Original Article

Physicians' Internet Information-Seeking Behaviors

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Abstract

Introduction: *Our understanding about the role of the Internet as a resource for physicians has improved in the past several years with reports of patterns for use and measures of impact on medical practice. The purpose of this study was to begin to shape a theory base for more fully describing physicians' information-seeking behaviors as they apply to Internet use and applications for continuing education providers to more effectively support learning.*

Methods: *A survey about Internet use and physician information seeking was administered by facsimile transmission to a random sample of 3,347 physicians.*

Results: *Almost all physicians have access to the Internet, and most believe it is important for patient care. The most frequent use is in accessing the latest research on specific topics, new information in a disease area, and information related to a specific patient problem. Critical to seeking clinical information is the credibility of the source, followed by relevance, unlimited access, speed, and ease of use. Electronic media are viewed as increasingly important sources for clinical information, with decreased use of journals and local continuing medical education (CME). Barriers to finding needed information include too much information, lack of specific information, and navigation or searching difficulties.*

Discussion: *The Internet has become an important force in how physicians deliver care. Understanding more about physician information-seeking needs, behaviors, and uses is critical to CME providers to support a self-directed curriculum for each physician. A shift to increased use of electronic CME options points to new demands for users and providers. Specific information about how physicians create a question and search for resources is an area that requires providers to develop new skills.*

Key Words: Information-seeking behaviors, on-line continuing education, on-line continuing medical education (CME), on-line continuing professional development (CPD), physician Internet use

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Introduction

Our understanding of the Internet as an information resource for physicians has improved in the past several years as a result of reports on use patterns and medical practice impact measures. Studies consistently indicate increasing popularity and more routine use among physicians, including more details about varying use patterns[1–3] and access.[4–6] Rapid availability of evidence and opinion sources for self-directed learning provides new avenues to more immediately compile, compare, and interpret information in responding to patient

Framework	Cognitive Needs	Affective Needs	Situational Needs
Information needs			
Information seeking			
Information use			

Figure 1 Choo's theoretical framework of information seeking and use. Adapted from Choo.[16]

problems. This study focuses on ways in which patient care is influenced by the Internet, which is defined as a complex repository of rapidly changing information and learning sources.[7,8]

The American Medical Association (AMA) 2001 study of physician Internet use summarized interview results with 997 physicians in the United States. About half of the group noted that the Internet had a major impact on the way they practiced medicine. The survey demonstrated a continued increase in physician Internet use beginning at 20% in 1997 and rising to the current level of 78%. For those physicians on-line, Internet use is becoming more frequent, with two-thirds of on-line physicians accessing it daily and expanding their hours of use, with additional growth expected.[9,10]

Immediate access to a broad array of resources comes with the difficulty of locating, screening, categorizing, and evaluating information, especially with physicians' limited time and opportunity to address a given problem.[11,12] Ely et al.[13] listed obstacles that occurred when physicians tried to answer questions with evidence, including excessive time to find information, original questions lacking specificity, difficulty in choosing an effective searching strategy, and not finding the appropriate resource to cover the content.

Choo and colleagues[14–16] proposed a framework for the information technology literature that is helpful in thinking about how physicians use the Internet for learning. They linked behaviors on an information-seeking continuum of discovering needs, seeking information to address those needs, and using that information in practice. An individual becomes aware of some lack in understanding a problem that stops or slows progress in addressing that problem. The awareness becomes sufficiently tangible to look for ways to address the gap between what a physician currently knows and what is needed to understand the problem. Each search for information occurs in an environment that presents cognitive needs, affective responses, and situational demands. Although it may be easiest to describe cognitive gaps, the affective needs, such as motivation to address a problem, are critical. Situational needs, such as the specific context or setting of a problem, shape its definition. Working with this kind of model allows those in continuing professional development (CPD) to create a systematic way to design learning activities that support physicians' approaches to use of the Internet.

To define information-seeking behaviors, we anticipated that specific behaviors around Internet use could be thought of in Choo et al.'s framework (Figure 1). We proposed that defining the components of a search for information would expand the way in which we think about support for physician learning and provide some ideas about how information could be arrayed to respond to the strategies that physicians use to search. Also, we sought a clearer picture of the Internet as a resource, comparing different approaches to learning.

