

Practicing Evidence-Based Acute Paediatric Medicine

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Abstract: Evidence-based practice provides a five-step framework for providing high quality healthcare. This review takes the reader through the basics of the five steps (ask a question, acquire some information, appraise the evidence, apply the results and assess performance) in the setting of acute paediatric medicine. It shows how even frontline clinicians can provide diagnoses, treatments and prognostic information based on the best evidence, acknowledging patient and family needs and integrating clinical expertise.

OBJECTIVES

- Introduce the concept of evidence based practice
- Introduce a framework to evaluate evidence sources
- Develop a hierarchy of search locations to retrieve evidence

INTRODUCTION

When it's pushing 2.00 am and you're uncertain about the right treatment, diagnostic test or information for risk stratification, where do you turn for help? You could ask a colleague (that's almost always useful anyway), grab a policy from your hospital/clinic shelf, or turn to a textbook. If you have access, you might head onto the internet to "Ask Jeeves" or "Google" to answer your query. Whatever approach you use, you hope to get a relevant, authoritative and useful answer. Evidence-based practice is intended to provide a framework for clinicians to answer questions in a valid and transparent way.

INFORMATION

Sources of information must be matched to the nature of the question, the degree of your ignorance and the potential problems your uncertainty exposes (Table 1). Evidence-based practice (EBP) is a process to combine the trio of clinical expertise, patient choice and clinical research. The full process starts with identifying knowledge gaps, finding relevant appropriate information and appraising this, then applying the results and evaluating performance in some way (Table 2). The misunderstanding of 'EBP' is that you must, for every query you generate, produce a full systematic review before any action can occur. As with the rest of medicine, the art is in selecting when to question and when to get on (and intubate, for example).

So what are useful sources of good quality information for guiding practice in acute paediatric medicine? This first begs the question; 'What is a good quality source of information?' A quality information resource can be identified by answering three questions:

Table 1.

Question	Suggested source
What dose of Paracetamol for a 6 month old with fever?	RCPCH Medicines for Children
Is two finger or two thumb chest compression better for CPR of this pulseless, apneic infant?	Don't ask now – do either
Can the lip laceration of this 9 year old boy be glued or should it be stitched?	BestBets website, Cochrane Library, SumSearch or PubMed

Table 2.

•Ask a question
•Acquire some information
•Appraise the evidence
•Apply the results
•Assess your performance

- Do the authors tell you how they found the evidence?
- Do they tell you how they appraised the evidence?
- Do they tell you how often they update the information?

Without positive answers – or inferences – from the source, you're uncertain of how unbiased the recommendations are or how factual the facts may be. The statements may be right, may be the best evidence, but it's impossible to tell.

QUESTIONS

The second point in selecting a useful source (and less obvious than the first) is to know what type of question you are asking. Questions can be of two broad types. They can be general (background) questions e.g. "What is lymphoid granulomatosis?" or specific (foreground) questions e.g. "In a child with a fever of 39°C and neutrophils of <0.1 should I start penicillin/aminoglycoside or a carbapenem antibiotic to avoid progressive sepsis and death?"

Background questions are a desire for a raft of information in a sea of ignorance. It's natural – we're all

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basically Type A control freaks and if we weren't we'd have become florists or actors. In order to answer these types of questions we need good general reviews, well fleshed guidelines or textbook chapters. These sources can provide you with enough knowledge to see through your patient, or in many cases can reassure you of your buried undergraduate memories and enable you to focus a specific question regarding the patient before you. Good sources for background knowledge will provide clear descriptions of who wrote them, when they were written, and possibly some information on the data used to compile the article/chapter.

Specific questions are the bread and butter of evidence based practice. They tend to be very focussed, and built around a strict format. They detail the Patient, the Intervention (or test/risk factor) a Comparator (if desired) and the Outcomes of interest. (See Table 3). Answers to these types of questions may come from good guidelines or decision support systems, evidence based summary articles, systematic reviews or individual studies.

clinical_docs.html. The American Academy of Paediatrics has its own program of guideline development (www.aap.org). Guidelines from the UK's National Institute for Clinical Effectiveness (www.nice.nhs.uk) or the reputable Scottish Intercollegiate Guidelines Network group (www.sign.ac.uk) may also produce results. In addition to these guideline locations, each hospital may have its own (rarely evidence based) documents and guideline clearing houses exist in the US (www.guidelines.gov) and internationally (www.inahta.org) with further work.

