The Future of the Internet in Health Care

A Five-Year Forecast

ROBERT MITTMAN
MARY CAIN

The use of the Internet in health care has attracted a lot of attention lately. Numerous publications from the New York Times to the Journal of the American Medical Association have featured stories on how consumers are finding medical information on the Web and changing the balance of power in the practice of medicine. Health care practitioners are also using the Internet—to keep up in their fields, to communicate with patients, and to consult with each other. But there is a dark side to Internet medicine. Inspiring stories of lives saved through the Internet get equal billing with hair-raising tales of Web-based quackery. What are we to believe?

This forecast begins by describing the driving forces behind some of the high expectations—the good reasons people are excited about the Web. It then presents some of the barriers to the implementation and diffusion of health care applications on the Internet—some sobering analyses to temper the enthusiasm. Finally, it presents forecasts of six leading-edge appli-
Consumer Experiences With Other Industries: Internet Shopping and E-Mail

Experience with other industries has helped shape the expectations that new consumers bring to health care. Part of that recent experience includes the use of the Internet for transactions—particularly for shopping.

During the 1998 and 1999 holiday shopping seasons, consumer-oriented Web commerce exploded. Amazon.com, Dell Computers, eBay, REI, CDnow, and many others did a booming retail business on the Internet. Retail transactions on the Net in 1999 exceeded $10 billion—only 0.4% of total retail sales, but still a significant figure. The media covered Internet shopping extensively. And any stock with a " .com " in its name traded at incredible multiples of earnings (assuming they made any profit at all). At the same time, there are now more than 100 million e-mail users in the United States (Harris Interactive, 1999). Many older Americans—about 25%—now use e-mail (Corey 1999), often starting as a way to communicate with their grandchildren. Many e-mail users go on to use the Web for other purposes.

However, not everyone will be a new consumer. If about half of the American population will have access to a PC and the Internet at home or work by the year 2005, about half of the population won't. An ever-widening disparity between the "haves" and "have-nots" with regard to technology is correlated with income, education, and ethnicity. Inner-city residents and new immigrants, in particular, have been left out of the information revolution. Such traditionally underserved populations are less likely to have electronic technologies in their homes and are more likely to get information through talking rather than reading (Kyrourou et al., 1998; National Telecommunications and Information Administration [NTIA], 1999).

A significant sector of consumers will not have access to information and services on the Internet. Even though the cost of PCs has dropped to below $500, some will not be able to afford to purchase the hardware and software and pay for Internet access. Others will be able to afford the computers but will face barriers of language, literacy, and education. Still others will choose not to go online.

Characteristics of the Internet

The Internet is particularly well suited to meet the needs of new consumers and health care organizations, for several reasons.

1. Inexpensive. Access to the Internet costs less than $20 per month, while the cost of an Internet-capable personal computer is below $500. For the 50% of consumers who don't have the resources of new consumers, Internet access is increasingly common in libraries and schools. In December 1999, President Clinton said that 50% of America's schools and more than 80% of its classrooms are wired for the Internet, and he set a national goal to have all connected by the end of 2000 (Hunt, 1999).

2. Easy to Use. Browser technology has made the act of navigating through complex information spaces much simpler through point-and-click interfaces. Although the sheer quantity of health information on the Web may be overwhelming, most Web sites are easy to use.

3. Democratic. Before the development of the Web, only large institutions could afford to disseminate their point of view to a wide audience. The Web has dramatically lowered the barriers to entry for people and organizations that want to spread their message. From the point of view of information seekers, it is possible to get a broad diversity of viewpoints on any health issue.

4. Long Distance. The delivery of health care services has always been an inherently local phenomenon. The Internet is an inherently global phenomenon. This means that it is possible to get medical information, and even medical advice, from geographically dispersed sources. This, too, contributes to the diversity of information available.

