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The principles of evidence based medicine (EBM) are well described and the integration of these principles into practice is an important part of the daily work of clinicians [1, 2]. This lecture will explore some of the obstacles to evidence- based practice and offer some strategies and practical suggestions to help learn and teach, and therefore practice, evidence- based anaesthesia.

The process of practising evidence- based medicine can be summarised in five steps [3]:

- stay up to date with the current literature
- formulate the clinical problem into an answerable question
- efficiently locate the best evidence with which to answer the question
- appraise the evidence to assess its validity and usefulness
- implement the results of the appraisal process in our clinical practice
- evaluate our performance

However, obstacles can arise at each step.

OBSTACLES TO EVIDENCE-BASED PRACTICE [4,5]**1. LACK OF AWARENESS OF A GAP IN PERSONAL KNOWLEDGE**

Practitioners need to be aware of gaps in their knowledge in order to be able to formulate clinical questions. Without this insight, the process of seeking the best available evidence to support a given course of action cannot begin.

2. LACK OF ABILITY TO FORMULATE A CLINICAL QUESTION

A clinical question needs to be properly formulated to allow a structured search for evidence to be undertaken. If the question is vague, or does not adequately relate to the clinical problem, the resulting search for information to answer the question will be more difficult. For example, the question 'How can I relieve shoulder pain after an arthroscopy?' would be harder to answer with a literature search than the question 'Are opioids as effective as an interscalene block for the relief of pain following shoulder arthroscopy?' Not only does formulating a precise question help focus the literature search, the discipline of having to specify it carefully helps us to think more clearly about the clinical problem.

3. LACK OF ACCESS TO INFORMATION RESOURCES

The search for information with which to answer a clinical question depends upon access to appropriate resources. These exist in a variety of formats, both printed and electronic, including textbooks, journals and bibliographic indices of the medical literature. The internet has revolutionised the availability of information, but problems with information retrieval still occur. Lack of computers with internet access in the workplace is a major barrier to evidence based practice. Slow or unreliable computers, organisational blocks on access to appropriate websites, or lack of institutional subscriptions to the required resource also hinder the search for the best available evidence.

If the scope of the available resources is limited, then other problems arise. The resources may be out of date, may contain incorrect information or may be incomplete. Most of us will have endured the frustration of discovering that the required journal volume is the only one missing from the library shelf!

4. LACK OF SKILLS IN RETRIEVING AND INTERPRETING INFORMATION FROM AVAILABLE RESOURCES

A well formulated clinical question and access to high quality resources are only of value if an appropriate search strategy is employed to find the necessary information. The amount of information available and the multiple ways in which it is presented can be bewildering, and an inadequate search may lead to information being missed and subsequent failure to answer the clinical question correctly.

A lack of skills to interpret and synthesize many pieces of evidence, some of which may have contradictory conclusions, can be another barrier to evidence based practice. When faced with a complex collection of information, it may be easier to abandon the attempt to answer a clinical question, rather than process the information and draw a conclusion based upon the best evidence.

5. DIFFICULTY IN CHANGING CLINICAL PRACTICE IN THE LIGHT OF EVIDENCE

Finding an answer to a clinical question does not automatically lead to a change in practice by an individual or within an organisation. It may be that the resources, financial or otherwise, are not available to implement the desired change. Key personnel may object to the changes, for many reasons. Current practice may be too entrenched to allow change to occur. The practitioner who wishes to instigate change may occupy a relatively junior position in the hierarchy of the organisation and therefore may not be in a position to influence policy.

6. LACK OF TIME

The demands of modern medical practice limit the amount of time available for educational activities, and many clinicians feel that the time spent in systematic pursuit of the answers to their clinical questions is a luxury they cannot afford. However, promoting effective, high-quality care by using the best available evidence may take time in the short term but yield many benefits in the long term.

The above issues represent some of the barriers to evidence based practice. However, these difficulties can be successfully overcome, and the process of learning, teaching and implementing evidence based medicine can be very rewarding.

STRATEGIES FOR LEARNING AND TEACHING EVIDENCE-BASED PRACTICE

Teaching programmes in evidence-based medicine improve the knowledge and skills of the participants in such programmes [6,7]. Educational approaches that integrate evidence-based skills teaching with daily clinical work have been found to be more effective at changing behaviour than classroom based courses. Delivery of such programmes can be challenging due to lack of resources and time, but enthusiasm and hard work can lead to success.

GENERATING AND FORMULATING QUESTIONS

Clinical practice generates many questions. These occur frequently, but often remain unanswered as they are not followed up. One strategy for making sure that these learning opportunities are not missed is to set up a 'clinical question bank'. Anyone can submit a question to the bank, and selected questions can be used to initiate the search for 'Critically Appraised Topics (CATs)', described in more detail below, or to provide the topic and material for deeper appraisal in the journal club. Alternatively, teachers can issue an 'educational prescription' [8] when the question first arises. These specify the clinical problem that gave rise to the question, the question to be answered, who is to answer it, and when it is to be done by. The learner is then given the task of 'filling' the prescription. Another variant allows learners to issue prescriptions for their seniors, which reinforces the idea that everyone is learning together.

