Of studies, summaries, synopses, and systems: the “4S” evolution of services for finding current best evidence

Practical resources to support evidence-based healthcare decisions are rapidly evolving. New and better services are being created through the combined forces of increasing numbers of clinically important studies, increasingly robust evidence synthesis and synopsis services, and better information technology and systems. The need for these resources is being spurred by demands for higher quality at lower cost from health services, but the impact of better information resources is being blunted by noisy pretenders, promising “the earth” but yielding just the dirt. Providers and consumers of evidence-based health care can help themselves to current best evidence by recognising and using the most “evolved” information services for the topic areas of concern to them.

The figure provides a “4S” hierarchical structure, with original “studies” at the base, “syntheses” (systematic reviews) of evidence just atop the base, then “synopses” of studies and syntheses next up, and the most evolved evidence-based information “systems” at the top. Information seekers should begin looking at the highest level resource available for the problem that prompted their search.

“4S” levels of organisation of evidence from research

SYSTEMS

A perfect evidence-based clinical information system would integrate and concisely summarise all relevant and important research evidence about a clinical problem and would automatically link, through an electronic medical record, a specific patient’s circumstances to the relevant information. The user would then consult the system—in fact, be reminded by the system—whenever the patient’s record was reviewed. The information contained in the system would be based on an explicit review process for finding and evaluating new evidence as it is published and then reliably updated whenever important new research evidence became available. Thus, clinicians and patients could always have the benefit of the current best evidence. The system would not tell decision makers what to do—those judgments would require integration of the system’s evidence with the patient’s

circumstances and wishes, the skills of the nurse, and the resources available.¹ Rather, the system would ensure that the cumulative research evidence about a patient’s problem was immediately at hand. Furthermore, to maximise speed of use, a short synopsis would be the user’s first point of interaction, although there would be links to summaries and then to original studies so that the user could delve as deeply as needed to verify the accuracy, currency, and details of the synopsis.

Current systems don’t reach this level of perfection as yet, but production models exist for parts of such systems. Electronic medical record systems with computerised decision support rules have been shown in randomised trials to improve the process, and sometimes the outcome,² of care, but these cover a limited range of clinical problems, are not necessarily based on current best evidence, and are mainly “homebuilt” and thus not easily acquired in most practice settings.

Given that we have some way to go before current best evidence is integrated into electronic medical records, some excellent, but less developed systems are now readily available. For example, some electronic textbooks, such as UpToDate (<http://www.uptodate.com>), integrate evidence-based information about specific clinical problems and provide regular updating. Other services provide referencing, updating, and aggregated information services, such as WebMD (<http://webmd.com>), which is now connected to ACP Medicine (www.acpmedicine.com). *Clinical Evidence* (www.clinicalevidence.com) is another source with an explicit review process and integration of evidence about prevention and treatment for a broad and rapidly expanding array of clinical problems as diverse as changing smoking behaviour and treating venous leg ulcers and ear wax. It provides a model for the 4S approach to building information systems that are firmly based on underpinning studies, syntheses, and synopses. *Clinical Evidence* is also available on Ovid (<http://www.ovid.com>) as a separate title.

Although none of these systems are integrated with electronic medical records, they can be accessed through the same computers that run electronic records, so that one need not go to a remote location to find them. Unfortunately, connecting the right information to a specific patient’s problems requires that clinicians understand evidence-based care principles and that they apply some effort and skill in using the resources. Fortunately, emerging information systems reduce these burdens considerably.

SYNOPSSES

When no evidence-based information system exists for a clinical problem, then synopses of individual studies and reviews are the next best source. What busy practitioner has time to use evidence-based resources if the evidence is presented in its original form or even as detailed systematic reviews? Although these detailed articles and reviews are essential building blocks, they are often indigestible if consumed on the run. The perfect synopsis would provide

exactly enough information to support a clinical action. The declarative titles for each abstract that appears in *Evidence-Based Nursing*, *Evidence-Based Medicine*, and *ACP Journal Club* represent an attempt at this (eg, "Review: antibiotics do not lead to general improvement in upper respiratory tract infections"). In some circumstances, this can be enough information to allow the decision maker to proceed, assuming familiarity with the nature of the intervention and its alternatives, or to look further for the details, which, for an ideal synopsis, will be immediately at hand. The full abstract related to the above declarative title, as well as the related clinical commentary can be found in *Evidence-Based Nursing*. The synopsis in the table contains the essential information on the effects (or lack thereof, in this case), in a format that could be adopted to wireless palmtop internet devices.

SYNTHESES

If more detail is needed or no synopsis is at hand, then databases of systematic reviews ("syntheses") are available, notably the *Cochrane Library* (<http://www.update-software.com/clibng/>). UK users enter via the National Electronic Library for Health (<http://www.nelh.nhs.uk>) and Ovid's Evidence-Based Medicine Reviews (EBMR) service. These summaries are based on a rigorous search for evidence, explicit scientific review of the studies uncovered in the search, and systematic assembly of the evidence to provide as clear a signal about the effects of a healthcare intervention as the evidence will allow.

