
ANSWERING PATIENT-SPECIFIC QUESTIONS USING INFORMATION RESOURCES AVAILABLE IN AN OUTPATIENT CLINIC

Lisa M. Schilling, MD, and Robert J. Anderson, MD

A house officer and an attending physician are seeing patients at a walk-in medicine clinic affiliated with an academic health center. In an effort to employ evidence-based clinical decision making, the 2 physicians have agreed to generate patient-specific questions that arise while in clinic and then, if possible, answer the questions using resources available in or near the clinic. They encounter 4 patients whose care requires that they seek further information.

The first patient is a 35-year-old woman who comes to the clinic out of concern that she may be at high risk for breast cancer because her grandmother had a history of the disease. The patient recently saw an ad in a magazine recommending that women seek advice from their physicians on their personal risk for breast cancer. In this case, the question is: "What is this patient's risk for development of breast cancer?"

The second patient is a 70-year-old man with an alcohol abuse problem who is presumed to have lone atrial fibrillation and who unreliably takes coumadin for systemic embolic prophylaxis. The patient comes to the clinic for a scheduled visit. Two questions are generated in this case: "What is this patient's risk for systemic embolization?" and "What value are anti-platelet agents to prevent systemic embolization in this patient?"

The third patient comes to the clinic with her own well-formulated question: "What shots do I need before I travel to Tunisia?"

The fourth patient is a 65-year-old man with polymyalgia rheumatica and biopsy-proven temporal arteritis who has required moderate doses of systemic corticosteroids for 18 months to control his symptoms and maintain a normal erythrocyte sedimentation rate (ESR). The patient has recently experienced 2 serious

side effects of his therapy: a vertebral body compression fracture and a perforated colonic diverticulum. The patient comes to the clinic because of continued backache from his recent compression fracture. Together with the patient, the house officer and attending physician formulate 2 questions: "What is the lowest therapeutic dose of corticosteroids this patient can take?" and "Can anything be done to allow this patient to discontinue corticosteroid therapy altogether?"

During the course of the day, the house officer and attending physician search for answers to their questions using the resources readily available to them. These include professional colleagues, print and electronic medical textbooks and journal articles, searchable electronic evidence-based medicine resources, MEDLINE, and generic search engines.

Barriers to Answering Patient-Specific Questions

The preceding scenario may be familiar to residents who have had evidence-based medicine training, but it does not reflect the reality of clinical practice in many clinics, hospitals, and doctors' offices. In actual practice, physicians often do not seek authoritative, evidence-based answers to questions that arise in the context of patient care [1-3].

An important reason that patient care questions may go unanswered is that physicians may fail to recognize their own needs for medical information. In an early but important study of physicians' self-perceived information needs, Covell et al [1] found that physicians estimated that they needed patient-related information about once per week, whereas their actual information needs were revealed to be about 6 per physician per half day of clinic or about 2 to 3 needs for every 3 patients seen. More recent studies of practices in various medical educational settings revealed up to 6 information needs for every patient encountered [2-5].

Even if physicians recognize their information needs, they often do not pursue them. A recent study of 64 residents in 2 primary care, hospital-based teaching clinics reported that residents identified 280 new

Lisa M. Schilling, MD, Assistant Professor, Division of General Internal Medicine; and Robert J. Anderson, MD, Meiklejohn Professor of Medicine, Head, Division of General Internal Medicine, University of Colorado Health Sciences Center, Denver, CO.

questions after 401 patient encounters (approximately 2 questions for every 3 patients) but pursued answers to only 80 (29%) of the questions, most often by consulting textbooks, original articles, or attending physicians [6]. Similarly, several studies in ambulatory primary care settings found that physicians pursued only about one third of their information needs [5,7–9]. In 1 of these studies, involving 50 nonacademic physicians in Oregon, Gorman et al [2] found 2 factors to be strongly associated with physician pursuit of an answer: a belief that a definitive answer for the question existed, and a feeling of urgency regarding the patient's problem of note.

Most patient-related questions that arise in day-to-day medical practice are, in fact, answerable. For example, in the study by Gorman et al [2], professional librarians were able to answer most of the primary care physicians' questions using online resources to identify the best available evidence, but it took a considerable amount of time—an average of 43 minutes per question. By contrast, in another of these studies, involving 103 family physicians in Iowa, Ely et al [7] found that the physicians spent an average of less than 2 minutes pursuing an answer and used only available print and human resources.

