What is the best laxative preparation used for the preparation of bowel before the colonoscopy?
- Which diagnostic tests are cost-effective in a patient of fecal incontinence?
- Which is the investigation of choice for acute appendicitis?
- What is the best noninvasive treatment for a ureterolithiasis?

After answering the formulated clinical question, the answer to the question in other-words the evidence drawn from the literature search is categorized into various levels of evidence. The level of evidence depends upon the type of studies upon which the evidence is based (Table 1). Also based on the end results of these studies, the recommendations could be put forward. The recommendations are graded as A, B, C, D and E. (Table 2). The categorizing of recommendations is also very useful in explaining the evidence against an association.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Level of Evidence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>Meta-analyses of Randomised control trials, RCTs with substantial clinical effects or results</td>
</tr>
<tr>
<td>2.</td>
<td>II</td>
<td>RCTs with less significant clinical effects or results</td>
</tr>
<tr>
<td>3.</td>
<td>III</td>
<td>Prospective, non-randomized, controlled, cohort studies</td>
</tr>
<tr>
<td>4.</td>
<td>IV</td>
<td>Retrospective, non-randomized, case-control, cohort studies</td>
</tr>
<tr>
<td>5.</td>
<td>V</td>
<td>Case series, lacking a control group</td>
</tr>
<tr>
<td>6.</td>
<td>VI</td>
<td>Animal studies</td>
</tr>
<tr>
<td>7.</td>
<td>VII</td>
<td>Extrapolations from existing data collected for other purposes, theoretical analyses</td>
</tr>
<tr>
<td>8.</td>
<td>VIII</td>
<td>Common sense</td>
</tr>
</tbody>
</table>

Table 1: Levels of evidence.
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<table>
<thead>
<tr>
<th>S. No.</th>
<th>Category</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A</td>
<td>Good evidence for cause and effect.</td>
</tr>
<tr>
<td>2.</td>
<td>B</td>
<td>Fair evidence for cause and effect.</td>
</tr>
<tr>
<td>3.</td>
<td>C</td>
<td>Insufficient evidence to make recommendation.</td>
</tr>
<tr>
<td>4.</td>
<td>D</td>
<td>Fair evidence against cause and effect;</td>
</tr>
<tr>
<td>5.</td>
<td>E</td>
<td>Good evidence against cause and effect.</td>
</tr>
</tbody>
</table>

Table 2: Categorization of recommendations.

Difficulties in introducing evidence-based surgery

The adoption of the EBS has been widely encouraged throughout the world but occasionally the difficulties arise initially because of various misconceptions. There is sometimes a 'hostile' reaction to the introduction of EBS as it is sometimes seen as a 'threatening to the surgeons not updating their knowledge and skills regularly. Also, EBM or EBS is seen as a 'Political' tool for containing healthcare expenditure. The EBP is also thought to be dominated by the interests of researchers and the organisations that employ them.

Limitations of introducing evidence based surgical practice

Though the practice of evidence based surgery is widely acknowledged and being adopted throughout the world, there are some difficulties that limit its smooth adoption by a good chunk of surgeons into their clinical practice. The various limitations [12] and challenges posed by the practice of EBS are as under:

- Surgeons need to develop new skills in searching for and critically appraising relevant clinical research.
- Limited available time of busy and over-worked surgeons to master and apply the new skills of EBS practice.
- Limited evidence that improved patient care follows the practice of EBS.
- It is still challenging to apply evidence to the care of individual complicated surgical patient.
- General barriers (e.g. costs, patient expectations, etc.) to the practice of quality medicine.
- Practical difficulty in getting level I-II evidence in case of rare diseases. RCTs and particularly the meta-analyses of RCTs provide information only at the population level.
- EBS primarily focuses on clinical effectiveness or surgical complication rates and ignores the issue of cost effectiveness.

The practice of EBS can become a reality only after making available an original model of doctors capable of posing questions and searching and appraising the literature. This can become possible only by introducing the subject of 'Evidence Based Practice' into the medical curriculum at graduation level. Also, the surgeons should learn the proper time management and develop adequate statistical and analytical skills. In addition to this, the doctors need to be provided with modern electronic, communication and internet facilities and ancillary staff with good knowledge of statistics and biomedical research.

Conclusion

The overview of 'Evidence Based Practice' is to ask a clinical question, search and critically evaluate the medical literature to collect the appropriate evidence and apply this evidence to your patient. Evidence Based Surgery (EBS) de-emphasizes the practice of unsystematic...
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and unevaled clinical experience, clinical decisions based just on patho-physiological rationale and the clinical practice based on individual intuitions. EBS rather stresses upon the examination of evidence from clinical research and following the recommendations drawn there from. Practice of EBS is the best way to update oneself regarding the changing trends in the modern surgery.

Conflict of Interest
Authors declare that we don’t have any conflict of interest and we didn’t receive any funding in preparation of this article.

Bibliography