Original Article

Physician Internet Medical Information Seeking and On-line Continuing Education Use Patterns

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Abstract

Introduction: *Although physician Internet use patterns have been studied, little attention has been paid to how current physician learning and change theories relate to physician Internet information seeking and on-line learning behaviors. The purpose of this study was to examine physician medical information–seeking behaviors and their relevance to continuing education (CE) providers who design and develop on-line CE activities.*

Methods: *A survey concerning Internet use and learning was administered by facsimile transmission to a random sample of 2,200 U.S. office-based physicians of all specialties.*

Results: *Nearly all physicians have access to the Internet, know how to use it, and access it for medical information; the Internet's professional importance to physicians currently is in the area of professional development and information seeking to provide better care rather than for patient-physician communication. A particular patient problem was the most common reason for seeking information. The credibility of the source, quick and 24-hour access to information, and ease of searching were most important to physicians. Barriers to use included too much information to scan and too little specific information to respond to a defined question.*

Discussion: *The importance of the Internet to physician professional development is growing rapidly. Access to on-line continuing medical education must be immediate, relevant, credible, and easy to use. A sense of high utility demands content that is focused and well indexed. The roles of the CE provider must be reshaped to include helping physicians seek and construct the kind of knowledge they need to improve patient care.*

Key Words: Barriers to use, on-line continuing education (CE), on-line continuing medical education (CME), physician information seeking, physician Internet use, physician learning, physician professional development

Introduction

Over the past 10 years, physician use of the Internet has gone well beyond the boundaries of academic medicine to widespread use, with an increasing number of questions about what kind of role it should play in providing care to patients. The results from annual interviews of a random sample of 1,000 U.S. physicians by the American Medical Association (AMA) demonstrated that 10% of physicians surveyed in 1997, 37% surveyed in 1999, and 70% surveyed in 2000 were

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World Wide Web (Web) users. Physicians reported most frequently using the Web for electronic mail (e-mail), medical information sources, travel information, product information, and professional association communications.[1] The Canadian Medical Association (CMA) reported CMA physician survey results related to the Internet. In 1999, they found that 63% used e-mail, 60% used the Web, 53% searched literature, and 41% used continuing medical education (CME) sites. When compared to primary care physicians, specialists were more likely to use the Internet, with medical specialists more likely to be users than surgical specialists. Urban physicians were slightly more likely than rural physicians to use the Internet.[2]

Data from the annual Association of American Medical Colleges 2001 Medical School Graduation Questionnaire report the results of curricula intended to create technologically "savvy" graduates. A total of 93% of graduates agreed that they could carry out sophisticated searches of medical information databases. There were significant gains over 1999 in understanding the implications of clinical record keeping and confidentiality of private information from patients and colleagues.[3]

Currently, nearly 100% of physicians report access to the Internet either through office, hospital, or home connections, with use among all specialties increasing over the past year.[1,4] The largest obstacles to Web use cited by medical professionals were lack of time for searching, dissatisfaction with speed, and lack of ease of use in searching for information.[5] Medical professionals who reported using the Internet regularly felt that discussion of the results of patients' Internet searches was helpful in increasing patients' knowledge to improve communication between the medical professional and the patient.[5]

Recent studies report significant increases in the number of continuing education (CE) on-line providers and the number of CME Websites. In 2000, 96 CME sites were available; in 2001, this number had increased to 200. The majority of CME sites are text based; less than 20% of the sites are interactive.[6]

In a 2001 survey with responses from 200 of 540 member organizations of the Alliance for Continuing Medical Education, 30% of the providers (primarily from private companies) were offering nondegree distance education programs, whereas 2% of university providers were offering degree programs. In this study, distance learning was defined as learning that occurs when the learner and instructor are separated in time and/or space, with media including print, project work, audiovisual supplementary materials, and teleconferencing via telephone, computer, or video. Print materials and videoconferencing were found to be the most prominent technologies in the development of distance education programs. Although the study did not specifically investigate the use of on-line CME courses such as asynchronous on-line courses with access to faculty, the results did reveal a great deal of interest in providing distance learning on the part of CME providers. Providers were aware that the work environments of physician participants are extremely busy; providers were also aware of the need to improve the time efficiency of course work to better meet the needs of participants.[7]