An important finding in many studies of physician information needs is that when desired information is made available it appears to impact patient care. For example, Covell et al [1] concluded that in a half day of office practice, 4 management decisions might have been altered if the physicians being studied had had the needed information at the time of the patient visit. The physicians studied by Gorman et al [2] believed that the information retrieved by librarians would have impacted patient care in 40% of cases. Finally, Sackett and Straus [4] studied the impact of using an "evidence cart" of information during inpatient rounds with house staff. The authors found that, in 48% of cases, having evidence immediately available at the point of care altered the clinical approach of at least 1 clinical team member.

If physicians do attempt to address their patient-specific questions, they are unlikely to seek evidence-based answers [4,10,11]. The techniques of evidence-based medicine are difficult to tailor to the specific, patient-related needs of practicing clinicians. Providing the best evidence at the point of patient care requires time and an effective method for identifying and applying relevant research findings to individual patients. Even clinicians who consider their practices to be evidence based do not often use infor-

mation sources that provide research in its pure form [12].

The challenge to answer patient-specific questions in a busy practice is further compounded by the fact that medical information is expanding rapidly. For example, the number of MEDLINE citations (ie, abstracts and articles contained in the bibliographic database maintained by the National Library of Medicine) was 11 million as of November 2000, up from 9.2 million citations reported by Hubbs et al [13] in 1998. Approximately 10 years ago, the doubling time of the biomedical knowledge base was estimated to be about 19 years [14]. At that rate of growth, medical knowledge will increase at least four-fold in a professional lifetime. This information explosion demands that physicians constantly update their knowledge base and information retrieval systems in order to provide high quality care to their patients.

Although it may be impossible for most practicing physicians to keep up with new medical knowledge, a realistic goal is to optimize one's skills in information retrieval, assessment, and application to answer patient-related questions. In this article, we briefly review the information needs that are common in an outpatient clinical practice and the types of resources that are typically available to answer patient-specific questions. We then describe our experience using available information resources to answer patient-related questions that derive from our own clinic experience.

Information Needs of Physicians

The study by Covell et al [1] suggested that office-based physicians have 3 main types of questions: those of fact (eg, "What are the side effects of drug x?"), those of medical opinion (eg, "How should a patient with x be managed?"), and those involving nonmedical information (eg, "How is nutritional education arranged for a patient with x?") [1].

Several researchers have sought to further understand the information needs of physicians. In a review of several of these studies, Smith [15] categorized the clinical information needs of physicians in an effort to provide a framework for developing future information systems that will assist doctors in their daily clinical practices (**Table 1**). Smith's review revealed that 1) physicians usually generate at least 1 question per patient, 2) most questions involve therapy, and 3) many questions are complex and include an individual patient component and a component based in a particular area of medical knowledge. As noted by Smith [15], physicians are challenged to link their

Table 1. Categories of Information Needed by Physicians

Type of Information	Sources	Comment
Information about a particular patient	Patient, patient's family, referring physician, rest of health team, patient record, laboratory data	Much of medical practice lies in gathering this information
Data on health and sickness within the local population	Public health departments	This information often is not available on a sufficiently local scale and may be time sensitive
Medical knowledge	Textbooks, journals, electronic databases, many other sources	The challenge is to match the knowledge to the individual patient
Local information on physicians available for referral, etc.	Local sources	This information changes rapidly
Information on scientific, political, legal, social, management, and ethical changes that affect medical practice and physician interaction with individual patients	Diverse sources (local, national, international)	This information is diffuse, often comes from nonmedical disciplines, and is jargon ridden

Adapted with permission from Smith R. What clinical information do doctors need? *BMJ* 1996;313:1062–8.

daily, patient-specific needs for information to the rapidly changing knowledge base of medicine. This challenge is complicated by the fact that physicians' questions often are asked in practice-related terms that make them difficult to answer (eg, "Should I order a tricyclic blood level on this patient?") [1].

The content of patient-specific questions has recently been studied by Ely et al [16], who hypothesized that most clinical questions that arise in primary care practice can be categorized into a limited number of generic question types. Using 2 studies of primary care physicians in office-based settings, the authors developed a list of 10 generic questions (**Table 2**). The goal of this study was to produce a system for classifying the full range of questions that occur in primary care. The authors propose that such a system could be used to identify frequently asked but problematic questions and thus could help authors of information resources create more effective strategies for linking complex patient questions to better answers [16].

Meeting Information Needs

Several information resources are available to assist clinicians in answering patient-specific questions. As to what is commonly used in practice, our review of the lit-

erature suggests that consultations with professional colleagues are the primary method whereby practicing physicians attempt to meet their information needs, followed by printed material—usually textbooks and reference books [1,2,6–8]. The findings from a survey of the information sources used by 103 family physicians in Iowa are fairly representative of the overall results of our literature review (**Table 3**) [7].

