The Information Behaviours of Physicians: 
Implications for Digital Reference

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The role and status of physicians has increased immensely in recent times as individuals and populations live longer and healthier, yet are increasingly concerned about their health and quality of life. Physicians, for right or wrong, are seen as the pinnacle of the systems that contribute to health and well-being so their decisions are of utmost importance. Of course, these decisions are based on information, so the ways physicians perceive, gather, and use information have serious health and wellness ramifications. Physicians’ information behaviours have been (and are) studied extensively so there is a vast literature available that mostly condenses to a few essential points: physicians are individuals yet have some common information behaviour traits, they are barraged by information but have limited time to deal with it, and they prefer familiar and human sources to get information. While these are not unlike the information behaviours of any other group or individual, physicians and the health care system deal with higher and more immediate stakes than most: sickness-or-health, life-or-death.

Background and Definitions

The subtleties of humans interacting with information, and indeed the concept of information itself, occupy philosophers, theorists, and researchers both out of curiosity and because these interactions are essential to human existence. From this voluminous literature with a myriad of terminological twists and distinctions, Donald Case presents a few simple, base-line definitions:

- **Information** is any perceived difference;
- **Information need** is a recognition that knowledge is inadequate;
- **Information seeking** is a conscious effort to acquire information; and
- **Information behavior** is the “totality” of all information interactions from unintentional and passive encountering to active seeking; avoiding information is also included here (Case 2007, 5).
There are many other terms and concepts related to information behaviour (e.g., decision making, relevance, pertinence, salience, selective exposure, browsing, serendipity, information poverty, and information overload) that may be used in this paper but not necessarily defined; the reader is referred to Case’s excellent book to help sort them out if their sense is not readily apparent.

Information retrieval is explicitly not covered by Case who feels it has an abundant literature of its own and is really “more about documents (or computer records) than it is about people” (Case 2007, 145). Nevertheless, his glossary defines it thus:

- **Information retrieval** is searching in documents for information, searching for the documents themselves, searching for metadata about documents, or searching using databases (Case 2007, 333).

The above definitions might indicate a clear distinction between seeking (i.e. motivation) and retrieval (i.e., the process of getting), but, in reality, there is much overlap and the two can often not be separated. As to general motivations for seeking information, it is useful to imagine a continuum from “subjective” where information is needed to solve a specific problem, to objective which represents a “vague sense of unease …or anxiety” about lacking some sort of knowledge that might be useful (Case 2007, 76-7).

**Information Behaviours of Physicians**

Academics (especially scientists) have been the main occupational group studied by information behaviour researchers but the interest in physicians has increased significantly in the past few decades for several reasons. Increasing affluence in many societies has happily led to longer life and the elimination of many historic health problems but, at the same time, has created or revealed other health care problems such as obesity, heart disease, and drug abuse. The above combination has resulted in higher quality of life expectations which put greater demands on healthcare systems and providers to give the most up-to-date care and information. Additionally, the creation and demand for health related information has increased exponentially both within the medical field and the general population leading to increasing difficulty in keeping up with the barrage of information being produced. Physicians, often considered the highest-profile health care providers, have attracted much interest from information behaviour

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1 Ironically, the subject index to his book includes the phrase “information retrieval” and refers to 11 pages although the actual phrase only appears on three pages.
researchers who categorise their two basic concerns as: patients’ conditions and keeping abreast of medical research to address those conditions (Case 2007, 265).

Physician Context

Although the information needs of physicians can often be generalised, it is important to remember that this is not a homogenous group. Physicians conduct their business in a variety of settings from small private practices with close personal patient-doctor relationships and medical records close at hand, to collaborative clinics, to a variety of hospital settings where colleagues to consult are nearby and research or teaching likely occurs, as well (Gorman 1995, 732). Also, the variety of national medical systems with different degrees of privatization and insurance coverage could affect physicians’ information needs greatly; for example, the National Health Service in the UK (and each provincial system in Canada) is very different from the USA where most information behaviour research takes place (Davies 2007, 79). Additionally, physicians themselves are not a homogenous group with general practitioners, specialists, residents, and medical students likely having different information needs that are compounded by influences of education, community, and even personality. In other words, although many librarians and other information specialists assume the information needs of physicians are clinical only, like any other profession or information seeker, their needs are actually varied (Davies 2007, 79).