Although physician Internet use patterns have been studied with varying results, there is little information about the way in which theories of physician learning and change contribute to how we understand physician Internet information seeking and on-line learning behaviors. Learning and change resulting from information-seeking behavior vary from stage to stage in a multistage process.[8,9] Motivation for learning has been linked to the nature of the problem, most frequently a specific patient problem, and to the stage of resolution of the problem by the physician.[10] When information is sought that might indicate the need for complex changes in practice, other conditions of adoption must be met, including commitment to change, a conceptual base for making the change, and time to deliberate over making the change; information seeking might play various roles in this process.[11]

If we assume that information seeking results from an identified learning need, then a self-directed system for learning directs that work. The self-directed curriculum defines three stages of learning, beginning with an awareness of the need to learn or adopt a change in practice. Stage 2 encompasses the learning actually needed to develop that new competency to practice differently. Stage 3 focuses on managing the new skill by changing the environment or by adapting the new skill to create a good fit with daily life. Three kinds of resources support the stages of change: material resources, especially journals; human resources, especially colleagues; and formal CME programs. The curriculum is self-directed because the learner controls the kinds of changes needed and the resources to support those changes. A learner may address questions by searching for answers informally or formally, such as choosing a formal CME program, or both.[11]

In the general study of information-seeking behaviors, information seeking is defined as purposively acquiring information from selected information carriers. Johnson and Meischke proposed that this behavior may be influenced by the characteristics of the individual seeking information or by the characteristics of the information carrier. Demographic characteristics, experience, salience, and beliefs are individual factors that may affect information-seeking behavior. Information carrier factors include message design and utility.[12]

In connecting these concepts, we hypothesized that physician Internet information–seeking behaviors would be influenced by the stage at which information was sought, previous information-seeking experiences, beliefs, and demographic characteristics, such as practice location where the Internet might offer previously unavailable access to information. We further hypothesized that utility, defined as the usefulness in solving a specific patient problem, would be a key motivator to physician information seeking on the Internet. Not only have physician information-seeking behaviors not been studied in the light of related

theories, but also Internet CE on-line activities are not always designed or developed using theoretical constructs related to the physician as an information seeker. These issues are critical to the growing number of CE providers who wish to use the Internet to effectively design and develop CE courses, individual digital learning portfolios, and Internet strategies to promote clinical practice guideline dissemination and adoption. The purpose of this study was to examine physician medical information–seeking behaviors and their relevance to CE providers who design and develop on-line CE activities.

Methods

To determine current physician Internet medical information seeking and on-line use patterns of practicing physicians, a survey of 21 multiple-choice questions was field-tested and revised prior to use. The survey was designed to be conducted by facsimile transmission (fax). Fax surveying has been demonstrated to be effective in eliciting survey responses from practicing physicians.[13] The use of fax rather than an Internet survey was chosen to avoid the bias of surveying only those physicians who already are active Internet users.

The population of interest for this survey was defined as U.S. physicians of all specialties in active, community practice according to the most current AMA physician listing; 324,000 physicians were identified. A power calculation determined that a sample size of 2,200 was needed to generalize to the total population. Cochran's sampling technique was used, with a margin of error of 5% and 95% confidence.[14] Of the 324,000 physicians in the total population, fax numbers were available for 90% of the population. Random samples were drawn from the pool of available fax numbers and responses solicited until 2,200 usable surveys were obtained.