A recent study of "portable knowledge" (ie, what doctors carry in their pockets) revealed several items that are commonly carried and considered useful in daily clinical work [17]. Among the individual items that were rated as most useful to have in one's pocket were printed pocket references, such as the *Sanford Guide to Antimicrobial Therapy*, *Pocket Pharmacopoeia*, and *Facts and Formulas*; individually generated listings of telephone numbers; and personal digital assistants.

The reported use of computer-based resources is variable [18,19]. For example, 40% of rural general physicians in the state of Washington reported using MEDLINE [18]; of these users, 70% considered it a valuable tool to answer clinical questions. Most recently, a random sample of Norwegian physicians revealed that 48% use the Internet for professional purposes [19]. A

ANSWERING PATIENT-SPECIFIC QUESTIONS

Table 2. Generic Questions Derived from 1396 Clinical Questions Asked by Primary Care Physicians

Question Type	Rank	No. (%) of Questions
What is the drug of choice for condition x?	1 st	150 (11)
What is the cause of symptom x?	2 nd	115 (8)
What test is indicated in situation x?	3 rd	112 (8)
What is the dose of drug x?	4 th	94 (7)
How should I treat condition x (not limited to drug treatment)	5 th	82 (6)
How should I manage condition x (not specifying diagnostic or therapeutic)	6 th	67 (5)
What is the cause of physical finding x?	7 th	67 (5)
What is the cause of test finding x?	8 th	64 (5)
Can drug x cause (adverse) finding y?	9 th	59 (4)
Could this patient have condition x?	10 th	51 (4)

Adapted with permission from Ely JW, Osheroff JA, Gorman PN, Ebell MH, Chambliss ML, Pifer EA, Stavri PZ. A taxonomy of generic clinical questions: classification study. *BMJ* 2000;321:429-32.

total of 18% of physicians found the Internet to be of great or very great importance for professional updating, and 46% found it to be of some importance; the value of the Internet for answering patient-specific clinical issues, however, was not addressed [19].

Following is an overview of the information resources commonly used by physicians in practice, with a comment on the pros and cons of each for answering patient-specific questions. It is important to keep in mind that no single method to answer clinical questions, including recommendations of acknowledged "experts," is completely reliable [20]. To meet patient-specific information needs in a real-time clinical setting requires establishing a system of office-based resources. Telephone directories, lists of phone and page numbers, and e-mail addresses of frequently used consultants are essential to have close at hand. A well-stocked library of up-to-date print or electronic texts and reference sources also is critical, as is access to MEDLINE and to medical databases. Finally, if space allows, it is helpful to create and maintain a system to locate and quickly recover key articles from the primary medical literature.

Table 3. Information Sources Used by Family Physicians to Find Answers to 399 Questions

Information Source	No. of Times Used (% of total)	No. (%) of Searches That Were Successful
Human (doctor, pharmacist)	161 (36)	127 (79)
Nonprescribing printed information (textbooks, journal articles)	143 (32)	75 (52)
Prescribing text	113 (25)	96 (85)
Printed information posted on walls	17 (4)	14 (82)
Computer application (CD-ROM, Internet)	10 (2)	2 (71)
Total	444 (100)	314 (71)

Adapted with permission from Ely JW, Osheroff JA, Ebell MH, Bergus GR, Levy BT, Chambliss ML, Evans ER: Analysis of questions asked by family doctors regarding patient care. *BMJ* 1999;319:358-61.

Professional Colleagues

Informal consultations, or *curbside consultations*, with professional colleagues are one of the most common methods for physicians to obtain answers to their patient-specific questions. In 2 surveys, generalist physicians estimated that they obtain 3 curbside consultations per week, whereas specialists estimated that they obtain about 1 per week and receive about 4 per week [21,22]. From a consulting physician's standpoint, curbside consultations are timely, efficient, and patient specific. From a consultant's standpoint, these interactions are intellectually stimulating, foster collegial relationships, promote formal referrals, and enhance the standard of care.

In our view, curbside consultations are most helpful when complex patient-specific questions arise, when an unusual question arises and a consultant who is familiar with the issue is available, and when specific information is needed quickly. Curbside consultations are not, however, without potential problems. Lack of compensation and legal liability are 2 significant concerns from a consultant's viewpoint [23,24]. Also, consultants usually feel that the information provided to them is insufficient and lacks relevant details [21,22]. Finally, the quality, relevance, and evidence-based nature of the information provided by curbside consultations have not, to our knowledge, been evaluated.