Methods

Internet medical information seeking and use by physicians were examined using a survey instrument of 17 multiple-choice questions adapted

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from a previous study in June to July 2001.[1] The present survey was conducted by facsimile (fax) transmission during the period of December 2002 to January 2003. Fax broadcast surveying has been demonstrated to be effective in eliciting survey responses from community-based practicing physicians.[17] The use of fax rather than the Internet to deliver the survey was chosen to avoid the bias of surveying only active Internet users.

The population was defined as 518,000 U.S. physicians of all specialties in active practice, according to the most current AMA physician listing.[18] A power calculation determined that a sample size of 3,200 usable surveys was needed to generalize to the total population. Cochran's sampling technique determined the power required for the study, with a margin of error of 5% and 95% confidence.[17] Fax numbers were available for 90% of the identified population. Random samples were repeatedly drawn in blocks of 1,000 from the pool of available fax numbers and responses solicited until the usable sample size was obtained.

Each survey was personalized with the individual physician's name and fax number. Surveys were returned to the 800 number of a designated fax broadcaster; each returned survey was sent by electronic mail to the Division of Continuing Medical Education, University of Alabama School of Medicine, for data entry to avoid jamming of fax machines and lost survey pages.

Survey responses were entered into an ACCESS database and analyzed using SPSS software with the level for statistical significance as $p < .05$, where the p value is the measured probability of a finding occurring by chance. Frequency distributions and means were calculated for each survey item. The demographic characteristics of the sample of 3,200 were tested against those of the whole population to determine whether there were significant demographic differences between the respondents and the defined population. Demographic items were also cross-tabulated with survey items and analyzed using Pearson chi-square correlations to assess the significance of

association between variables. General linear model analysis was used to compare the 2001 and 2003 survey data.

Results

Sample Population

A total of 3,347 usable surveys were returned; 79.0% of the respondents were male and 21.0% were female. The majority had graduated from medical school more than 20 years ago (51.4%); 17.4% had graduated within the past 10 years. Nearly one-third (31.7%) reported primary care as their specialty (general practice, family practice, internal medicine, obstetrics/gynecology, pediatrics); all major specialties were represented within the remaining population. Most respondents were in group practices (57.8%) in urban or suburban settings (78.6%). When compared with AMA physician data,[18] there were no significant differences in demographic characteristics between the defined population and the sample of respondents.

Information Needs

Reasons for using the Internet to seek clinical information were (1) accessing the latest research on specific topics (46.1%), (2) accessing new information in a disease area (44.4%), (3) information related to a specific patient problem (43.7%), (4) drug dose information (40.4%), and (5) new therapy or product information (38.1%). Of those seeking information on a specific patient problem, 74.8% sought information on diagnosis or management, 59% sought patient education materials, and 49% sought guideline summaries. Specific patient problems were more important to physicians in urban locations than those in rural locations (p = .0042).

Sources of Clinical Information

Journals were ranked as the most important clinical information source, followed in order by

national continuing medical education (CME) meetings, videotape/audiotape/CD-ROM, Web sites, and local CME meetings.

Most respondents (73.9%) found that the Internet was useful or extremely useful compared with other clinical information sources. Credibility was identified as the most important Internet characteristic related to seeking clinical information (53.5%), followed by relevance (44.4%). Physicians in solo practice, compared with those in other settings, were more likely to identify credibility as the most important issue (p = .043).

Searching Behaviors

More than half of the respondents were confident (37.3%) or very confident (21.4%) in their Internet search skills in seeking medical information; 10% of respondents reported that they lacked confidence. Male physicians were more confident than females in using the Internet to find medical information (p = .0004). Confidence in using the Internet to find medical information decreased as the number of years since medical school graduation increased (p = .0004). The top three barriers physicians encountered when using the Internet for clinical information were navigation or searching difficulties (59.4%), too much information to scan (50.8%), and specific information not available (47.4%). Most indicated that they had both a medical library (76.5%) and on-line resources (78.5%) available when searching for information; 26.2% had technical staff for support.