Stimulated by the success of the Cochrane Collaboration, the number of systematic reviews in the literature has grown tremendously over the past few years. If the *ACP Journal Club* doesn't have a review on the topic you are interested in, it may worthwhile to look in Medline. Better still, Ovid EBMR provides one-stop shopping for both Cochrane and non-Cochrane systematic reviews. For the example of antibiotics for upper respiratory infections, a search on Ovid's *ACP Journal Club*, the *Cochrane Library*, and Medline retrieves 19 items, including 7 relevant Cochrane Reviews and 2 reviews from *Evidence-Based Medicine / ACP Journal Club*. Cochrane reviews are also indexed in Medline: "cold and antibiotics and Cochrane Review" brings up 5 items, including Cochrane reviews on antibiotics for bronchitis and for the common cold.

STUDIES

If all the other Ss fail (ie, no system, synopses, or syntheses), then it's time to look for original studies. These can be retrieved on the web in several ways. If you don't know which database is best suited to your question, search engines that are tuned for healthcare content can assemble access across a number of web based services. At least one of these search engines is attentive to issues of quality of evidence, namely, SUMSearch (<http://sumsearch.uthscsa.edu>). Nevertheless, users must appraise the items identified by such a search to determine which fall within the schema presented here. Many will not, especially when convenience of access is favoured over quality. A search on "antibiotics and cold" yielded several hits: 29 documents in the National Guidelines Clearinghouse and 5 from the *Cochrane Library* (both Cochrane reviews and from the DARE database). If the search is for a treatment, then the *Cochrane Library* also includes the Cochrane Controlled Trials Register.

If none of these services provides a satisfying result, it is time to go to the main search screen of any of the single databases, such as CINAHL, EMBASE, PsycInfo, or Medline's PubMed (<http://www.ncbi.nlm.nih.gov/PubMed/>). The Clinical Queries screen in PubMed provides detailed search strategies that hone in on clinical content for diagnosis, prognosis, therapy, and etiology. If you still have no luck, and the topic is, say, a new treatment (that your patients have asked about but you don't yet know about), then try Google (<http://www.google.com>). It is incredibly fast and can get you to a product monograph in a few milliseconds. At least you will find what the manufacturer of the treatment claims it can do, as well as detailed information on adverse effects, contraindications, and prescribing. The Google homepage allows you to add a Google search window to your web browser's home page. Unless you are a very slow typist, this is the fastest way to get to almost any service on the internet, including all of the ones named in this article that are accessible on the web.

It's worth emphasising that almost all of the resources just reviewed are available on the internet. The "added value" of accessing these services on the web is considerable, including links to full text journal articles, patient information, and complementary texts.

A prototype for evidence synopsis for hand-held computers*

Based on: Review: antibiotics do not lead to general improvement in upper respiratory tract infections. *Evidence-Based Nursing* 1999;2:78. Abstract of: Arroll B, Kenealy T. Antibiotics versus placebo in the common cold. Cochrane review, 8 Apr 1998. In: *Cochrane Library*. Oxford: Update Software.

Question	Study groups	Outcomes at 1-7 days (5 trials)	Weighted EER	Weighted CER	RBR (95% CI)	NNH
In patients with acute respiratory tract infections, what is the efficacy and safety of antibiotics (compared with placebo) in curing infection and improving nasopharyngeal symptoms?	Experimental: antibiotics (tetracycline, penicillin, ampicillin, amoxicillin, erythromycin, and cotrimoxazole) Control: placebo	General improvement	51.2%	52.5%	2% (-5 to 10)	NS
RRI (CI)						
		Adverse effects	9.7%	3.6%	82% (-25 to 340)	NS

Conclusion: in patients with acute upper respiratory infection, antibiotics are no more beneficial in terms of general improvement than placebo and are associated with a non-significant increase in adverse effects.

*EER = experimental event rate, CER = control event rate, RBR = relative benefit reduction, RRI = relative risk increase, NS = not statistically significant.; RBR, RRI, NNH, and CI calculated from data in article.

IS IT TIME TO CHANGE HOW YOU SEEK BEST EVIDENCE?

Compare the 4S approach with how you usually seek evidence-based information. Is it time to revise your tactics? If, for example, it surprises you that CINAHL and Medline are so low on the 4S 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 much quicker and more satisfying for answering clinical questions if the features of your quest match those of one of the evolved services. This is in no way a knock against single databases such as CINAHL or Medline. They provide premier access routes to the studies and reviews that form the foundation for all of the other more specialised databases reviewed above. There are big rewards from becoming familiar with these new resources and using them whenever the right clinical question presents itself.

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- 1 DiCenso A, Cullum, Ciliska D. Implementing evidence-based nursing: some misconceptions. *Evidence-Based Nursing* 1998;1:38-9.
- 2 Hunt DL, Haynes RB, Hanna SE, et al. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review. *JAMA* 1998;280:1339-46.

Conflict of interest statement: Brian Haynes has direct or indirect connections with many of the evidence-based resources used as examples above, including *ACP Journal Club* (editor), *Evidence-Based Medicine* (co-editor), *Cochrane Library* (reviewer and former board member and Cochrane Centre director), *Clinical Evidence* (advisory board), and PubMed Clinical Queries (developer). These resources are used to illustrate the concepts in the paper; there are other, and perhaps better, examples.

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