Print Materials: Books, Journals, Guidelines

Print versions of medical textbooks and references are another common method whereby physicians meet their educational needs. These resources have the advantage of ready availability and familiarity of usage, are generally written by authoritative individuals, and are excellent resources for incontrovertible facts. Disadvantages include lack of timeliness, poor patient specificity, lack of information to meet the educational need, lack of easy transportability, cost, and poorly organized indices.

Print versions of medical journals are less commonly used as real-time sources of patient-specific information but are considered helpful in the global aspects of keeping up with medical knowledge. Journals, which primarily contain research papers, are important for their contribution to evidence-based medicine but are difficult to access and apply at the point of patient care. Medical journals are commonly read and kept on file for future reference and educational use.

Clinical practice guidelines have been defined as systematically developed statements to assist clinicians and patients regarding appropriate health care interventions for specific clinical circumstances [25]. In our experience, 2 factors often limit guidelines as effective tools for updating physician knowledge and facilitating knowledge application at the point of patient care. First, guidelines often are difficult to apply to narrow questions posed about individual patients. For example, guidelines often contain specific management suggestions that may not be compatible with the substantial comorbid conditions that occur in selected patients. Second, physicians may be unaware of or confused by guidelines, given the large number of available guidelines on certain topics and the potential for them to contain conflicting recommendations.

Computer-Based Resources

An increasing number of electronic information resources are available to physicians with computers and Internet access (**Table 4**). These resources can be considered as 4 general types: electronic publications, critically reviewed evidence-based medicine compilations, medical bibliographic databases (MEDLINE), and generic search engines. Advantages of computer-based resources include the ability to obtain timely, clinically relevant information quickly and to utilize extensive sources including critically appraised material [26]. Disadvantages include lack of familiarity with or access to these resources, cost, lack of training in effective literature searching, and time (2 to 30 minutes is needed to consider most questions). The relative mer-

its of several electronic medical information resources for evidence-based practice were recently assessed by members of the Evidence-Based Medicine Working Group [27].

Electronic publications. Table 4 lists several examples of medical textbooks, references, and journals that are available in electronic form (ie, CD-ROM or via the Internet). MD Consult, an "online library," provides access to over 35 reference textbooks, 52 medical journals, and over 600 practice guidelines. Free Internet access to clinical practice guidelines also is available through the National Guidelines Clearinghouse.

Critically reviewed evidence-based medicine resources. Prefiltered evidence-based medicine databases are relatively easy to search quickly, and the information is provided in an abstract form with expert commentary that places the evidence-based conclusion in its appropriate clinical context. This type of electronic information resource has been recommended as an efficient starting point for answering focused clinical questions [27]. Two such resources are worth mentioning.

Best Evidence contains more than 1600 abstracted studies related to general internal medicine, which have been published in *ACP Journal Club* or *Evidence-Based Medicine*. Studies included in *Best Evidence* are judged to be both methodologically sound and clinically relevant. *Best Evidence* is available on CD-ROM and is updated annually.

The Cochrane Library is another method for locating high-quality, critically reviewed evidence. The Cochrane Library is focused primarily on systematic reviews of controlled trials of therapeutic interventions and consists of several databases. Two of these are the Cochrane Database of Systematic Reviews (complete reports for all systematic reviews prepared by members of the Cochrane Collaboration) and the Database of Abstracts of Reviews of Effectiveness (abstracts of systematic reviews published by non-Cochrane members). The Cochrane Library is updated quarterly and available in CD-ROM format or via the Internet. Abstracts of the Cochrane Database of Systematic Reviews are free via the Internet, but to view the complete review article requires a subscription.

Medical bibliographic databases. Large bibliographic database systems such as MEDLINE allow retrieval of original, peer-reviewed research citations. Access to MEDLINE is available free via the Internet (eg, PubMed) and via subscription through several software companies (eg, OVID). Other options for accessing MEDLINE are via selected electronic textbooks that provide references with direct links to

ANSWERING PATIENT-SPECIFIC QUESTIONS

Table 4. Examples of Currently Available Electronic Medical Information Resources

