



Of studies, syntheses, synopses, summaries, and systems: the "5S" evolution of information services for evidence-based healthcare decisions

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Jottings

Most of the articles we pick for EBM stand the test of time, and conclusions are rarely changed by subsequent research. However, John Ioannidis has published a fascinating study of this issue by looking at 49 highly cited articles (>1000 citations) from 1990–2003 (*JAMA* 2005;294:218–28). Of these, 7 were contradicted by subsequent research, but 5 of these were non-randomised studies (including vitamin E and hormone therapy), and 2 were surrogate endpoints. And none of these was selected for the EBM journal. Having said that, this issue does contain a minor update. We had previously published a trial showing no benefit of antibiotics in conjunctivitis, but the meta-analysis in this issue shows a small benefit.

For those keen on teaching evidence-based medicine, one of the premier events on the international calendar is the

biennial meeting in Sicily. So you might like to mark in your diaries that the 4th International Conference of Evidence-Based Health Care Teachers & Developers will be in Sicily, 31 October to 4 November, 2007. You will find more details at www.ebhc.org/2007.htm.

For folk from developing countries interested in learning about teaching EBM, we have 6 bursaries each year to attend the annual 5 day residential Teaching & Learning EBM course in Oxford. Details and contacts can be found at the Centre for Evidence-Based Medicine website (www.cebm.net).

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EBM notebook

Of studies, syntheses, synopses, summaries, and systems: the “5S” evolution of information services for evidence-based healthcare decisions

Success in delivering evidence-based health care relies heavily on the ready availability of current best evidence about diagnosis, treatment, and prevention options for health disorders, ideally tailored to the characteristics and context of the individual patient or population and the resources of the provider. While existing information resources fall short of perfection, the past decade has seen considerable progress, and an attractive array of services is now available for many healthcare decisions. Providers and consumers of evidence-based health care can help themselves to the best current evidence by recognising the most “evolved” information services in the topic areas of concern to them.

A “4S” model for the organisation of evidence-based information services, proposed several years ago,¹ begins with original *studies* at the foundation; *syntheses* (that is, systematic reviews, such as Cochrane Reviews) at the next level up; then *synopses* (very brief descriptions of original articles and reviews, such as those that appear in the evidence-based journals); and the most evolved services, *systems* (such as computerised decision support systems that link individual patient characteristics to pertinent evidence) at the top.

George Box, an industrial statistician, once pointed out that “All models are wrong, some are useful”,² and so it is with the 4S model. Conceptually, this model has been useful for both describing and guiding the development of evidence-based information services, and it has also been wrong in

oversimplifying the relationship of these services to original studies. In this editorial we add a layer to the model, namely, clinical topic *summaries* of evidence about all pertinent management options for a health condition, such as those included in *Clinical Evidence* and *PIER*. A second purpose of the editorial is to explore how the layers are relevant to clinical decisions in ways that may not be apparent in the model.

THE 5S MODEL

Figure 1 shows the augmented “5S” model. This model’s additional layer, *summaries*, resides between *synopses* (succinct descriptions of an individual study or a systematic review) and *systems* (decision support services that match information from individual patients with the best evidence from research that applies). *Summaries* integrate best available evidence from the lower layers (drawing on *syntheses* [ie, systematic reviews] as much as possible) to provide a full range of evidence concerning management options for a given health problem (eg, acute coronary syndromes [ACS]). The lower layers—*synopses*, *syntheses*, and original *studies*—most often examine only 1 aspect of management (eg, a specific drug or drug class for ACS, such as angiotensin converting enzyme inhibitors), leaving decision makers to do their own integration and, for original studies, their own critical appraisal of the evidence. If a current topic *summary* exists, it would

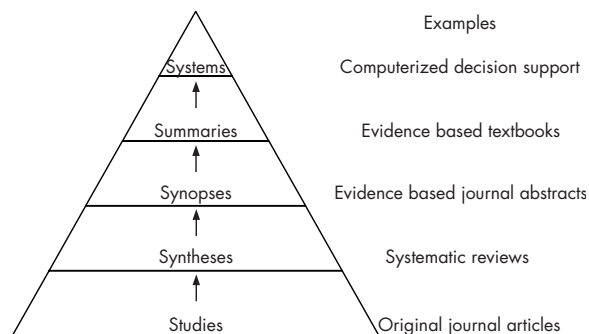


Figure 1 The “5S” levels of organisation of evidence from healthcare research

summarise the relevant *synopses*, *syntheses*, or *studies* about several aspects of a health condition. Thus, a current *summary* “trumps” an individual *synopsis*, *synthesis*, or *study* or a collection of these.