Each survey was personalized with the individual physician's name and fax number before faxing. Directions for returning the survey by fax included an 800 fax number. Surveys were returned

to the 800 number of a designated fax broadcaster; each returned survey was then sent by e-mail to the Division of Continuing Medical Education, University of Alabama School of Medicine, for printing and data entry to avoid jamming of fax machines and lost survey pages. Survey responses were entered into a database and analyzed. Frequency distributions and means were calculated for each survey item. Demographic items and survey items were cross-tabulated and analyzed using Pearson product moment correlations.

Results

A total of 2,200 usable surveys were returned via fax. Responses included 79% male and 21% female physicians, with 32% from physicians representing primary care specialties and 68% from physicians representing all other major specialties.

Practice locations included 37% urban, 40% suburban, and 23% rural locations. The majority of respondents (58%) practiced in group practices. Eighteen percent of respondents had graduated from medical school within the past 10 years, 36% between 10 and 20 years, and 46% more than 20 years prior to the time of the survey. A total of 34% of respondents reported using the Internet more than 5 years, 33% reported use of 3 to 5 years, 25% reported use of 1 to 3 years, and 8% reported use of less than 1 year.

Eighty percent of respondents reported currently using the Internet in various ways to find medical information, including literature searching, accessing on-line journals, general searching for medical information, and searching for spe-

Table 1   Physician Experience in Internet Use (%)

Electronic mail	90
Personal use	86
Literature searching	65
Searching for medical information	53
Professional association updates	33
Accessing on-line journals	45
Continuing medical education	31
Searching for specific patient information	29
Consultation with colleagues	17
Filing insurance claims	13
Participating in clinical trials	7
Writing prescriptions/patient orders	2

cific patient information. Eight percent reported using the Internet daily to find medical information, 21% several times a week, 25% weekly, 26% monthly, and 18% rarely. Personal use and e-mail were the most frequent uses of the Internet (Table 1).

Physicians were asked which of three variables was the most important in seeking medical information on the Internet; the results demonstrated that 41% felt that credibility of the source was most important, 35% felt that quick and 24-hour access to information was most important, and 24% felt that ease of searching was the most important. Physician beliefs regarding the Internet were assessed in four additional areas (Table 2).

Physicians were asked to rank their motivations in searching for medical information on the Internet. A particular patient problem was the strongest motivation to search for information on the Internet (Table 3).

Table 2   Physician Internet Beliefs

	Mean	SD
Belief in professional value of Internet to physicians	3.88	.98
Belief better care can be provided using the Internet	3.50	.98
Belief Internet will improve patient-physician communication	3.48	.99
Belief Internet will save money for the health care system	3.12	.88

5 = strongly agree; 1 = strongly disagree.

Table 3 Physician Motivation for Internet Searching for Medical Information

	Mean	SD
Particular patient problem	1.75	1.16
Scanning new information in a disease area	2.32	1.10
Latest research on a specific topic	2.60	1.28
New product information	3.38	1.14
Specific drug dosage	3.94	1.31

1 = highest motivation; 6 = lowest motivation.

Table 5 Factors Important in Using On-line CME

	Mean	SD
Ease of program use	2.5	1.7
Validity of content	2.6	1.7
Category 1 credit	3.8	2.4
Evidence-based content	4.2	2.0
Faculty credentials	4.3	1.9
Length of course	4.2	1.9
On-line CME certificate	5.3	2.2
Provider credentials	6.0	2.0

1 = most important; 6 = least important.

When specifically asked about the usefulness of the Internet in searching for information about a particular patient management problem, 36% labeled the Internet as very helpful and 45% reported it as occasionally helpful. Physicians were asked when they searched the Internet for medical information if they found the information they wanted; 62% reported that they usually found the information they wanted, and 28% reported that they occasionally found the information. When asked if their search skills were sufficient, responses paralleled the earlier question about whether they found the information they were seeking; 61% said that their search skills were sufficient, 26% said that their search skills were partially sufficient, and 13% reported that their search skills were not sufficient. Physicians were also asked if they used the information they found on the Internet; 70% reported usually or always using the information, and 25% reported occasionally using the information. When asked about the largest barrier to the use of the Internet, 28%

Table 4 Physician Perceptions of Largest Barrier to Internet Use (%)

Too much information to scan	30
Not able to find information	28
Inadequate searching skills	23
Slowness of loading information	16
Need for additional software plug-ins	3

reported not being able to find what they were looking for (Table 4).