Type and Title	Availability	Description
Electronic publications		
<i>Harrison's Online</i>	www.harrisonsonline.com Subscription	Online version of <i>Harrison's Principles of Internal Medicine</i> with search function and links to related Web sites
<i>Scientific American Medicine Online</i>	www.samed.com Subscription	Online textbook with search function, references linked to MEDLINE citations, and links to related Web sites
<i>Merck Manual of Diagnosis and Therapy</i>	www.merck.com/pubs/mmanual/ Free	Online textbook with extensive table of contents and search function
<i>JAMA</i>	jama.ama-assn.org Subscription	Archive of full-text articles (1998 to present) with search function, references linked to MEDLINE citations, and index of <i>JAMA</i> patient pages
<i>New England Journal of Medicine</i>	www.nejm.org Subscription	Archive of full-text articles (1993 to present) with search function, references linked to MEDLINE citations, and option to build and save an archive of useful articles
<i>BMJ</i>	www.bmj.com Free	Archive of full-text articles (1994 to present) with search function and references linked to MEDLINE citations
Evidence-based medicine resources		
<i>BestEvidence</i>	www.acponline.org/catalogue/ electronic/best_evidence.htm Subscription	Searchable database of abstracts published in <i>ACP Journal Club</i> and <i>Evidence-Based Medicine</i>
Cochrane Library	www.cochrane.org/cochrane/cdsr.htm Subscription	Online library of reference books, journals, and clinical practice guidelines; includes searchable Cochrane Database of Systematic Reviews and Database of Abstracts of Reviews of Effectiveness
Evidence-Based Medicine Reviews	www.ovid.com/products/cip/ebmr.cfm Subscription	Searchable compilation of Cochrane Database of Systematic Reviews, <i>ACP Journal Club</i> , <i>Evidence-Based Medicine</i> , and MEDLINE
<i>UpToDate</i>	www.uptodate.com Subscription	Searchable reference organized according to specialty with quick reference diagnosis and treatment information; references include MEDLINE abstracts
Federal health-related Web sites		
National Guidelines Clearinghouse	www.guideline.gov Free	Searchable index and downloadable collection of clinical practice guidelines
Centers for Disease Control and Prevention	www.cdc.gov Free	Links to publications, software, statistics, surveillance reports, and other medical Web sites

Table 4. (continued)

Type and Title	Availability	Description
Other health-related Web sites		
MD Consult	www.mdconsult.com Subscription	Collection of electronic textbooks, journals, clinical practice guidelines, patient education materials, and drug updates
WebMD	www.webmd.com Subscription	Collection of electronic textbooks, journals searchable via OVID, instructions for setting up a virtual practice, and CME materials
Medscape	www.medscape.com Free	Collection of electronic textbooks, journals, clinical practice guidelines, and CME materials
MEDLINE		
PubMed	www.ncbi.nlm.nih.gov/entrez/query.fcgi Free	Access through the National Library of Medicine to MEDLINE citations
Internet Grateful Med	igm.nlm.nih.gov/ Free	Access through the National Library of Medicine to MEDLINE citations and several other databases (eg, AIDSLINE, BIOETHICSLINE)
OVID Technologies	www.ovid.com Subscription	Access to MEDLINE citations and several other databases (eg, Evidence-Based Medicine Reviews)

MEDLINE abstracts (eg, *UpToDate*) and via electronic libraries that simultaneously search MEDLINE (eg, MD Consult). Searching MEDLINE is probably best reserved for answering very specific clinical questions, but to do so effectively requires careful thought and thorough knowledge of how the database is structured and how publications are indexed [27]. The use of MEDLINE also is not generally time efficient for practicing clinicians; an average of 30 minutes is needed to perform a search [5]. Search filters to help with MEDLINE searching are available and most easily accessed via PubMed as "Clinical Queries."

Generic search engines. We have found the Google search engine to be superb for searching the Internet for medical information. Many clinicians have favorite Internet sites with which they feel comfortable, diminishing concerns regarding the scientific quality of the information available. Several recently developed ethical codes and guidelines for assessing health-related Web sites can help a physician judge the quality and reliability of information provided by a site [28].

Answering Patient-Specific Questions at the Point of Care—Four Patient Examples

How do available information resources measure up when put to the test in real-time patient care? Reflecting on the opening scenario of the house officer and attending physician, we can illustrate some of the methods that we use to help answer patient-related questions. The 4 patients described in the opening scenario are actual patients we recently encountered in our community-based, university hospital-affiliated clinic. About half our clinic is a combined faculty-resident practice; the other half is a faculty practice. At our clinic, we are increasingly using computer-based information resources. We describe our experience using these and other resources available to address the questions raised in the care of our 4 clinic patients.

Patient 1

The clinical question. Recall that the first patient was a 35-year-old woman concerned about being at high risk for breast cancer because of a grandmother who developed the disease late in life. The clinical question

raised by this patient was stated as, “What is this patient’s risk for development of breast cancer?”

The search for an answer. For this patient, we initially consulted a conventional textbook (*Harrison’s Principles of Internal Medicine*, 14th edition, published in 1998). We found a general, not patient-specific, discussion of risk factors for breast cancer.