Physician Information Needs

The heterogeneity of physicians and their information behaviours is a reminder that good reference service must acknowledge the context and situation of the each user. There are, however, several useful generalizations about physicians that can inform reference provision in a practical sense. One categorization of physician information needs is foreground and background questions. Foreground questions relate directly to a patient’s case and include information needed to make a diagnosis, prescribe a treatment, or make a prognosis while background questions represent general information about diseases which may or may not be used directly when dealing with a patient. Another categorization is into medical facts (e.g., side effects of a certain drug) as opposed to medical opinion (e.g., patient management) and non-medical information needs (Davies 2007, 83).
Gorman (1995) devised a more thorough taxonomy of physician information needs based on a review of research and separated them into five types of “information used” and four types of “information needs.” Actually, Gorman’s category of “information used” equally represents “needs”; nonetheless, his five information-used types are:

- **Patient data:** information specific to one patient including medical history, observations, or test results. This information is typically obtained from medical records, patient’s self-reports, and from friends and relations of the patient;

- **Population statistics:** information about the health or illness of larger groups that helps with diagnosis of an individual (e.g. “there’s a flu going around” or that certain populations are more susceptible to a given illness). These are typically obtained through medical journal literature but could come from local sources like news reports. This has major potential for electronic resources;

- **Medical knowledge:** information that is generalizable to all patients. It comes from original research, systematic reviews, standard textbooks or handbooks, or through the experience of the physician and colleagues;

- **Logistic Information:** local policies, procedures, and resources that inform “how to get the job done.” These could be forms, lists of medicines on-hand, and directories of referral agencies. This is obtained from administrative staff or colleagues;

- **Social influences:** the expectations of the community (patients, administrations, colleagues) about how things should be done. This is rarely captured in any formal way and is gathered informally (Gorman 1995, 730).

Other reasons for seeking information (i.e. a need exists) are to confirm what is already believed to be true by the physician and thus raise their confidence, pure curiosity with no immediate impact or use, or general background knowledge that may later be used in treating a patient (Davies 2007, 83; Gorman 1995, 734).

Whatever ways information needs can be broken down, research shows physicians mostly need information related to clinical treatment and patient care (Gorman 1995, 734) which would include information on treatments or therapies, diagnoses, and drug-related information for prescriptions and dosage (Davies 2007, 82).
Seeking and Retrieval

Gorman’s four information needs below lead nicely into a discussion of information seeking:

1) **Unrecognised needs** are not realized or recognised by the physician but can have large impacts on treatment. There is potential here for the use of automated reminder systems and diagnostic decision support systems because the physician would not even know to search for these needs.

2) **Recognised needs** are articulated by physician as something needing further investigation although not always followed up.

3) **Pursued needs** are recognised needs that are followed up.

4) **Satisfied needs** are recognised and pursued needs where answers or solutions are found (Gorman 1995, 731-732).

Several attempts have been made to quantify the information needs of physicians. Several researchers estimate the number of questions generated from a typical patient consultation either through observation or physician self-reports but show a vast range from one question for every 15 patients to five questions per patient; the discrepancies are all in the definitions and the context. Some studies tried to include unrecognized question types but this is problematic because they are unrecognized and thus only obtained by later reflection or third-party observation and judgment. Not surprisingly, the number of questions actually pursued is much less, maybe half or one-third (in Case 2007, 267).

Information Challenges

There are many challenges to physicians seeking and retrieving information. The most reported is a lack of time whether that time frame is “immediate” or “less immediate.” Immediate information needs arise, for example, during a patient consultation or emergency situation while less-immediate needs might arise during morning rounds, case consultations, or discussions with colleagues. Somewhat worryingly from a quality of care perspective, many physicians believe they only have time for “quick and dirty” searches that are useless for a patient consultation if it takes longer than 2 minutes. Even library professionals and informaticists who know the tools and literature well are not often able to find relevant information within the time “usually devoted to a single patient appointment”; if the search takes
longer than 2 minutes, “it will not produce information suitable” for a patient consultation (Davies 2007, 85-86). Compounding the time element is the physical distance from resources even where they exist within an institution but in another wing or building not near the point-of-care (McShea 2006, 104).