When asked how frequently they had accessed the Internet for CME in the past year, nearly 70% reported rarely or not accessing on-line CME. Of the remaining respondents who reported accessing on-line CME during the past year, 18% reported accessing it several times a year, 8% once a month, and 3.5% once a week or greater. Respondents ranked ease of program use and validity of content as most important in using on-line CME (Table 5).

Eighty-four percent of respondents reported anticipating personal use of the Internet increasing in the next year; 28% reported anticipating using the Internet more frequently at the request of patients in the next year and 20% at the request of health plans and insurance groups. More recent graduates from medical school differed from other respondents in their use of the Internet in increased use and increased professional value placed on the Internet (Table 6).

Male physicians had more experience and confidence using the Internet than female physicians did (Table 7). There were no significant differences between male and female physicians in finding and using information. Male physicians agreed that they expect to use the Internet in the future at the request of patients more frequently than female physicians (p = .02). Female physi-

Table 6 Recent Medical School Graduates Use of Internet Compared to Other Physicians (p)

More likely to use the Internet to find medical information	< .0001
More literature searching	.01
More accessing on-line journals	.003
More searching for specific drug information	.002
More likely to consider search skills sufficient	.0002
Greater professional value placed on the Internet	< .004
Greater belief the Internet supports better patient care	< .004
Greater belief Internet will save money for the health system	< .004

cians found local traditional CME to be more helpful than did their male counterparts (p = .0042). Physicians in urban locations were more likely to have used the Internet for more years than those in rural areas and to use the Internet more frequently (p = .002) (Table 8). Since more specialists live in urban than rural locations, there is some overlap between the comparisons of urban versus rural physicians and the comparison of specialists versus primary care physicians.

Specialists were more likely to have used the Internet longer than primary care physicians (p = .03), although primary care physicians were more likely to use the Internet more frequently (p = .03). Specialist use focuses on literature searching, research results, and professional association updates, whereas primary care physicians reported more use of the Internet to search for information on specific patient problems and for CME (Table 9).

Discussion

The results of the study point to four important questions reflecting our understanding of the ways

in which the Internet can support the professional development of physicians. First, who is using the Internet? Clearly, almost all physicians have access to the Internet and know how to use it. This finding is consistent with other studies cited previously and anecdotal reports.[1–5] However, there are differences in use by gender, practice location, and specialty that suggest unique approaches by different groups of physicians and special uses important for developers of on-line programs for physicians. Age or experiences with the Internet since medical school are not simple predictors of use. Questions for this study were not structured in a way to determine whether physicians are most frequently using the Internet at home, at the office, or in other locations such as hospitals and libraries.

Second, what are the ways in which physicians use the Internet? Traditional activities, journals, and local CME meetings remain important to physicians for their learning. Most physicians use the Internet to support those learning activities and to find medical information. More specifically, its importance is in the area of professional devel-

Table 7 Male Physicians Use of Internet Compared to Female Physicians Use (p)

More likely to have used the Internet longer	< .001
More likely to use the Internet more frequently	.0003
More likely to use the Internet for filing insurance claims	.01
More likely to use the Internet for CME	.05
More likely to have accessed the Internet for CME in the past year	< .0001
Less likely to search for specific patient information	.005
More secure in search skills	< .0001

Table 8   Physicians in Urban Areas Compared with Physicians in Rural Areas (p)