Subsequently, we tried 3 computer-based resources. Initially, we searched *Best Evidence* for “breast cancer risk.” We obtained 24 citations reviewing individual studies that addressed a wide range of variables and breast cancer risk. Not finding this helpful, we did a Google search for “breast cancer risk.” The search took 0.35 seconds and resulted in 332,000 hits. The second hit provided a detailed, patient-specific tool—the “Breast Cancer Risk Calculator”—developed by an individual physician. This calculator utilized the 6 questions contained in the “Breast Cancer Risk Assessment Tool” developed by the National Cancer Institute (NCI), plus 6 additional risk modifiers. The author clearly noted that his method has not been peer reviewed nor validated. However, his site provided a link to the “Breast Cancer Risk Assessment Tool” for calculating individualized risk assessment (www.bcr.nci.nih.gov/bcr/start.htm). We also consulted *UpToDate* and found several helpful tables, including the “Breast Cancer Risk Assessment Tool” and other information regarding genetic testing.

In short, we found that Google and *UpToDate* provided real-time, useful information to address our patient’s concern about breast cancer risk. Wishing to pursue this area further, we examined a filing system for helpful articles related to primary care issues, which one of the clinic faculty members maintains. We rapidly found a recent review article by Armstrong et al [29] on assessing risk for breast cancer. This article provided an exceptionally detailed and thoughtful analysis of breast cancer risk.

Resolution. Based on all of the information we found, we were able to determine that our patient’s risk for breast cancer was not significantly greater than the risk for an average patient of her age. Some of this information was provided at the time of the patient’s clinic visit and some was provided later, after a careful reading of the article by Armstrong et al [29].

Patient 2

The clinical questions. The second patient was a 70-year-old man with an alcohol abuse problem, who was presumed to have lone atrial fibrillation and who unreliably took coumadin for systemic embolic prophylaxis. Two clinical questions were generated: “What

is this patient’s risk for systemic embolization?” and “What value are antiplatelet agents for preventing systemic embolization in this patient?”

The search for answers. We were unable to quickly locate a medicine textbook from our clinic library. Initially we searched *UpToDate* to review the frequency and risk factors for systemic embolization in atrial fibrillation. We found an overview of atrial fibrillation that had been updated within the preceding 4 months and was reasonably concise (6 single pages). The review was generously referenced and provided clear guidelines for estimating the probability of systemic embolization in our patient. Evidence-based therapeutic recommendations were clearly stated. A referenced section dealt specifically with the efficacy of antiplatelet therapy. After reviewing the data obtained in *UpToDate*, we felt we had enough information with which to construct a reasonably sound clinical plan relevant to our 2 patient-specific questions.

Wishing to verify our information using other databases, we searched *Best Evidence* for “atrial fibrillation” and limited the search to therapy. We obtained 22 references, of which 7 (1 from 1992, 1 from 1993, 4 from 1994, and 1 from 1997) appeared relevant to our case. We then printed and read these sources. This search resulted in a substantially greater time investment (for comparable conclusions) than did the search of *UpToDate*, and it did not result in any change to our treatment plan.

We also searched the Cochrane Library for “atrial fibrillation” with restrictions. Fourteen systematic reviews were identified, including 5 directly related to our patient. Also, 16 quality-assessed reviews directly pertinent to our patient were identified. Succinct summaries of these reviews were read, which essentially confirmed the information found in *UpToDate*.

Out of interest, we did a Google search for the use of antiplatelet agents for atrial fibrillation and found 144 references in less than a half second. The fourth listed reference was to a Web page on frequently asked questions for health care professionals, sponsored by the Northern Ireland Multidisciplinary Association for Stroke Teams. This site offered a 4-page reference section on primary and secondary prevention of stroke in atrial fibrillation and suggested consulting the Cochrane Library. The summary of data on primary and secondary systemic embolization prophylaxis in atrial fibrillation was referenced and accurate but incomplete.

In summary, within the time frame of the patient’s clinic visit, we were able to quickly find several resources

containing information directly related to our 2 questions regarding managing his atrial fibrillation. *UpToDate* was perhaps the easiest and most helpful resource in this particular case. At the end of clinic, we also consulted *Harrison's Principles of Internal Medicine* for information about the risk for systemic embolization. Under the topic "atrial fibrillation," the treatment discussion did not specifically mention this issue. Consulting the index again, we found a brief paragraph on the risk for systemic embolization under "cerebral embolism," which discussed risk factors for cerebral events in atrial fibrillation.

Resolution. For this patient, we were greatly concerned about how to appropriately manage his atrial fibrillation to minimize the risk for stroke. The patient had been repeatedly nonadherent to embolic prophylaxis, despite considerable effort in the past to improve his compliance with coumadin therapy. Considering the patient's high risk for bleeding from coumadin and his estimated low risk for systemic emboli, we elected at the time of his clinic visit to treat him with aspirin alone.