The wide range of time requirements to answer a question is partly due to the complexity of medical information needs. Some information needs are simple (e.g., finding a drug dosage) while some are extremely complex, such as conducting a literature search to find evidence-based medicine (EBM) resources (Davies 2007, 84). Furthermore, clinical questions around diagnosis are even more complex in that they are unique to each patient and communicated through a narrative of symptoms and treatment history, thus implying they cannot be solved with just a list of conditions and treatments taken from a handbook or database (Gorman 1995, 734).

Physicians’ skill level and confidence are another challenge for their information seeking and retrieval. Physicians are generally not trained to search literature and inexperienced users use “inappropriate search terms, inappropriate databases, incorrectly spelt terms, inappropriate connectors, and brand drug names rather than generic.” This lack of skill is compounded by the required information being “scattered among thousands of journals, textbooks, monographs, reports, and guidelines … many of which are not electronically indexed (Davidoff and Florance 2000, 996). Exacerbating this is the many physicians who believe that if they cannot locate information, it does not exist; they do not consider the possibility they might be using an ineffective search strategy (Davies 2007, 85) or fail to understand the complex structure of the published evidence (Shipman 2007, 335). Ironically, this complex structure is intended to make access to published literature if not easier, at least more consistent.

Information overload is not insignificant. Physicians may start with too little information yet “quickly become inundated, often with irrelevant or unreliable information” (Davies 2007, 82). There is no shortage of medical information but much of it is useless and inaccessible. Billions of dollars are spent on clinical tests (often “unnecessary or inappropriate”) but very little is spent on transferring the “rich, sophisticated knowledge from the medical literature to the bedside” resulting in less than optimal patient care and a waste of the “effort, creativity, and money that go into biomedical research” (Davidoff and Florance 2000, 996-997). Compounding this is that researchers fail practitioners in several ways including “publishing in the wrong
journals ...measuring the wrong outcomes ... [and] most importantly, asking the wrong questions (Booth 2001, 130).

In short, many physicians acknowledge the value of evidence-based medicine but “the lack of time to search, appraise, and discuss the implications of evidence with patients was a significant barrier” (Magrabi, Westbrook, and Coiera 2007, 702) and they will often refer a patient elsewhere rather than search for information (Davies 2007, 86).

Physicians’ Information Sources

So, if physicians do not search for information due to a lack of time, lack of search skills, physical inconvenience, complexity of needs, or an inundation of information, where do they get their information? It appears that libraries and internet resources are largely ignored in favour of “textbooks, drug texts, and people (colleagues, consultants, and nonphysicians) with a strong preferences for colleagues and other highly familiar sources” (Case 2007, 267). For the most part, treatment information comes from the patients’ medical records although physicians will confer with colleagues and read journals or textbooks to keep up-to-date. It should be noted that data indicating a low use of computers is partially due to studies conducted before computers and the Internet came into such widespread use; nonetheless, even in 2005 computers were still less consulted than textbooks and colleagues (Davies 2007, 87-8).

One informal study looked at what books medical student and residents carry in their pockets. In general, there were general handbooks, medication prescription tables and formulas, chart and data interpretation on patient vitals, as well as quick-guide reminders to surgery and emergency situations. It is suggested these are essential for any medical library as test copies and for physicians to borrow when they forget their own copies. Such books need to be light, well-indexed, and information dense (Schott 2007, 47-55) and may be offered for download to handheld computing devices or PDAs.

Above all, physicians prefer human sources for information. Affectively, they serve a “need for commiseration, affirmation of professional relationships.” Additionally, “facts” such as found in textbooks and journal literature are often sufficient except when “higher-order information, such as confirmation, explanation, analysis, synthesis, and ultimately judgment” is required that goes beyond facts and requires context. Sometimes what physicians need is not “information relevant to a query, but an answer to a patient care problem” (Gorman 1995, 734).
Digital Reference for Physicians

Physicians require information at the point of clinical need both spatially and temporally. A well-stocked library that is physically distant or cannot offer timely answers is not very useful. Four solutions to this have been noted in the literature: desktop internet access, specialized electronic resources, PDAs, and clinical librarians.

Internet

The internet is often touted as an efficient means of making up-to-date information available in a timely way that will “improve information seeking within the time constraints of a busy clinical setting.” However, variations in usage uptake (i.e., lower than expected) might relate to “patient load and casemix; frequency of clinical questions; access to colleagues and other … clinical information; lack of time to use the system, lack of experience with online systems and expertise in searching; and access difficulties” (Magrabi, Westbrook, and Coiera 2007, 702). There are other significant problems with desktop internet access including physicians’ lack of familiarity with evaluating internet sources, not understanding the difference between search engines and databases, and that suitable resources are scattered in many different sites. The internet may be an “excellent dissemination tool” but general search engines will not bring up the most authentic information and require significant effort and skill in evaluating for the best (Davies 2007, 89-91).