The only more compiled source would be a *system*, such as an electronic medical record, in which the individual patient’s characteristics were automatically linked to the current best evidence that matched their specific circumstances, with caregivers being reminded or notified of key aspects of management. Such computerised decision support systems are currently few and far between, and those in existence often fall short of ensuring that the evidence supporting the system is the best available and is kept up to date. *Summaries*, on the other hand, can easily be made universally available (eg, via the internet) and it is more feasible to keep them up to date and provide at least passive decision support by automatically linking them to individual patient problems in electronic medical records.

CAVEAT EMPTOR

Users of evidence reports at any level of the 5S pyramid need to be aware of the underlying methods of assembly and assure themselves that these methods are sound. At each level, the standards for evidence generation, retrieval, selection, and analysis should be explicit and at the highest evidence standard possible. For example, *systems* based on guidelines for patient care should be explicit about the source of the guidelines, and the guidelines should be based on systematic reviews of the pertinent evidence to date. *Summaries* should include details of the retrieval process used to find best evidence, the appraisal process for rating the quality of evidence should be explicit and auditable, key references should be provided for all care recommendations, the date of most recent updating should be stated, and updating should be done frequently enough to assure that important new evidence has not been neglected.

Services that provide *synopses* should have defined procedures for retrieving and appraising original and review articles and should report evidence quantitatively. For example, synopses of treatment studies and syntheses of such studies should include control and intervention group event rates, relative risk reductions, and numbers needed to treat, with 95% confidence intervals.

WHERE TO LOOK FOR CURRENT BEST EVIDENCE

How can this model guide decision makers to find the evidence they need, with speed and confidence? Begin the search for evidence to guide clinical decisions at the highest possible level in the 5S pyramid of evidence. If you have a

computerised decision support system integrated into your electronic medical record system that reliably links your patient’s characteristics with current evidence-based guidelines for care, you don’t need to look any further. If you do not work in such an environment (or if you do but the system does not provide support for your patient’s problems), then the next place to look is for integrated evidence in a summary service such as *Clinical Evidence* (www.clinicalevidence.com/cweb/conditions/index.jsp) or *PIER* (<http://pier.acponline.org>). If the topic is not covered there, look for a synopsis in one of the evidence-based journals suited to your practice, such as *ACP Journal Club* (www.acpjic.org), *Evidence-Based Medicine* (www.evidence-basedmedicine.com), and *Evidence-Based Nursing* (www.evidencebasednursing.com). If you have no success there, look for a systematic review in *BMJUpdates+* (<http://bmjupdates.com>), the Cochrane Library (www3.interscience.wiley.com/cgi-bin/mrwhome/106568753/HOME?CRETRY=1&SRETRY=0), or PubMed Clinical Queries (www.ncbi.nlm.nih.gov/entrez/query/static/collection.shtml). Failing that, you could look up original studies via *BMJUpdates+* first, then *Clinical Queries* if needed.

If you are not familiar with which evidence-based resource is best for a particular clinical problem—or you know that the resources you usually use don’t cover the problem at hand—then “federated search engines,” such as *TRIP* (www.tripdatabase.com) and *SUMsearch* (<http://sumsearch.uthsca.edu>), provide means to search many resources, with the retrieval being organised according to the source of evidence. But if you use such services, you will need to keep your critical appraisal filters on alert: the quality of the retrieval depends on the source, and many sources do not provide critical appraisal of evidence.