Internet Information Use

More than half of respondents reported daily (23.0%) or weekly use (37.2%) of the Internet for clinical information, 24.2% reported monthly use, and 15.6% reported never using the Internet for clinical information. Male physicians were more likely than females to use the Internet on a daily basis (p = .0006).

Almost all respondents (92.2%) had electronic mail accounts; 85.0% reported checking

Table 1 Physicians' Internet Information Use

Purpose	n	%
Personal use	2748/3242	84.8
Personal e-mail	2599/3243	80.1
Literature searching	2319/3243	71.5
Accessing on-line journals	2112/3243	65.1
Searching for patient-specific information	1840/3242	56.8
CME courses	1477/3243	45.5
Professional association updates	1472/3242	45.4
E-mail patients	641/3243	19.8
Consultation with colleagues	605/3243	18.7
Prescription/patient orders	134/3242	4.13

CME = continuing medical education.

this mail several times a week or daily. More than half (52.0%) of physicians had broadband connections, with those in urban and suburban settings more likely to have access to broadband connections (p = .0001). Forty-two percent of physicians used handheld computers. Reasons for Internet use are summarized in Table 1.

Of those who use on-line CME, most physicians accessed programs at home (60.1%); 27.8% reported accessing on-line CME several times per year. On-line CME course features of most importance were selected topics (67.1%), AMA category 1 credit (49.6%), and ease of use (48.2%).

2001 to 2003 Survey Comparisons

The average time physicians reported using the Internet for clinical information doubled, from 4.4 times per month in 2001 to 8.6 times per month in 2003 (p < .0001).[1] The importance of journals and local CME meetings has declined since 2001, and the importance of videotape/audiotape/CD-ROM, as well as Web sites, has increased (p < .0001), as represented in Table 2.

The importance physicians assigned to the Internet also increased (p < .0001). In 2001, 31.0% of respondents selected CME courses as a reason for using the Internet compared with 45.5% in 2003 (p = .0001). Using professional association

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Table 2 Comparison of Importance of Clinical Sources, 2001 and 2003

Source	n	df	T	SE	95% CI	
					Lower	Upper
Journals	4741	4739	21.76*	0.046	0.916	1.097
Local CME meetings	4561	4559	10.48*	0.040	0.337	0.492
Web sites	4372	4370	−13.17*	0.045	−0.686	−0.509
Videotape/audiotape/CD-ROM	4213	4211	−13.16*	0.049	−0.742	−0.549

*$p < .0001$, two-tailed.

updates increased from 32.9% to 45.4% in 2003 ($p < .0001$). Accessing on-line journals increased from 45.3% in 2001 to 65.1% in 2003 ($p < .0001$), and literature searching increased from 64.8% to 71.5% ($p < .001$). Searching for specific patient information increased from 29.2% to 56.8% in 2003 ($p = .0001$). Prescriptions and patient orders increased from 1.9% to 4.1% in 2003. No differences in consultation with colleagues or personal use were found.

Barriers to Internet use by physicians increased significantly between 2001 and 2003, as reflected in Table 3. Information management issues have become more problematic in the past 2 years, with a perception of too much material to scan coupled with a lack of specific information. Technical issues with navigation, speed, and software also increased significantly.

Discussion

The increasing role of the Internet as a resource for physicians to answer questions in their clinical practice is clear, with significant increases in the past 2 years in its perceived value for learning. That shift points to our need for a clearer understanding of how learning just-in-time on the Internet influences delivery of care and how to think about the shifting roles for CPD providers who design learning options. Using Choo's design, three dynamic elements comprise information-seeking behavior: defining what information is needed, seeking that information, and putting it into use.