Several options to address these issues hold such promise on the surface; electronic newsletters, push technologies, and RSS feeds ensure the most up-to-date information is brought to physicians’ attention. While these may address the issue of lack of time to search or develop search skills, any benefit may be negated by the contribution to information overload so common these days.

Specialised Electronic Resources

Another strategy is to create authoritative collections of information that alleviate the evaluation and multiple-search burdens by presenting pre-evaluated information in one product. As Davies notes, this is where filtered evidence sources such as the Cochrane Library and MEDLINE “come to the fore”; the Cochrane Library provides the “best evidence (systematic reviews) in a usable and understandable format” while MEDLINE has unevaluated information
that can be time consuming to work through (Davies 2007, 85). There are many, many options in this category so only a few are considered below.

The Cochrane Library claims its reviews “represent the highest level of evidence on which to base clinical treatment decisions” and also includes “other sources of reliable information” to provide “all the current evidence in one single environment” (Wiley Interscience). This may be true but whether it is accessible is another matter. There are several ways to search for information: by topic, new reviews, updated reviews, A-Z listing, by review group, a MeSH (medical search headings) thesaurus, and a search engine. The A-Z listing is unwieldy, even under “A” there are several hundred titles in a long scrolling list. The “New Reviews” list is similarly long with no real apparent use other than curiosity since it would not cover all the options in a given topic. The likely access methods are “by topic,” a search engine, or through a MeSH thesaurus search. The search engine is very direct but does requires familiarity with terminology and the structure of the Cochrane Library database; the MeSH search and topic search offer contextual clues but require more time to drill down through various topic layers.

An exploratory search “by topic” shows there are about 50 broad topics (e.g. acute respiratory infections, drugs and alcohol) each of which indicate how many reviews are available therein (from 14 to 416). Finding the reviews through several topic layers takes time (tens of seconds each depending on the network connection) and might end in little or no information. For example, Eyes and Vision (123 reviews), narrows to 20+ sub-topics from where Eye Injuries (3 reviews) narrows to Trauma (3 reviews) which narrows to Hyphaema (1) and Corneal abrasion (2) which, in turn, has a review on “patching for corneal abrasion” and a protocol for “topical non-steroidal anti-inflammatory drugs for treating traumatic corneal abrasions.” While the review on “patching” does provide useful information when eventually reached (i.e., eye patches are not recommended), there are several annoying steps along the way: there were several topics listed with no reviews, some subtopics had the same number of results as their parent topic (i.e., an unnecessary division), and protocols only indicate that a topic is being considered but provide no useable clinical information.

The Cochrane Library is a powerful tool that should be included in any medical digital reference collection if possible, but it is not free. Some jurisdictions have negotiated free access to all residents (e.g. Norway) or public library patrons (e.g., New Brunswick) while residents of
many low-income countries can get free access. Paid access appears to be a complex calculation based on institution type, number of potential users, and which components are desired. For illustrative purposes, an academic institution with 30,000 faculty and students that wanted all components would pay over $200,000 per year while a single site license for one concurrent user would be about $650 per year.

MEDLINE is a bibliographic database from the US National Library of Medicine that references and indexes journals in the life sciences, especially biomedicine. Access to this database is free through PubMed (which includes value-added information) or, confusingly, through subscription-based aggregators such as OVID. Continuing the example from above, searching “corneal abrasion” on the OVID version results in over 500 journal article hits; even limiting to EBM reviews (evidence based medicine) results in 17 hits. Gleaning diagnostic or treatment information from these articles requires time and effort because they are not pre- evaluated or systemically reviewed in this product.

QuickClinical provides search filters relating to typical clinical queries such as “diagnosis” or “prescribing” by selectively searching high quality resources and ensuring that only the most relevant evidence is retrieved (Magrabi et al. 2005, 1). It is a project of the University of New South Wales Centre for Health Informatics who have designed it with the goal of creating a tool that makes clinicians “more likely to search, and when they do search, are more likely to find information which changes their practice.” It is currently under evaluation in the UK for use by the National Electronic Library for Health and the BMJ publishing group (UNSW, Centre for Health Informatics, www.chi.unsw.edu.au/CHIweb.nsf/page/QuickClinical).

