ABSTRACT
The voluminous growth of the health literature paired with time constraints of practitioners can make it difficult to implement evidence-based medicine (EBM). New and better resources that summarize and/or synthesize the literature are available to facilitate the integration of evidence into practice. Understanding how such resources work and how to use them is an important step in finding evidence for patient care. By using a clinical scenario concerning abdominal aortic aneurysm screening, this article describes 3 types of EBM resources from the “4S” model: systems, synopses, and syntheses. The common features of each resource type are discussed and comparisons of selected examples are provided.

INTRODUCTION
Although evidence-based medicine (EBM) has permeated medical education since its beginnings in the 1990s, the time required to find and evaluate evidence has prevented many clinicians from using EBM in practice. Recent improvements in evidence retrieval and resources provide some relief for over-booked clinicians who need prompt, accurate answers to patient care questions. This article will focus on sources that maintain requisite high quality while introducing a new level of effectiveness and convenience through synopses, concise summaries, and clear, explicit, recommendations.

CLINICAL SCENARIO
A 65-year-old male, in for a routine health assessment, asks about ultrasound screening for abdominal aortic aneurysms, which he saw advertised in the newspaper. Prior to entering any EBM resource, a precise clinical question should be developed. A well-formed question for this scenario is: In an asymptomatic 65-year-old male, is ultrasound screening effective in reducing mortality compared to no screening? You decide to search for evidence to answer your patient’s question.

4S MODEL
Once the clinical question is framed, you are ready to locate the best evidence. Haynes offers an evolution and hierarchy of EBM resource types available to practitioners (Figure 1).1 At the base of the model are individual studies, which are not discussed in this article; the next level up are the syntheses (systematic reviews and meta-analyses), then synopses (of high impact articles or reviews), and atop the pyramid are the systems (clinical information databases). Using our scenario, we will look at each level, starting at the top.

SYSTEMS (CLINICAL INFORMATION DATABASES)
The best current clinical information databases (CID) are designed to answer specific clinical questions through the summarization and synthesis of up-to-date, high-quality research. They aim to provide practice implications that are specifically supported by rationale and pertinent current evidence. The vanguard of the CIDs are designed to dovetail with comprehensive health care information systems to improve patient care and practice management by bringing the right evidence to bear on clinical problems from within the physician’s own electronic environment. However, the CIDs currently on the market are not at this level. While these systems continue to emerge, at present they are limited by the lack of explicit evidence-gathering techniques, coverage on a limited range of clinical problems, and disparities in the evidential support of clinical recommendations between and among CIDs.

Table 1 includes selected examples of products that
may be considered CIDs. The majority of CIDs have similar features. The centerpiece of each product includes hundreds of entries on medical conditions and their treatment, which are developed from synthesized information obtained by searching quality EBM resources including Cochrane Database of Systematic Reviews and health-related literature databases (e.g. MEDLINE). Recognized experts and clinical specialists generally oversee the creation of the entries and offer succinct evidence-based recommendations. Most products are updated monthly, although some are quarterly, inserting new items and urgent updates as needed. They are available via the Internet and in versions for the personal digital assistant. Although there is great variation in searchability, interfaces associated with these products often offer browsable tables of contents and rudimentary search boxes; some include means to target or narrow search results.

Let us look at how 2 of these CIDs responded to our clinical scenario question. Physicians’ Information and Education Resource (PIER) has an adequate search engine, but its topical organization lends itself to rapid browsing. We clicked “Screening and Prevention” to immediately find “Screening for Abdominal Aortic Aneurysm” with subsections on “key points,” “population at risk,” “effectiveness/harms,” “timeline,” “direct evidence,” “referral/consultation,” and so on. Each heading presented succinct information and recommendations. Included was the advice to use ultrasound for 1-time screening of asymptomatic men age 65-79, especially those with a history of smoking. PIER provided evidence ratings for each recommendation. In-depth reasoning for the recommendations and evidence from individual trials can be rapidly accessed by clicking additional links on the page.

Searching “AAA” in UptoDate brought up a perfect match, which we clicked to find a listing of “Most Relevant Topics” and “Related Topics.” Easily seen among the most relevant was “Screening for abdominal aortic aneurysm.” The information was thoroughly detailed, with sections on screening tests and screening strategy. We then scrolled down or clicked on the left navigation bar for “Recommendations.” This took us to the conclusions from both Canadian and American task forces that do not recommend such screening. In the next paragraph, it was stated that the MASS study on mortality benefit and the related cost effectiveness analysis, which favored screening, were not available at the time the Guidelines were prepared. UpToDate stated that for patients in the United States, the implications are not clear, and recommends that for men over 60 or with other risk factors, the decision be made on an individual basis.