Patient 3

The clinical question. Our third patient came to us with a well-formulated travel medicine question: "What shots do I need to go to Tunisia?"

The search for an answer. Based on our own previous positive experience, we went immediately to the Centers for Disease Control and Prevention Web site (www.cdc.gov), clicked on the traveler's health section, and printed the information regarding North Africa, which had been updated within the previous 2 weeks.

Resolution. We read the printed information with the patient. The 4 pages of material outlined common illnesses encountered in the region, recommended specific vaccines for selected circumstances, provided general health tips, and offered suggestions for how to access additional information. Based on our review of the printed material, the patient was given a hepatitis A vaccination and advised when to return for a booster dose. She gratefully took the 4-page document with her for more careful perusal at home.

Patient 4

The clinical questions. The fourth patient presented the greatest challenge. This patient was a 65-year-old man with polymyalgia rheumatica and biopsy-proven temporal arteritis. He had required moderate doses of systemic corticosteroids to keep his symptoms and ESR under control, and he had recently experienced

2 major complications of this therapy. Together with the patient we formulated 2 questions: "What is the lowest therapeutic dose of corticosteroids the patient can take?" and "Can anything be done to allow the patient to discontinue corticosteroid therapy altogether?"

The search for answers. Based on the complexity of this patient's situation, we first agreed that more information, outside of the clinic visit, would be needed to adequately address his questions. Subsequently, on a day off, we first consulted the "temporal arteritis" section in *Harrison's Principles of Internal Medicine*. We found a helpful overall discussion, but it did not specifically address either of the patient's questions. Next, we reviewed *UpToDate* and found a more helpful, more detailed discussion of temporal arteritis and its treatment, but only limited information directly relevant to our patient. We also reviewed the Cochrane Library. Although information was available, it did not specifically address our patient's issues.

Next, we called a respected generalist colleague we knew had extensive experience with temporal arteritis. Fortunately, he had recently reviewed the literature on the subject. A 20-minute discussion provided substantial specific information. To confirm and extend this information, we also called a trusted rheumatologic colleague. A 15-minute discussion provided additional helpful specific information. In addition, at the time these discussions were occurring, a copy of the *Cleveland Clinic Journal of Medicine* arrived and contained a brief, succinct article on the topic [30].

Resolution. In summary, over a period of 3 days we obtained information that we believed provided reasonable answers to our 2 patient questions. Using the information from the article and 2 curbside consultations, we were able to formulate a new therapeutic plan for our patient. Approximately 1 week after the patient's clinic visit we initiated therapy with a modest dose of oral methotrexate, began a slow taper of the corticosteroids, and scheduled careful clinical and biochemical follow up. We also instituted an aggressive program to treat his osteoporosis.

Tips for Answering Patient-Specific Questions

Two important factors should be considered when attempting to address patient-specific information needs: 1) developing a well-constructed question, and 2) choosing the best resource to pursue the question [26,31,32]. Practical guidelines for developing a well-built question focus on 4 domains: 1) the patient or problem being addressed, 2) the intervention being

considered, 3) the comparison intervention when relevant, and (4) the outcome of interest [26,31,32]. To choose the best resource, consider first whether a phone call or e-mail to a colleague or an organization (eg, medical specialty society) would be the quickest route to an authoritative answer. If not, the most efficient route to an evidence-based answer may be to consult a medical database such as *Best Evidence*, the Cochrane Library, or *UpToDate* (our favorite). If this method fails to provide a satisfactory answer, a MEDLINE search for a relevant medical journal article or a Web search for information perhaps not otherwise published may be necessary.

As illustrated by our 4 clinic patients, the questions that arise in actual clinical practice are diverse in nature, require a varying amount of time to be answered, and may not be entirely answerable on the basis of complete evidence. Although a real-time, evidence-based answer to patient-specific questions is an admirable goal, the complex nature of some questions will prevent uniform realization of this goal. Furthermore, no single information resource will be uniformly helpful for answering patient-specific questions, and a well-constructed network of information resources will be needed.