Not mentioned in articles cited in this paper but recommended on the University of Alberta Library Health Science resource guide page are such resources as BMJ Clinical Evidence and AccessMedicine. The former is similar to Cochrane Library in offering systematic reviews on the current “knowledge and uncertainty about the prevention and treatment of clinical conditions” without making specific treatment recommendations because “evidence should be individually interpreted, rather than applied across the board.” Their tagline seems to be, ‘we supply the evidence, you make the decisions’ (BMJ Clinical Evidence: About Us, http://clinicalevidence.bmj.com/ceweb/about/index.jsp). AccessMedicine is an “innovative online resource providing students, residents, clinicians, and researchers with instant answers to clinical questions from the most trusted sources”; its diagnostic tool (diagnosaurus) searches by
Despite the range of such electronic resources (or perhaps because of it) none are comprehensive or efficient enough for physician satisfaction and widespread uptake. Indexing is far from ideal and searching is “complex and arcane” so searches often return either no hits or “avalanches of irrelevant citations” (Davidoff and Florance 2000, 997). Like every information seeker, physicians would “prefer to utilize one authoritative source, rather than search several information sources” (Davies 2007, 91). The reality is that patient situations are unique if not in the actual illness or conditions, certainly in the narratives offered by the patient. Some suggest that medical decision systems could utilize features common in the humanities for information seeking and retrieval (in Case 2007, 268-9). Above all, information providers must fight their inclinations and remember that an “abundance of relevant information may be of little use; a small amount of the right information is most appropriate” (Gorman 1995, 734).

PDAs

PDAs (personal digital assistant), also known as handheld computing devices, are another technological solution to delivering “medical information at the true point of clinical need” and have been adopted by many individual physicians as well as promoted by various libraries in medical settings. PDAs promise portable access to various specialized products including adaptations of desktop resources, journal articles, and whole reference books in a pocket-book-sized machine that can be used anywhere. Libraries can develop specialized local content, provide instruction in PDA use and configuration and even install library-purchased resources (Martin, Arndt, and Rana 2006, 84).

Images of physicians reaching into their pockets and quickly answering any query are attractive but there are several problems including an apparent two-year obsolescence cycle, the need for labour-intensive, small-group training sessions, high expectations for support and consultation from users, copyright and security issues around locally produced content, and the cost of producing material especially formatted and written for a very small screen (Martin, Arndt, and Rana 2006, 88-90). In addition, there are questions over ownership when the machine owner and content owner are not the same (e.g., hospital supplies PDA but user has to pay for adding content to a machine they do not own) as well as who repairs and re-installs content when
the PDA goes down (Schott 2007, 47-55). Again, the issue of too much information arises even within the context of the University of Alberta Library system. The health sciences resource page offers a link to PDA available resources conveniently grouped by category (e.g. Medical Books, Drug References, Calculators, Clinical Decision Rules and Practice Guidelines, etc) and further divides these into free and for purchase. However, there are tens if not hundreds of options with little annotation: again, overwhelming!

Clinical Librarians

Given the preference of physicians for human sources, their lack of search training, the wide array of information source options with complex organizational schemes, and the short amount of time physicians have to solve any given patient problem, a librarian or information specialist close-to-hand, if not embedded in clinical teams, seems a brilliant solution.

Many hospitals have excellent library facilities that are not conveniently located to patient-care areas and so get little use. Some have tried putting satellite search stations with printers in clinical areas but found these are not effective if they are not maintained and no one is available to answer questions (McShea 2006, 107). It seems obvious but the idea of putting a librarian or information specialist right into the clinical care area is quite new. In 2000, a new health professional called “informationist” was proposed (n.b. the basic concept was not completely new). Informationists could provide point-of-care information retrieval services based on their thorough training in “basic medical concepts, principles of clinical epidemiology, biostatistics, critical appraisal” as well as the information skills of “retrieving, synthesizing, and presenting medical information” (Davidoff and Florance 2000, 997). The advantages are in providing up-to-date information and answers to questions that might otherwise go unanswered as well as educating physicians and other clinical care staff on information seeking and retrieval techniques.