There are also a number of sources of stand-alone evidence summaries. The BMJ Publications Group produces Clinical Evidence, a compendium of mainly treatments for a wide range of conditions. Paper versions are printed twice a year (a child health specialist subsection is available) and the web version is updated monthly. They also produce the journal 'Evidence Based Medicine for Primary Care'; this contains critical appraisals of recent articles accompanied by an expert commentary. Through the majority of this related to adult practice, there are occasional pieces of great relevance to paediatrics.

Table 3. 'PICO' Structure for Specific Clinical Questions.

PICO		Treatment	Diagnosis
Patient	<i>In</i>	child with a fever of 39°C and neutrophils of <0.1	a 2 month old with fever
Intervention	<i>Does</i>	penicillin /aminoglycoside	abnormal neutrophil count
Comparison	<i>Compared to</i>	carbapenem	-
Outcome	<i>Prevent, promote produce or predict</i>	avoid progressive sepsis and death	occult septicaemia

SOURCES

In a perfect world the information you needed would be delivered seamlessly without you even noticing its appearance (in the same way your beverage is never empty at a well hosted party). This type of 'systems' approach to information delivery is a long way off in every acute paediatric setting I've worked in, and so we usually need to look lower down the pyramid of sources to fulfil our needs (See Fig. 1).

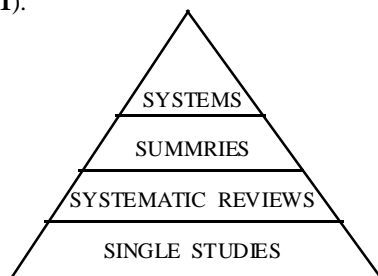


Fig. (1). Based on Haynes 2001.

Evidence based summaries come packaged within guidelines or as stand-alone chunks. There are a number of good sources of guidelines. The UK's Royal College of Paediatrics and Child Health runs a programme of appraising relevant high quality paediatric guidelines from any source. Their appraisals, with links to the original guidance in many cases, can be found at www.rpch.ac.uk/publications/

An independent group centred at UK's Manchester Royal Infirmary has been producing evidence summaries called 'Best Bets' for many years. These are regularly published in the Journal of Emergency Medicine and can be searched through on their website. These cover a wide range of emergency medicine and emergency surgery topics, including paediatric issues. There is a dedicated paediatric version published bimonthly in the Archives of Diseases in Childhood called Archimedes (www.archdischild.com/cgi/collection/archimedes) which mainly covers medical paediatric topics.

The SumSearch portal (available from the University of Texas Health, Sciences Center at San Antonio) is a web tool designed to search on-line textbooks, systematic review resources and the primary literature in an attempt to answer your query. This allows a series of filters to be applied to your question depending on the focus (e.g. therapy, clinical findings, prognosis). It is sometimes a little slow and has annoying pop-ups, but provides a quick way of accessing web based information. It is only a portal – a route to information – and you still need to think about the quality of the answers it returns.

Systematic reviews type of study on the next rung down. They provide detailed and comprehensive coverage of the best evidence to answer very specific questions. The Cochrane Library provides access to a range of different databases that specialise in systematic reviews. Although

Table 4.

Source	Content	URL
Centre for Evidence-based Medicine, Oxford	Teaching packs, worksheets, course application forms and The CATmaker. (Computer programme dedicated to assisting clinicians appraise and record their deliberations in practicing EBM.) Also plentiful links to other EBM sites	www.cebm.net
Centre for Evidence-based Medicine, Toronto	Resources for learning, teaching and practising EBM (including personal digital assistant applications, e.g. for Palm devices).	www.cebm.utoronto.ca/
Critical Appraisal Skills Programme	Work packs for learning about critical appraisal in practise	www.phru.nhs.uk/casp/casp.htm
Netting the Evidence	Summary of a wide range of EB-related websites and resources	www.shef.ac.uk/scharr/ir/netting/

Table 5.