More likely to use the Internet to search for medical information	.03
More likely to use the Internet more frequently	.01
More likely to access the Internet for clinical trial participation	.03
More likely to access the Internet for filing insurance claims	.01
More likely to access the Internet for professional association updates	.003
Less likely to find information	< .0001
Less likely to consider their search skills sufficient	.02
Less likely to use the information they found in Internet searching	.009
Less likely to rely on local CME meetings	.0005
Less likely to value the Internet professionally	.01

opment in a general approach to providing better care rather than for patient-physician communication. The most frequent use patterns centered on personal business and e-mail. That response, however, does not convey the more complex pattern of looking for medical information about patient problems demonstrated in this study. Physicians clearly convey their interest in information about something that comes up in patient care as a major impetus for Internet use. Beyond personal use, there is a focus on patient information. We did not ask for a full description of "personal use," some of which may be related to patient problems such as informal conversations among colleagues. Not unexpectedly, ease of use and validity of content are critical demands from users, although the specific criteria to judge these areas are less clear.

A large majority was motivated to search on the Internet for a specific management problem, and information was found and used by the majority of searchers. The pattern suggests that this form of information gathering is developing its identity in the portfolio of options for physicians and fits with the importance of the utility of information in information seeking, as well as the emphasis on a specific patient problem as a motivator for physicians' self-directed learning.[10–12] Those searches that do not result in helpful information for management strategies may reflect the uneven quality of material found among the huge number of available options, as well as the structure of medical knowledge, the way it is indexed, and the way it is retrieved, a problem previously cited as a barrier to adoption of new information.[15] Although used to support informal aspects of self-directed learning, most of the group has not used the Internet for formal CME programs in the past year.

Third, when are physicians using the Internet and what are the barriers to use? Physicians report using the Internet multiple times each month, primarily for personal use and e-mail but also for

Table 9   Specialist Use of the Internet Compared to Primary Care (p)

More likely to use the Internet for literature searching	.0001
More likely to use the Internet for professional association updates	.0007
More likely to search for the latest research on a specific topic	< .0001
More likely to consider faculty credentials important to Internet CME	< .0001
Less likely to use the Internet to search for specific patient information	< .0001
Less likely to use the Internet for writing prescriptions or patient orders	.0007
Less likely to use the Internet for CME	.0001
Less likely to have accessed the Internet for CME during previous year	< .0001
Less likely to use the Internet in the future at the request of patients	.01

searching the literature and accessing journals. The barriers are predictable for such a large resource in that there is often too much information to scan and, at the same time, too little specific information to respond to a defined question. Creating an optimal fit between question and answer is difficult and may require sophisticated searching skills.

Fourth, what does the evidence suggest to providers of CME about their new role in developing this learning resource for physicians? Presently, physicians use the Internet to support traditional CME activities. Ready access to journals and ease in searching literature match a long-standing commitment to local traditional CME programs. Compared to journals and local CME programs, hospital rounds and home study options appeal to a subset of the group of learners. Linking these uses with the search for specific information in managing a patient problem begins to shape a better picture of several patterns for information seeking.

One point of interest is the similar ratings for keeping up to date via the Internet compared to local hospital rounds. Great emphasis has been placed on maintaining learning within hospital settings. One of the traditional models used by many smaller hospitals is to invite outside experts to cover a range of topics. Although topics present current thinking, some lack relevance for any given individual within the group, or there may be a lack of overarching themes or goals that build on central ideas for the series or a focus that is not appropriate to the specific setting of the group, such as tertiary care issues in a community hospital. Rather than a more general dissemination of information, the Internet demands a specific goal, with specific needs defined for each search. That shift in thinking from a more general scan to a defined question with a specific outcome demands some changes in learning systems. Further, traditional schooling places high value on direct interaction with teachers and traditional resources such as textbooks. That model continues with hospital lectures. If the role of the expert is reconfigured

in the Internet to be one resource, physicians must use new criteria to assess credibility.