One hospital library identified the following roles and responsibilities for a clinical librarian:

- provide evidence for clinical care (or be a liaison for finding it);
- attend clinical rounds, reports, and meetings to be apprised of topics needing supporting evidence;
- conduct evidence-based literature searches;
- create new information products to allow quick access to relevant information;
- teach information retrieval skills (McShea 2006, 106).
There are several challenges to the implementation of clinical librarians including a need to understand specialized terminology, physicians reluctant to ask questions, and physicians fearing a challenge to their rank and authority. Indeed, possession of highly specialized, complex knowledge lies at the heart of physicians' identity, a principal source of their power and prestige. But even as physicians seriously underuse that knowledge, they seem to feel the need to control it completely (Davidoff and Florance 2000, 997).

Another challenge comes from within the library community; after 6 years of meetings, task forces, and consultant reports, it seems all that has been accomplished is deciding on a new name for the concept (i.e. Information Specialist in Context or ISIC) and a lengthy report still “envisioning” the concept that will be subject to much more dissection and discussion (Shipman 2007, 335-339). Fortunately, there have been some “early adopters” who have discovered that many of the challenges can be overcome if there is a “champion” among the physicians who will advocate for the service and promote its benefits, by taking every opportunity to become familiar with the terminology and needs (and personalities) of clients, and by proving the value as often as possible through actions and evidence such as statistics (Mc Shea 2006, 106-109).

**Organising Digital Reference Services and Reference Interviews**

Many of the characteristics and challenges of physicians’ information behaviours have been outlined above and could be grouped under four, oversimplified headings: non-homogeneity or diversity, barrage of information, time constraints, and a preference for the human and the familiar. In considering the implications for digital reference services, it must be noted that “digital reference” can refer to two quite separate operations: the acquisition, access, and organization of digital resources as well as the interaction between client and information provider through a digital medium (i.e. instant messaging, email) also known as virtual reference. For the purposes of this section, digital reference services will refer to the provision and organization of digital sources, not virtual reference per se as the virtual reference aspect will be considered a form of reference interview.

Furthermore, many principles of organizing digital reference services and conducting reference interviews go hand-in-hand. Just as a good reference interview identifies the client’s needs and logically proceeds to providing relevant sources, a well-organized digital reference
service will anticipate the needs and organize resources in such a way that various clients can access them logically. Furthermore, reference interviews (in-person or virtual) will utilize the digital sources usually through the same interfaces as the client.

Non-homogeneity or Diversity

Perhaps the most important of the four considerations (i.e. diversity, information barrage, time, and human preference) in this context is diversity. Neither digital reference services nor interviews can assume that all physicians have the same information needs, skills, preferences nor indeed have similar personalities. This implies a variety of services, resources, and search methods are necessary. The most important task is to know the users that are being served or targeted either through personal contact or user surveys in various forms.

Digital sources and information provider expertise exist to satisfy all five basic physician needs (i.e. patient related, population related, medical knowledge, logistics, and social). There are tools for managing patient records and understanding their social networks, a plethora of popular media sources (e.g., local newspapers, television, podcasts) to keep up-to-date on general health trends and local outbreaks, endless textbooks and journals with medical information, untold forms and handbooks and policy documents specific to the local institution, and ways of creating networks and spaces to encourage collaboration). Digital services and reference interviewers need to keep on top of all of these and provide the mix appropriate to their users.

For digital resources, this means designs that offer a variety of search options, highlight the right tools, and give terminological support, synonym expansion, or spell checks. In particular, it is recognition that the domain knowledge of individuals (i.e. familiarity with the topic in question) governs their effectiveness with different search methods; search engines require high domain knowledge because they do not offer the clues and context of alphabetic or content-organised lists (Kralisch and Berendt 2005, 244). This also implies going beyond the mere provision of options and actually drawing attention to the different resources and searching methods either through the layout of the digital services screens or during a reference interview. It should be noted that alphabetic lists become unwieldy very quickly as the number of options increases. Obstacles to achieving the full range of variety and diversity are the information barrage, time constraints, and physician confidence (i.e. arrogance).
Information Barrage

As wonderful as it would be to offer every possible option, information providers must remember that an abundance of relevant information may be of little use compared to a small amount of the right information. Dealing with this information barrage is tricky both in providing digital sources and reference interviews. Fortunately, studies have shown that physician needs can be broken down in to two broad categories (although there are different pairs): foreground and background, diagnostic and background knowledge, medical fact and medical opinion, immediate or less-immediate. Whatever the pair, the essence is determining immediately whether the need relates to patient care or is general background information. In a reference interview this can be questioned at the start, in providing digital reference service, resources could be separated into these two groups. Studies mentioned above show that the majority of physician information needs relate to patent care with treatment/therapy and diagnosis most sought and drug information a distant third; resources relating to these topics must be most prominent or suggested first. As well, queries can be separated into simple, one-concept queries (e.g., drug dosage) and complex evidence-based literature searches (e.g., are eye patches a beneficial treatment for a corneal abrasion?) so this could be another useful division.