Jadad Score Calculation	
Item	Score
Was the study described as randomized (this includes words such as randomly, random, and randomization)?	0/1
Was the method used to generate the sequence of randomization described and appropriate (table of random numbers, computer-generated, etc)?	0/1
Was the study described as double blind?	0/1
Was the method of double blinding described and appropriate (identical placebo, active placebo, dummy, etc)?	0/1
Was there a description of withdrawals and dropouts?	0/1
Deduct one point if the method used to generate the sequence of randomization was described and it was inappropriate (patients were allocated alternately, or according to date of birth, hospital number, etc).	0/-1
Deduct one point if the study was described as double blind but the method of blinding was inappropriate (e.g., comparison of tablet vs. injection with no double dummy).	0/-1

most of these reviews are centred around the evaluation of treatments, others address questions of diagnosis, prognosis or risk stratification. Another way of accessing systematic reviews quickly is by using the 'Clinical Queries' function on PubMed (www.pubmed.gov/entrez/query/static/clinical.html) and selecting the 'Systematic Reviews' button. This provides a filter to the main PubMed database returning predominately systematic reviews.

If these avenues have failed, then the only resort is to the primary literature. This can be time consuming and frustrating. It is best attempted off the clinical floor, when you have a 30-45 minute slot to dedicate to chasing 'index terms' and references. There is a useful resource that can assist the active clinician in trying to extract an answer from the primary literature in time to use it (if you're not using SumSearch). The 'Clinical Queries' filter page available for PubMed also allows you to select highly specific (narrow focussed) search filters to extract the best types of studies to answer therapeutic, diagnostic, prognostic or aetiologic questions.

APPRAISAL

In brief: all EBP appraisals have at the heart of them three questions;

1. Is the result likely to be true (Valid)
2. Does the result mean anything (Importance)
3. Can the result be used for us/our patients (Applicability)

Exactly how a clinician decides what's Valid, Important and Applicable differs between people and settings, but there are a number of frameworks which can guide thinking for different types of clinical questions. We'll discuss the essentials of appraising a study that asks a question of therapy here, but only briefly. There are many books [1] and courses dedicated to the art and science of appraising the information you extract from the clinical literature to apply to patients. For greater detail, try looking at a few free resources on the web (Table 4) which may assist you in learning more, or go on a local course.

The essentials in appraisal of a question of therapy are captured by the Score [3] [Table 5]. This assessment of trial quality was developed within the field of drug trials, but has been used widely across many interventions. It asks three overarching questions:

1. Was the study properly randomised?
2. Was the study properly blinded?
3. Were withdrawals and dropouts properly accounted for?

Randomisation is used to try to account for the presence of known and unknown prognostic features by using chance to spread these factors evenly across each group. To ensure the quality of randomisation, the creation of the random numbers must be truly random and the investigators must be unaware of the subjects allocated group when they enroll the next patient. (In a properly blind trial, this should always be the case). Deviations from this make it more likely that biasing factors will be present; these usually favour the experimental treatment!

Blinding is used to try to reduce the expectations on the parts of the physician and patient – usually that the new treatment is a better one – and truly assess its effectiveness. Effective studies can be undertaken without blinding (such as high frequency *vs.* conventional ventilation modes in neonatal care) but within drug studies, blinding is highly desirable.

Properly accounting for patients in the trial has a number of benefits. It provides a way of auditing how well they were followed up – if there's only 60% follow-up after 2 weeks you can take a big message away! It also lets you know if the patients are being assessed in the groups to which they were randomised. If they aren't (like only letting those who had all of the experimental treatment get counted in that group) then you've upset the randomisation and introduced biases.

These basic assessments of trial quality let you start to judge if the study you've got to answer a therapeutic question is valid. The next steps in appraisal are asking if it's important (will it alter your course of action, or supply more accurate information) and finally how applicable is the evidence to your patients.

SUMMARY

Putting evidence into your practice as an acute physician is not impossible, but it can be difficult. Remembering a few pointers on the way may be helpful:

1. Evidence based practice is a trio of research evidence, clinical expertise and the individual patient
2. Ask questions when you've got time to do so
3. Work out what sort of answer you want – background or specifics
4. Interrogate the right resource – look first at systems, then summaries, systematic reviews and finally individual studies
5. Appraise the evidence you get as well as you can – for summaries think about searches, quality criteria and timeliness
6. Even if you find no research you still have to make a decision – remember to look at the other components of the trio (patients views and professional expertise)

REFERENCES & RECOMMENDED READING

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