Evidence-based medicine

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Introduction

In each issue of the journal we plan to run this segment on Research Methodology which will look at different aspects of undertaking a research project in family medicine, and then preparing that research for publication. As pointed out in our mission statement, one of the briefs of the journal is to act as a vehicle for dissemination of original research relevant to our region. However, the academic basis of family medicine is still in its infancy compared to many other medical disciplines and to some extent we are still searching for a suitable methodology. We expect, therefore that this segment will be a valuable part of the journal. In each issue, one aspect for undertaking research will be dissected with key elements pointed out and some tips offered for young researchers. In this first issue, a general overview of evidence-based medicine is given, with some tips on how to dissect a published paper, to make sure it provides the reader with essential information for you to be able to assess the relevance of the findings to your own context.

From the Editors

Evidence-based medicine

Sackett *et al*. described **evidence-based medicine** (**EBM**) as 'the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients'. To practice EBM, you must be able to locate the research relevant to the care of your patients, and judge its quality. Only then can you think about applying the findings in clinical practice.

Sackett *et al*. suggest the following approach to EBM. For convenience, we have phrased the third and fourth points below in terms of clinical trials and observational studies, but they can be modified to suit other forms of investigations (e.g. diagnostic tests).

1. Formulate the problem

You must decide what is of interest to you – how you define the patient population, which intervention (e.g. treatment) or comparison is relevant, and what outcome you are looking at (e.g. reduced mortality).

2. Locate the relevant information (e.g. on diagnosis, prognosis or therapy)

Often the relevant information will be found in published papers, but you should also consider other possibilities, such as conference abstracts. You must know what databases (e.g. Medline) and other sources of evidence are available, how they are organized, which search terms to use, and how to operate the searching software.

3. Critically appraise the methods in order to assess the validity (closeness to the truth) of the evidence

The following questions should be asked.
- Have all **important** *outcomes* been considered?;
- Was the study conducted using an **appropriate spectrum of patients**?;
- Do the results make **biological sense**?;
- Was the study designed to eliminate **bias**? For example in a clinical trial, was the study **controlled**, was **randozimation** used in the assignment of patients, was the assessment of response '**blind**', were any patients lost to follow-up, were the groups treated in a similar fashion, aside from the fact that they received different treatments, and was an '**intention-to-treat**' analysis performed?;
- Are the statistical methods appropriate (e.g. have underlying assumptions been verified; have dependencies in the data (e.g. pairing) been taken into account in the analysis?

4. Deciding on the most useful and important results

Extracting the most useful results

You should ask the following questions:

(a) What is the **main outcome variable** (i.e., that which relates to the major objective)?

(b) How **large** is the **effect of interest**, expressed in terms of the main outcome variable? If variable is:

- **Binary** (e.g. died/survived)
  - What are the rates of occurrence of this event (e.g. death) in the (two) comparison groups?
  - The effect of interest may be the difference in rates (the absolute reduction in risk) or the ratio of rates (the relative risk or odds ratio) – what is its magnitude?
- **Numerical** (e.g. systolic blood pressure)
  - What is the mean or (median) value of the variable in each of the comparison groups?
  - What is the effect of interest, i.e. the difference in means (medians)?

(c) How **precise** is the **effect of interest**? Ideally, the research being scrutinized should include the confidence interval for the true effect (a wide confidence interval is an indication of poor precision). Is this confidence interval quoted? If not, is sufficient information (e.g. the standard error of the effect of interest) provided so that the confidence interval can be determined?

Deciding whether the results are important

- Consider the **confidence interval** for the effect of interest (e.g. the difference in treatment means):
  - Would you regard the observed effect clinically important (irrespective of whether or not the result of the relevant hypothesis is statistically significant) if the lower limit of the confidence interval represented the true value of the effect?
  - Would you regard the observed effect clinically important if the upper limit of the confidence interval represented the true value of the effect?
  - Are your answers to the above two points sufficiently similar to declare the results of the study unambiguous and important?
- To assess therapy in a randomized controlled trial, evaluate the **number of patients you need to treat** (NNT) with the experimental treatment rather than the control treatment in order to prevent one of them developing the 'bad' outcome (such as postpartum hemorrhage, see Box). The NNT can be determined in various ways depending on the information available. It is, for example, the reciprocal of the difference in the proportions of individuals with the bad outcome in the control and experimental groups (see Box).

5. Apply the results in clinical practice

If the results are to help you in caring for your patients, you must ensure that:

- your patient is similar to those on whom the results were obtained;
- the results can be applied to your patient;
- all clinically important outcomes have been considered;
- the likely benefits are worth the potential harms and costs.

Evaluate your performance

Self-evaluation involves questioning your abilities to complete tasks 1–5 successfully. Are you then able to integrate the critical appraisal into clinical practice, and have you audited your performance? You should ask yourself whether you have learnt from past experience so that you are now more efficient and are finding the whole process of EBM easier.

Adapted from: Petrie A, Sabin C. *Medical Statistics at a glance*. Oxford: Blackwell Science, 2000; 96–8.

Box

Primary aim specified

Objective To test the hypothesis that active management (prophylactic oxytocic within 2 minutes of baby's birth, immediate cutting and clamping of the cord, delivery of placenta by controlled cord traction of maternal effort) of the third stage of labour lowers the rates of primary postpartum haemorrhage (PPH) compared with expectant management (no maternal effort), in a setting where both managements are commonly practiced, and that this effect is not mediated by maternal posture.

Spectrum of patients

Subjects 1512 women judged to be at low risk of PPH (blood loss > 500 ml) were randomly assigned to active or expectant management. Exclusion criteria were placenta praevia, previous PPH, antepartum haemorrhage after 20 weeks' gestation, anaemia, non-cephalic presentation, multiple pregnancy, intrauterine death, epidural anaesthesia, parity greater than five, uterine fibroid, oxytocin infusion, anticoagulant therapy, intended operative/instrumental delivery, duration of pregnancy less than 32 weeks. Trial profile shown in Topic 14.

Midwife and mother not blinded

Avoids bias

Design A randomized controlled parallel group trial in which women either received active or expectant management. Women were also randomly assigned upright or supine posture. The treatment allocation could not be concealed because active and expectant management require different actions on the part of both midwife and mother. The technicians who did the antenatal and postnatal blood tests were unaware of the allocation.

Technicians blind

Main outcome variable

Avoids bias

Findings Analyses were by intention-to-treat. The rate of PPH was significantly lower with active than with expectant management (51 [6.8%] of 748 vs 126 [16.8%] of 764; relative risk 2.42 [95% CI 1.78–3.30] , $P<0.0001$). Posture had no effect on this risk (upright 92 [12%] of 755 *vs* supine 85 [11%] of 757). Objective measures of blood loss confirmed the results. There was more vomiting in the active group but no other important differences were detected.

Magnitude of main effect of interest

Interpretation Active management of the third stage reduces the risk of PPH, whatever the woman's posture, even when midwives are familiar with both approaches. It is recommended that clinical guidelines in hospital setting advocate active management (with oxytocin alone). However, decisions about individual care should take into account the weights placed by pregnant women and their caregivers on blood loss compared with an intervention-free third stage.

Questions the importance of the findings as they relate to the individual

Precision of main effect of interest -rate of PPH is at least 1.8 and could be 3.3 times greater with expectant management

From these proportions with PPH (ie 0.068 and 0.168) NNT=1/(0.168–0.068) =10 ie. need to treat 10 women with active management to prevent one suffering a PPH