SOME LIMITATIONS OF THE RESOURCES AND THE MODEL

We return to George Box’s dictum about models being imperfect. Firstly, the higher you go up the pyramid, the scarcer the resources become. Thus, there are vanishingly few computerised decision support systems that reliably link patients’ individual characteristics to current best evidence, and even the best of these covers only a tiny range of medical problems, often just a single condition. Secondly, the number of evidence-based summary publications is growing, but the number of disease conditions covered is probably just a few hundred. Indeed, developers are finding that the cost of maintaining even 200–300 conditions is very high. The costs, of course, must be passed along to the consumer, a situation that is made problematic by the plethora of cheap imitations (it seems that the label “evidence-based” is being applied to anything that contains a reference to the medical literature, no matter how old or unsystematic).

Thirdly, processing information takes time, and synoptic services typically provide their commentaries months after publication of the original article or synthesis. The Cochrane Collaboration estimates that it will be many years before existing original treatment reports are summarised,³ and reviews of diagnosis, prognosis, and aetiology are scarce. Further, even when the same evidence is being examined, syntheses may disagree with one another, a problem that can sometimes be resolved by considering the original studies to see if one or more of them more closely matches the clinical problem at hand.

The original literature certainly covers a much broader range of clinical problems. However, even if the decision maker goes to the trouble to root out all the original studies on a given problem, there is no guarantee that a satisfactory study has been done, or

that the patient will not have unique characteristics, making extrapolation of existing evidence less certain.

IS IT TIME TO CHANGE THE WAY YOU SEEK BEST EVIDENCE?

Compare the 5S approach with how you usually seek evidence-based information. Is it time to revise your tactics? If, for example, it surprises you that PubMed is so low on the 5S list of resources for finding current best evidence, then this communication will have served a purpose: resources for finding evidence have evolved in the past few years, and searches can be a lot quicker and more satisfying for answering clinical questions if the features of your quest match those of one of the more advanced services. This is in no way a knock against PubMed, which continues to provide the premier access route to the studies and reviews that form the foundation for all of the other more specialised databases reviewed here. Big rewards can be gained from becoming familiar with these new resources, beginning at the top of the pyramid, and using them whenever the right clinical question presents itself.

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- 1 Haynes RB. Of studies, summaries, synopses, and systems: the "4S" evolution of services for finding current best evidence. [editorial]. *ACP Journal Club* 2001;**134**: A11-13, *Evidence-Based Medicine* 2001;**6**:36-8.
- 2 Box GE. Robustness in the strategy of scientific model building. In: Launer RL, Wilkinson GN, editors. *Robustness in statistics*. New York: Academic Press, 1979.
- 3 Garg AX, Adhikari N, McDonald H, *et al*. Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. *JAMA* 2005;**293**:1323-38.
- 4 Mallett S, Clarke M. How many Cochrane reviews are needed to cover existing evidence on the effects of health care interventions? *ACP Journal Club* 2003;**139**:A11.

Journals reviewed for this issue*

Acta Obstet Gynecol Scand	Arch Pediatr Adolesc Med	Gut	J Vasc Surg
Age Ageing	Arch Surg	Heart	Lancet
Am J Cardiol	Arthritis Rheum	Hypertension	Med Care
Am J Med	BJOG	JAMA	Med J Aust
Am J Obstet Gynecol	BMJ	J Am Coll Cardiol	N Engl J Med
Am J Psychiatry	Br J Gen Pract	J Am Coll Surg	Neurology
Am J Public Health	Br J Psychiatry	J Am Geriatr Soc	Obstet Gynecol
Am J Respir Crit Care Med	Br J Surg	J Clin Epidemiol	Pain
Ann Emerg Med	CMAJ	J Fam Pract	Pediatrics
Ann Intern Med	Chest	J Gen Intern Med	Rheumatology
Ann Surg	Circulation	J Infect Dis	Spine
Arch Dis Child	Cochrane Library	J Intern Med	Stroke
Arch Gen Psychiatry	Crit Care Med	J Neurol Neurosurg Psychiatry	Surgery
Arch Intern Med	Diabetes Care	J Pediatr	Thorax
Arch Neurol	Gastroenterology		

*Approximately 60 additional journals are reviewed. This list is available on request.