### Table 1. Selected Examples of Clinical Information Databases

<table>
<thead>
<tr>
<th>Database Name</th>
<th>URL</th>
<th>Annual Cost</th>
<th>Audience</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Evidence (BMJ)</td>
<td><a href="http://www.clinicalevidence.com">http://www.clinicalevidence.com</a></td>
<td>$90 per year</td>
<td>Primary or hospital care physicians</td>
<td>Summary of effects, not effectiveness, for each topic; Categorizes results per evidence; Includes help with drugs and calculating risk, NNT</td>
</tr>
<tr>
<td>FIRSTConsult</td>
<td><a href="http://www.firstconsult.com/">http://www.firstconsult.com/</a></td>
<td>$149 per year</td>
<td>Primary care providers</td>
<td>Includes differential diagnoses, procedures videos, English and Spanish patient education; Links to MDConsult</td>
</tr>
<tr>
<td>Physicians’ Information and Education Resource (PIER) (ACP)</td>
<td><a href="http://pier.acponline.org/">http://pier.acponline.org/</a> or <a href="http://www.statref.com">http://www.statref.com</a></td>
<td>Free to ACP members; $219 per year via STAT!Ref</td>
<td>Clinical recommendations are rated based on quality of underlying evidence; cited references are also graded</td>
<td>Integrates with hospital and practice management information systems; Browse is better than search; Includes CAM, ethical/legal issues</td>
</tr>
<tr>
<td>UptoDate</td>
<td><a href="http://uptodate.com">http://uptodate.com</a></td>
<td>$495 per year</td>
<td>Professionals in internal medicine and subspecialities</td>
<td>Stronger search engine, allows narrowing/limiting; Detailed text with index links</td>
</tr>
</tbody>
</table>

### SYNOPSIS

Synopses are available in the form of summaries or structured abstracts provided by evidence-based journals and reliable Internet resources. Experts associated with these resources scan the biomedical literature and highlight published topic reviews and single peer-reviewed studies from prominent journals. With few exceptions,
Table 2. Selected Examples of Sources for Synopses

<table>
<thead>
<tr>
<th>Database of Abstracts of Reviews of Effects (DARE)</th>
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</thead>
<tbody>
<tr>
<td>• <a href="http://www.york.ac.uk/inst/cri/carehpt.htm">http://www.york.ac.uk/inst/cri/carehpt.htm</a></td>
<td></td>
</tr>
<tr>
<td>• Free of charge; also by subscription via OVID (for fee)</td>
<td></td>
</tr>
<tr>
<td>• Critical summaries of selected systematic reviews about the effects of interventions</td>
<td></td>
</tr>
<tr>
<td>• More advanced search capability</td>
<td></td>
</tr>
<tr>
<td>• Covers health and social care topics</td>
<td></td>
</tr>
<tr>
<td><strong>ACP Journal Club</strong></td>
<td></td>
</tr>
<tr>
<td>• <a href="http://www.acpjic.org/">http://www.acpjic.org/</a></td>
<td></td>
</tr>
<tr>
<td>• $94 per year (free to ACP members)</td>
<td></td>
</tr>
<tr>
<td>• Scans &gt;100 journals for high impact medical studies and systematic reviews of most importance to physicians</td>
<td></td>
</tr>
<tr>
<td>• Studies often not yet included in systematic reviews or meta-analyses</td>
<td></td>
</tr>
<tr>
<td>• Summarizes in value-added abstracts and expert commentary</td>
<td></td>
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</tbody>
</table>

EBM synopses and syntheses resources are also emerging and have limited content. As a result, search techniques that cast the widest net should be utilized. To optimize searches it is important to take advantage of system specific search features, such as truncation wildcards and the Boolean operators. Truncation wildcards (often * or $) find all terms that begin with a given text string. For instance, steroid$ will find all terms that begin with steroid, e.g. steroids, steroidal, steriodogenic, etc. The Boolean operator “OR” can be used be used to combine natural language, brand names, generic names (e.g. Tylenol OR acetaminophen), synonyms (e.g. tumor OR neoplasm), and commonly used abbreviations with full terms (e.g. MRI OR Magnetic Resonance Imaging). Combing terms with the “OR” expression will return articles that contain any of these terms.

For our clinical scenario, we searched Database of Abstracts of Reviews of Effects (DARE) and the ACP Journal Club. In DARE, we entered the search query “(AAA OR abdominal aortic aneurysms) AND screening” and retrieved 23 items. This was too many to peruse, so we added an “AND” and the term “screening” to reduce our set to a manageable 9. Of the 9, we found 1 relevant entry entitled “Screening for abdominal aortic aneurysms.” However, this was a Cochrane “protocol”—the plan or set of steps to create a systematic review, so it was unable to answer our question.