Another challenge to providing targeted, relevant information is that there is no one perfect information resource and there is so much competition between sources to capture share in the multi-billion dollar health information market. New products come out almost daily that promise to fill a gap or present information in more useful ways. Information providers strive for completeness but this is inversely related to efficiency; many products overlap coverage or bundle not-so-useful information to bulk up their product. Digital services and reference interviews must strive to cut through the clutter and cut to the chase (as it were) in not providing everything but somehow offering the best up front with supplementary access to duplicate sources if necessary. Again this contradicts trying to provide diversity but it does complement attempts to address the time constraints faced by physicians.

Time Pressures

Physician information needs have been characterized as either “immediate” or “less-immediate” with little mention of anything resembling long term or “back burner” or “get back
to me when you find something.” In the reference interview context, this means recognizing the urgency of many questions; determining the urgency at the start of an interview would be good practice (if physicians will answer honestly and not try to “play” this system). Digital resource services can achieve this by offering quick guides that are truly “quick,” not a strategy to grab attention. As mentioned above, one could divide digital sources into categories by typical urgency or by having a main page with only one (excellent) option for each type of question or topic and link to all the variations and alternatives through a message something like “need more options?”

Many physician questions have been identified as very simple one-concept queries that physicians can easily be taught to do on their own through a reference interview contact or can be answered through resources downloaded to a PDA. Here again, the essence is to provide the best source, not all the sources that, together, would provide every answer to every question. Some have suggested that automatic dissemination through push technologies such as RSS feeds can ease the time pressure of keeping up-to-date; however, this quickly runs into the information barrage issue.

Time pressures are exacerbated by the physical or temporal distance between the physician or point-of-care and the information sources often open only during “regular hours” or on a computer in an inconvenient location. Offering digital resources on physician’s desktop computers or PDA’s are obvious solutions if their information skills are high. However, given the preference of physicians for human sources, perhaps information providers in a medical setting must adjust their work schedule expectations and accept the challenges and benefits of shift work.

Preference for Human Sources

Physicians prefer, and rely on, human sources for information be it patients (and their families and friends) describing their symptoms through complex narratives or colleagues providing the benefit of their own medical or institutional logistical expertise. There is no reason why information providers can not be embedded into this system but there are challenges, mostly around credibility. As noted above, physicians tend to be (or think they are) the pinnacle of the health care system whose credibility is based on their command of information; they are not easily convinced to abdicate any of that power. Similarly, information providers (e.g., librarians)
are wont to over-estimate their importance and bemoan the information (il)literacy of others. It is a tricky balance to establish one’s value and credibility yet not be perceived as arrogant or a threat. Clinical librarians or Information Specialists in Context (ISIC) have been well-received by clinical teams if they make an effort to be part of the team by proactively keeping abreast of information needs and fitting into the culture of the team. It does take a lot of effort to promote information services so there must be commitment to backing up the promotion whether through adaptive work schedules, proactive information provision, or on-going individual service.

**Brief Case Study: University of Alberta Library, Health Sciences Resources**

Although the University of Alberta Library obviously serves a broader clientele than just physicians, a quick look at resource page for health sciences (http://www.library.ualberta.ca/subject/healthsciences/index.cfm) illuminates several points made above. It seems there is a wide variety of information available on many topics but the choices are overwhelming. A user would have to spend considerable time navigating through this page (and all the connected pages) to become familiar. At the very least, the first page could be simplified into a few sections by most immediate needs (e.g. diagnostic tools and calculators, evidence based medicine) and by typical user groups (physicians, students, researchers). In this case, overall importance or prestige would be trumped by time factors; information needs that must be satisfied immediately should take precedence because these users are not willing to spend valuable time figuring out where to look. Also, the “Databases-Try These First” has an almost duplicate listing at the top (i.e., MEDLINE is within PubMed); unless there is a very good reason for offering the same database (e.g., one is through OVID), the better option should be chosen.