References

- Covell DG, Uman GC, Manning PR. Information needs in office practice: are they being met? *Ann Intern Med* 1985;103:596-9.
- Gorman PN, Helfand M. Information seeking in primary care: how physicians choose which clinical questions to pursue and which to leave unanswered. *Med Decis Making* 1995;15:113-9.
- Osheroff JA, Forsythe DE, Buchanan BG, Bankowitz RA, Blumenfeld BH, Miller RA. Physicians' information needs: analysis of questions posed during clinical teaching. *Ann Intern Med* 1991;114:576-81.
- Sackett DL, Straus SE. Finding and applying evidence during clinical rounds: the "evidence cart." *JAMA* 1998;280:1336-8.
- Gorman PN, Ash J, Wykoff L. Can primary care physicians' questions be answered using the medical journal literature? *Bull Med Libr Assoc* 1994;82:140-6.
- Green ML, Ciampi MA, Ellis PJ. Residents' medical information needs in clinic: are they being met? *Am J Med* 2000;109:218-23.
- Ely JW, Osheroff JA, Ebell MH, Bergus GR, Levy BT, Chambliss ML, Evans ER. Analysis of questions asked by family doctors regarding patient care. *BMJ* 1999;319:358-61.
- Ely JW, Burch RJ, Vinson DC. The information needs of family physicians: case-specific clinical questions. *J Fam Pract* 1992;35:265-9.
- Gorman PN. Information needs of physicians. *J Am Soc Inform Sci* 1995;46:729-36.
- McColl A, Smith H, White P, Field J. General practitioner's perceptions of the route to evidence-based medicine: a questionnaire survey. *BMJ* 1998;316:361-5.
- Feinstein AR, Horwitz RI. Problems in the "evidence" of "evidence-based medicine." *Am J Med* 1997;103:529-35.
- McAlister FA, Graham I, Karr GW, Laupacis A. Evidence-based medicine and the practicing clinician. *J Gen Intern Med* 1999;14:236-42.
- Hubbs PR, Rindfleisch TC, Godin P, Melmon KL. Medical information on the Internet. *JAMA* 1998;280:1363.
- Wyatt J. Use and sources of medical knowledge. *Lancet* 1991;338:1368-73.
- Smith R. What clinical information do doctors need? *BMJ* 1996;313:1062-8.
- Ely JW, Osheroff JA, Gorman PN, Ebell MH, Chambliss ML, Pifer EA, Stavri PZ. A taxonomy of generic clinical questions: classification study. *BMJ* 2000;321:429-32.
- Lynn LA, Bellini LM. Portable knowledge: a look inside white coat pockets. *Ann Intern Med* 1999;130:247-50.
- Chimoskey SJ, Norris TE. Use of MEDLINE by rural physicians in Washington state. *J Am Med Inform Assoc* 1999;6:332-3.
- Nylenna M, Aastand OG. Physicians' Internet activities and their perceived coping with the medical information. *Medscape Gen Med* 2000;2(1). Available at: www.medscape.com/medscape/GeneralMedicine/journal/2000/v02.n01/mgm0107.nyle/mgm0107.nyle.html. Accessed 13 Nov 2000.
- Antman EM, Lau J, Kupelnick B, Mosteller F, Chalmers TC. A comparison of results of meta-analyses of randomized controlled trials and recommendations of clinical experts. Treatments for myocardial infarction. *JAMA* 1992;268:240-8.
- Kuo D, Gifford DR, Stein MD. Curbside consultation practices and attitudes among primary care physicians and medical subspecialists. *JAMA* 1998;280:905-9.
- Keating NL, Zaslavsky AM, Ayanian JZ. Physicians experiences and beliefs regarding informal consultation. *JAMA* 1998;280:900-4.
- Golub RM. Curbside consultations and the viaduct effect. *JAMA* 1998;280:929-30.
- Block MB. Curbside consultation and malpractice policies [Letter]. *JAMA* 1999;281:899.
- Field MJ, Lohr MJ, editors. *Clinical practice guidelines: directions for a new program*. Washington (DC): National Academy Press; 1990.
- McKibbon KA, Richardson WS, Walker Dilks C. Finding answers to well-built clinical questions. *ACP J Club* 1999;6:164-7.
- Hunt DL, Jaeschke R, McKibbon KA. Users' guides to the medical literature. XXI. Using electronic health

- information resources in evidence-based practice. Evidence-Based Medicine Working Group. *JAMA* 2000;283:1875-9.
28. Crigger B-J, Callahan M. Patients, physicians, and the Internet. *Semin Med Pract* 2000;3(3):9-16.
 29. Armstrong K, Eisen A, Weber B. Assessing the risk of breast cancer. *N Engl J Med* 2000;342:564-71.
 30. Wilke NS: What is the appropriate initial dose of corticosteroids to treat giant cell arteritis? *Cleveland Clin J Med* 2000;67:546-8.
 31. Badgett RG. How to search for and evaluate medical evidence. *Semin Med Pract* 1999;2(3):8-20.
 32. Booth A, O'Rourke AJ. Searching for evidence: principles and practice. *Evidence-Based Med* 1999;4:133-6.

Copyright 2000 by Turner White Communications Inc., Wayne, PA. All rights reserved.