A return to our scenario starts with a search in the Cochrane Database of Systematic Reviews (OVID version). We entered the query “AAA or abdominal aortic aneurysm$” and retrieved 23 items. This too was too many to peruse, so we added an “AND” and the term “screening” to reduce our set to a manageable 9. Of the 9, we found 1 relevant entry entitled “Screening for abdominal aortic aneurysm.” However, this was a Cochrane “protocol”—the plan or set of steps to create a systematic review, so it was unable to answer our question.

MEDLINE via PubMed offers 2 features to reduce the results of a search to systematic reviews: the “Meta Analyses” publication type limit and the Clinical Queries systematic review filter. We first searched “Abdominal Aortic Aneurysm” in PubMed and utilized the publication type limit. Eleven meta-analyses

**SYNTHESES/REVIEWS**

Systematic reviews are summaries of the medical literature that use explicit methods to perform a thorough literature search and appraise individual studies. Meta-analyses are systematic reviews that apply statistical techniques to pool the results of valid studies to bring additional statistical power to the mix. They provide practitioners with all of the available evidence on a clinical question and offer bottom-line implications. Systematic reviews are available from many sources, including Web sites and medical journals; however, the Cochrane Collaboration creates what many consider the gold standard for this evidence type. Cochrane experts develop reviews with explicit standards and detailed search strategies to assure inclusion of relevant studies. Rigorous research methods, updated reviews (when new studies appear in the literature), and a consistent and predictable structure for quick perusal make it a popular and recommended first choice for systematic reviews. When no Cochrane Review exists to answer your question, MEDLINE can be searched and limited to locate meta-analyses and systematic reviews published in journals. Table 3 provides specific information for these review sources.
were retrieved, but only 1, from a 1993 issue of Annals of Internal Medicine warranted attention: “Screening for abdominal aortic aneurysm in men ages 60 to 80 years: a cost-effectiveness analysis.”

Since there were no recent meta-analyses, a search for systematic reviews using the Clinical Queries feature was our next option. We entered “Abdominal Aortic Aneurysm AND screening” in the appropriate search box with a result of 42 hits. Scanning the titles and abstracts, we found 4 interesting reviews. Of the 4, 3 were current, and 2 were the MASS reports we had seen previously.

**OBTAINING ITEMS FOUND IN MEDLINE**

Basic databases such as MEDLINE provide citations (and often abstracts) to items of interest, but the full text article is not always immediately available on-line. As electronic journal collections have grown, access to individual studies and published reviews has dramatically improved, but usually remains a multi-step process. PubMed now allows publishers and institutions to insert a button within item records to lead users to the full article; however, in many cases publishers charge fees of up to $35 or more to grant access to a single article. We recommend that you first contact your local clinic, hospital or academic library or information center. Very often, libraries have established access to journal collections or offer interlibrary loan services. If none are available in your area, an inexpensive yet effective alternative is the National Library of Medicine’s Loansome Doc service for ordering documents through PubMed. A web link to this service is available on the left side menu bar of PubMed under “Order Documents.”

**CONCLUSION**

The perfect evidence resource is not yet available, but tremendous strides have been made in the last 15 years. The resources described allow practitioners to more rapidly acquire high-quality evidence. For the clinical question posed, we found evidence-based support for the use of AAA screening without having to conduct a time consuming MEDLINE search for individual studies. Each resource grouping has strengths and weaknesses. Understanding how they work and how to use them most efficiently is an important step in bringing practitioners closer to real time use of EBM in patient care. As information resources continue to improve, they will accelerate the translation of evidence into clinical practice.

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**Table 3. Selected Examples of Sources for Systematic Reviews and Meta Analyses**

<table>
<thead>
<tr>
<th>Source</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Cochrane Database of Systematic Reviews** | - http://www.cochrane.org or available through other vendors (OVID, Wiley, etc)  
- Systematic reviews may be purchased individually ($25 for 24-hour access); $265 per year via Wiley  
- Abstracts are free and searchable at http://www.cochrane.org  
- Detailed, lengthy systematic reviews  
- Includes brief statements concerning summary implications for practice and research  
- Discloses conflicts of interest  
- Covers only therapy and prevention topics  
- Includes protocols (reviews in progress) |
- Free of charge  
- Journal database that covers 4600 journals  
- Full text may or may not be available  
- To find meta analyses, use the “Publication Type” limit  
- To find systematic reviews, use the Systematic Reviews filter via Clinical Queries |

**REFERENCES**

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