When CE professionals consider specific planning and design techniques, it will be important for them to be aware that specialists look at the Internet differently than do those in primary care. Specialists are less interested in on-line CME courses than in specific specialty updates. Those kinds of updates in other formats are already part of the role of specialty societies. Making a distinction among providers in terms of effectively supporting specialists versus those in primary care is part of redefining where providers will use resources.

Not surprisingly, in the eyes of users, on-line CME must be immediate, relevant, credible, and easy to use. The utility must be focused and well indexed. The ability to gather effectively a more in-depth understanding by hyperlink levels, rather than a linear model, provides that kind of access. Faculty credentials, institutional identity, and appropriate CME credit are criteria used to evaluate the quality of a program. The findings speak to traditional program planning as well as new forms of thinking about CME credit. In the future, credit must recognize the value of focused information-seeking behaviors compared to traditional learning.

Learners develop and manage their own self-directed curriculum by drawing on different kinds of resources at different times. All categories of resources (human resources, material resources, and formal CE programs) reside on the Internet. The ability to scan a wide range of options and the enormous number of possibilities on the Internet make it a unique support for a self-directed curriculum. If the image of the Internet is defined as an open resource center with a range of options, credibility may emerge from a combination of formally recognized thought leaders, recommendations from colleagues, and multiple resources pointing to a similar conclusion. As a self-directed curriculum, the Internet in its current form allows a wide range of learning styles, searching styles, and ways to combine resources.[11]

The results of this study suggest that CE providers redefine their role in terms of how infor-

Lessons for Practice

- Increasingly, physicians are turning to the Internet for professional development, and they intend to do so more often in the future.

- The most common reason physicians seek information on the Internet is to solve a specific patient problem.

- In pursuing professional development on the Internet, physicians expect that access to information will be immediate, easy to use, relevant, and credible.

- Based on the physician's need for information on a specific patient problem, adopting case-based learning as a component of the design of on-line continuing medical education courses will enhance the utility of on-line courses.

- Roles of the continuing education provider must be reshaped to include helping physicians seek and construct the kind of knowledge they need to improve patient care.

mation seeking links to traditional planning for CME. Physicians construct the kind of knowledge they need by using their own experience and the information they find. Rather than a single piece of data or a single randomized controlled trial as a defining answer, the study suggests that physicians build a picture by using several pieces of data from several sources. At this time, help in locating materials, rather than the development of those materials, may be an important function for CME in this environment. For example, rather than a focus on new content, links between professional association updates, breaking news, and sources for specific patient management strategies might be helpful. Teaching search skills or facil-

itating searches at a more sophisticated level would provide ready access to content developed within the Internet system.

The same redefinition of the role for continuing professional development educators demands a look at how formal CME participation is rewarded in the current system. The awarding of CME credit based on outcome or quality of information gathered rather than "seat time" presents new challenges for current systems. If searching on the Internet provides direct patient care information, is that assessed differently than a broad scan for updates from a professional association? Should the CME system provide credit for effectiveness and efficiency in framing a problem and finding information relevant to solving that problem? If the average use of an on-line system is very short, is it devalued in the current CME system of measuring only contact time?

In summary, the Internet provides an extensive and ever-growing resource center available to physicians as part of a self-directed curriculum. Its range of options and varying quality of information provide both a challenge and a barrier in terms of defining new terms for credibility and effectiveness and, most importantly, finding relevant answers to questions. Support for physicians using the Internet from those in CME requires some new roles for CME providers. In designing on-line CME programs, patient problems presented as cases could make important information more accessible than transforming traditional lectures into on-line CME. Indexing to make relevant clinical content accessible to physicians who may not be sophisticated in information-seeking strategies is also an important role. Supporting retrieval of information, pointing to and consolidating resources, and looking for definitions of credibility may take precedence over traditional kinds of programming. Although the Internet creates an educational delivery system that reaches nearly all physicians, it also poses significant challenges to CME providers who must provide accessible, credible content that addresses relevant patient problems.

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