WORKPLACE ACCESS TO INFORMATION

Teaching critical appraisal skills in the clinical workplace has been shown to improve knowledge and change behaviour of participants [6]. The provision of high quality sources of information (the 'evidence cart') in the workplace to facilitate critical appraisal skills teaching has been described [9]. This resource consisted of printed and electronic materials available on a trolley, on the ward, for immediate access by the medical team. The presence of the 'evidence cart' was found to increase the extent to which clinicians sought evidence to answer their clinical questions. Therefore, access to information sources in the clinical workplace is useful for the teaching and implementation of evidence based practice. The provision of internet linked computers in the operating theatre suite can be very useful. Clinical questions that have been raised during preoperative assessment rounds can be investigated before, or between, cases. Similarly, access to electronic information sources on intensive care units can help anaesthetists to search for evidence in their daily practice.

TEACHING CRITICAL APPRAISAL SKILLS

CRITICALLY APPRAISED TOPICS

Critically appraised topics (CATs) are summaries of evidence based answers to clinical questions, and can be a useful tool to help teach evidence based medicine skills [8]. A CAT consists of the following components:

- A brief summary of the question,
- The steps taken to find the evidence (the search strategy)
- A brief synthesis of the evidence
- The conclusion or clinical 'bottom line'.

The questions for CATs can be made relevant by basing them on problems encountered in daily practice. For example, during a preoperative assessment of a patient for an elective abdominal aneurysm repair, the use of perioperative beta-blockade may be considered. However, it may be that neither the consultant nor the trainee anaesthetist is sure about the evidence for the risks and benefits of this intervention. This problem can form the basis of a CAT:

- The problem is formulated into an answerable clinical question: Does the use of perioperative beta-blockade reduce the postoperative morbidity and/ or mortality for abdominal aneurysm repair?
- An appropriate search strategy is devised, possibly with the assistance of the medical librarian.
- Once identified and retrieved, the relevant studies are subjected to critical appraisal. This process can be undertaken as a group exercise as part of the journal club.
- The evidence is synthesised into an answer to the clinical question, and presented as the clinical 'bottom line'.
- A short summary of the process is written, given a date for review, and added to the collection of CATs previously written. This process can also be done as part of an educational meeting.

By using commonly encountered problems as the basis for CAT writing, the practical benefits of EBM readily become apparent. Requiring participants in an educational programme to prepare CATs based on questions generated by their clinical experiences can be a valuable way to disseminate critical appraisal skills. Also, a collection of up to date CATs can form a bespoke evidence based resource, tailored for local use, for future reference.

THE JOURNAL CLUB

The journal club is often a regular timetabled event in postgraduate medical education programmes. The format of the journal club can be modified from the traditional, relatively unstructured appraisal of a journal article, to allow the skills of critical appraisal and evidence- based medicine to be taught.

IMPLEMENTING CHANGE

An inevitable outcome, and an integral part, of the process of learning and teaching evidence- based medicine is the need to change our practice, or that of our colleagues, in the light of the best available evidence. This process can be made easier by using sources of pre- appraised evidence that present summaries of critically appraised evidence, systematic reviews and other collations of information. Examples include the Cochrane Database of Systematic Reviews (www.thecochranelibrary.com) and the UK's National Institute for Health and Clinical Excellence (www.nice.org.uk). Pre- appraised evidence sources do not remove the need for clinicians to have critical appraisal skills. The conclusions of some systematic reviews are controversial, and not universally accepted. Systematic reviews may have methodological flaws and may draw the wrong conclusions. Clinicians need to have critical appraisal skills and be able to make their own judgements about the validity of evidence, and about its applicability to individual patients in their own practice.

Similarly, clinical guidelines can be another useful tool for implementing evidence- based practice. Guidelines with a sound and explicit evidence base, compatibility of recommendations with existing values and no requirement for extra resources, skills or knowledge are more likely to be implemented [10]. Evidence based, robust guidelines that are transparent to critical appraisal are more likely to be used and are a valuable tool for evidence-based practice.

The provision of high quality, robust, well presented critically appraised evidence is the first step in implementing changes to our practice. There are a number of educational techniques that can be employed to influence the practice of others [11]. Distributing educational materials such as booklets, posters or audiovisual media is relatively inexpensive, and may be useful as one part of a wider process. Courses and conferences, although useful, are generally less effective at changing behaviour than workshops [12]. Educational outreach, defined as a personal visit by a trained person to a health care provider in his or her own setting, can also be an effective method of changing behaviour [13]. The use of local opinion leaders, defined as health professionals nominated by their colleagues as being educationally influential, to disseminate advice, is less well supported by evidence [14], possibly because it is not always clear how to identify local opinion leaders. However, it is possible that a respected colleague who tries to practice evidence- based medicine will be, or will become, a local opinion leader.

SUMMARY

The difficulties encountered when learning, teaching and implementing evidence- based anaesthesia are far from insurmountable, and the environment in which anaesthetists work can be favorable for these activities:

- The diversity of clinical conditions that anesthetists manage provides an excellent opportunity for asking clinical questions.
- Operating theatre work offers many opportunities for high quality teaching and exploration of clinical questions.
- Critical care medicine provides a more traditional ward environment for clinical workplace teaching.
- Anesthetist's working environments are increasingly provided with internet linked computers.
- Teaching programmes are usually well organized and can incorporate critical appraisal skills teaching.
- Protected time for journal clubs can allow this educational activity to become an important part of evidence based medicine skills teaching.
- Anaesthesia is a large specialty, and can therefore exert influence within organizations to bring about evidence based practice.

The integration of pre-appraised evidence, clinical guidelines and clinicians' own appraisal of the literature can be implemented into a rational practice by using a variety of techniques to change our own behaviour and that of our colleagues.

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