The QuickStart Guides on the left are a confusing jumble. The captions are too long yet not descriptive enough; there is no need to repeat “QuickStart Guide to Searching” for several entries, nor are two categories needed for PDAs. This whole section could be organized into a few topics (e.g., Health Sciences Resources, PDA, Database Selection and Searching, Useful Sites, Citation Managers). The “Make an Appointment with a Librarian” link does not link to a health science librarian directly but leads to a page where all disciplines are listed and uses different titles than on the main health sciences page. Furthermore, all the options seem to lead to the same form no matter which area of study is chosen.
The University of Alberta Libraries, Health Sciences research page is a good example of a bad digital collection resource guide which needs much reworking to address issues of diversity, information barrage, user skill and familiarity, and human contact. These four issues are identified in this paper with respect to physicians but actually apply to all users so such a redesign would be useful.

Conclusion

Physicians’ information needs and behaviours are not necessarily unique but do have distinctive features amplified by the nature of the profession. They are a heterogeneous group, they are faced with a barrage of information but limited time to shift through and utilise it, and they prefer human sources of information. There are some traits distinctive to the group that can inform digital reference source provision and reference interviewing. For instance, their decisions can have serious life-or-death and sickness-or-health ramifications but their choices have to be made under severe time constraints with imperfect knowledge; so they need a wide range of background information that can be targeted efficiently in any immediate circumstance. In addition, they are typically no more skilled than an educated member of the general population in information seeking but are likely to be more confident (or arrogant) in those skills and have a lofty perception of their own importance and prestige. This means that information providers dealing with this user group need to be thick-skinned yet confident enough in the value they can offer that they are willing to proactively promote their services and committed enough to back it up. As well, they have to be familiar enough with a wide range of resources to confidently select and recommend the source that will provide “a” best answer; this is not necessarily “the” best answer as there may not be one or finding it would take too long to be useful. Above all, information providers in this field need to embrace the notion that an over-abundance of relevant information may be of little use and lead to death and sickness whereas a small amount of the right information can lead to health and save lives.
Appendix: Some Useful Medical Sources

There are endless medical sources available. Below are some of the ones that keep coming up in the literature or are most recommended on the University of Alberta Libraries Health Sciences resource page. The content depth and breadth of each one is substantial so short descriptions only are included.

**Cochrane Library:** Represents the highest level of evidence on which to base clinical treatment decisions in a single place. Many searching and locating options. Evaluates many sources to give the bare-bones information for diagnosis and treatment.

**MEDLINE / PubMed:** Bibliographic database from the US National Library of Medicine. References. Indexes about 5000 journals from the USA and 80 other countries in the life sciences, especially biomedicine. Records are indexed by MeSH (medical subject headings) terms. Access to this database is free through PubMed (which includes value-added information); other aggregators such as OVID also offer access to Medline. Information in Medline is unevaluated.

**BMJ Clinical Evidence:** Systematic reviews on prevention and treatment of clinical conditions. Incorporates both current knowledge and uncertainty and avoids specific treatment recommendations in preference to allowing physicians to make individual interpretations based on specific cases which are all unique.

**AccessMedicine:** Geared to students, residents, clinicians, and researchers. Identified as on-line access to medical textbooks, it also promises instant answers to clinical questions from trusted sources and offers a diagnostic tool (i.e. diagnosaurus) allowing searching by symptoms, diseases, or organ systems.

**QuickClinical:** Geared at clinicians to make their searches useful by allowing limits such as “diagnosis” or “prescribing.” Project of the University of New South Wales Centre for Health Informatics and is currently under evaluation in the UK for use by the National Electronic Library for Health, and by the BMJ publishing group. Does not seem to be publicly available yet nor through the UofA.

**Stat!Ref:** Healthcare reference that integrates core titles with evidence-based resources and innovative tools. A collection of EBM point-of-care tools, full-text e-books, pharmacy databases, coding sets, calculators, and 3-D animations (such as anatomy TV).

**Medicines Complete:** Online service from the Royal Pharmaceutical Society of Great Britain publishing on pharmacy and related disciplines (includes Martindale: The complete drug reference, the British National Formulary, Stockley's Drug Interactions and the Journal of Pharmacy and Pharmacology.)
References