First, how can we identify the *information needs* of physicians as they relate to continued learning? In this study, most physicians expanded their use of the Internet to find clinical information, citing credibility as the most important criterion for learning from and making sense of the information. Compared with their female colleagues, male physicians felt they needed more speed and broader access for their more frequent use of the Internet. The picture that emerges is a busy clinician who defines a number of questions that cannot be answered without further information. Learning just-in-time, using credible sources to respond to

Table 3 Comparison of Physician Internet Barriers in 2001 and 2003

Barrier	2001		2003		df	χ^2
	N	%	N	%		
Too much information to scan	443	21.8	1626	48.6	1	381.7*
Specific information not available	406	20.0	1516	45.3	1	351.6*
Navigation/searching difficulties	322	15.9	1900	56.7	1	871.3*
Too slow	227	11.2	965	28.8	1	227.9*
Software incompatibilities	42	2.1	648	19.4	1	337.6*

*$p < .0001$.

problems, the clinician sorts out new research findings and new options for specific patient problems. Part of the initial search that a physician undertakes may result in a need to refine thinking about how to narrow the question to find specific information. Results of a search to answer a question may come from searching journals on-line or from national meetings that offer interaction with colleagues. However, participation in traditional approaches to CME such as national meetings and journal use is decreasing somewhat in the face of more options for self-study using a variety of electronic media, such as the Internet, videotapes, audiotapes, and CD-ROMs. Electronic learning options that provide CME credit are gaining in popularity, although they are still a small part of the overall picture.[19] Although studies of participation for the overall physician population have shown that on-line CME activities appeal more often to younger and male physicians,[1,5,9] one study of the demographics of participation among primary care physicians indicated that when participants were offered a financial incentive to complete an on-line CME course, users more often were younger and female.[3] Comprehensive detailing of participation would help those in CPD to more effectively shape activities so that they address the learning needs of users. The majority belief that the Internet compares with other traditional sources of learning in addressing relevant needs points to important components of motivation and attitude.

Second, what learning strategies or sources do physicians use for *information seeking*? The active use of the Internet offers a sense that physicians believe that new information is essential and has significant potential for impact on health care delivery. When physicians look for information, they intend that learning be purposeful and goal directed. They value the credibility, relevance, unlimited access, speed, and ease of use that the Internet provides. Although most physicians indicate that they are confident about their searching skills, they are troubled by too much information to scan or the lack of specific information, coupled with problems searching the Internet. The con-

tradiction may reflect the complex state of the art for physicians who have easy access to the Internet but little technical support to help with more specific information needs and insufficient experience to find desired information quickly. Further, we do not currently have a system to weigh or judge materials that are presented on-line, searching options may be complex, specific material may not be available at the desired level of detail, and the volume of material is difficult to scan. The study demonstrates significant situational barriers, including searching and navigation difficulties, as well as problems with software incompatibilities and slow speeds. A focus on looking for the latest research or diagnostic information or a reliable form of evidence seems to say that search patterns focus on a limited number of sites or limited scope of information to manage the barriers. Further information about barriers and patterns may provide important ways for providers to think about effective learning on-line.

Third, what do we know about linking learning with *information use* resulting from resources found on the Internet? Internet access and use are high. We know that the majority of users find important applications for personal use, electronic mail, literature searching, and on-line journal access. The infrastructure in use by this population is improving, with more users gaining access to broadband. However, we know little about the application of knowledge gained by using the Internet and how it compares with knowledge gained from other resources.

Even as physicians are spending more time on the Internet in clinical and practice-related activities, they are encountering more barriers to use. Compared with the results in 2001,[1] more than twice as many physicians say that there is too much information to scan on the Internet and that specific information is not available. More practitioners are encountering navigational and searching difficulties. As respondents have become more proficient in their use of computers, their expectations have increased, so that concern with slow response time and software incompatibilities are frustrating.

Lessons for Practice

• Physicians are increasing their use of the Internet as an information resource and finding that it has a major impact on the way they practice medicine.

• Although use of the Internet has increased, barriers have also increased.

• Patterns of physician information seeking suggest implementation strategies for providers.

As physicians' belief in the importance of the Internet as a medical information resource has increased, so has the role of the Internet in self-directed learning. CPD providers are challenged to understand the skills necessary for physicians to find the information they need and to translate it into practice. In this study, about half of respondents had searching and navigation difficulties, found too much information to scan, and did not find specific information available, indicating that searching skills are often not adequate to answer important clinical questions. Building new kinds of partnerships, especially with such groups as libraries and information technology units, expands the kinds of expertise we can use to address problems.[20,21] Increases in the use of the Internet as a credible information resource for individualized learning offer challenges to CPD providers for new roles and new partnerships that correspond to new information needs in the changing practice of medicine.

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