5. Increasing Functionality. The Web platform is gaining in functionality and sophistication. In addition to its core browser functions, it now includes client- and server-side Java and will soon include XML (eXtensible Markup Language). These provide a much richer set of capabilities for deployment of interfaces and for integration across health care information systems.
Market Forces in Health Care

For most of this century, American health care was isolated from the kinds of market forces that pushed other industries to become more efficient and provide excellent customer service. But market forces have been at work in health care for almost a decade now, in the form of managed care, employer purchasing coalitions, assertive government payers and regulators, and consumer organizations. The system has adapted. Many of these adaptations favor the use of information technology and the Internet.

Physicians, hospitals, and health plans all have recognized that the larger they are, the more market power they can command. As a result, a wave of consolidation has swept the industry in the past 3 years, with, for example, about 170 hospital mergers per year and the consolidation of 18 large health plans across the country into 6 (Institute for the Future [IITF], 2000). At the same time, provider organizations around the country have created vertically integrated enterprises, spanning physicians, hospitals, home care, labs, imaging centers, and even health plans. Web technologies—intranets, extranets, and the Internet—can serve as a low-cost, rapidly deployable platform for disseminating information across vertically and horizontally integrated health care organizations.

Managed care has increased the flow and diversity of information about health care. One result of the cost-containing pressure of managed care is that the simple indemnity insurance world of charges, claims, and payments is nearly gone (see Figure 2.1). It has been replaced with the “hassle factor” of managed care—discounts, provider networks, eligibility verification, precertification, referral authorization, drug formularies, chart reviews, and so on. Large employers, purchasing coalitions such as the Pacific Business Group on Health, accreditors such as the National Committee on Quality Assurance, and the government are all demanding that health plans and providers show they deliver high quality and good value. These factors all increase the information coming in and out of health care organizations. The Internet will be a channel for an increasing share of those transactions.

Perhaps the most significant indicator of market forces in health care is the growth of brands. Along with the competition and consolidation has come an increase in advertising of health plans, hospitals, medical groups, specialty clinics, and pharmaceutical products. Hoping to drive consumers toward their products, pharmaceutical companies spend increasing sums on direct-to-consumer advertising, from $600 million in 1996 to an expected $1.8 billion in 1999. Like other advertisers, health care advertisers have promoted their Web sites on television, on billboards, and in print ads. Advertising has raised the profile of health care Web sites. Advertising online is the subject of many discussions about revenue streams. In health care, online marketing is expected to be a boon to medical marketing. According to researchers at Cyber Dialogue, pharmaceutical companies spent an estimated $915 million on direct-to-consumer advertising in the first half of 1999 to influence an estimated 34 million U.S. adults who requested specific prescription medications from doctors. The vast majority of this spending, $530 million, ended up on television, while print came in second with expenditures of $370 million. Internet ad spending amounted to just 1%, $10 million (Cyber Dialogue, 1999). Yet Forrester Research projected in September 1999 that Internet advertising will reach $33 billion by the year 2004.
BARRIERS

Although the scene is set for the Internet to move rapidly into the health care mainstream, a number of barriers will inhibit its deployment. None of the barriers is fatal, but together they will slow adoption of Web technologies substantially. The main barriers to Internet adoption are security concerns, characteristics of the Internet, distrust of the quality of Internet information, physician ambivalence, the disarray of legacy information systems, the lack of resources for Web development in health care organizations, and a confusing array of “nonstandard standards.”

Security Concerns

If there’s one thing people are more guarded about than their financial information, it’s private information about their health. Moving to electronic commerce in health care and using the Internet will send large quantities of private health information zinging across open networks. The perception of a lack of security (as much by providers and insurers concerned about liability and bad publicity as by consumers) will inhibit the use of the Internet for personal clinical information in the near term (Cyber Dialogue, 2000). The “security challenge” breaks down into six components:

1. Protecting servers and databases from unauthorized intrusion or modification
2. Authenticating the identity of senders and recipients
3. Protecting the integrity of the message itself
4. Ensuring nonrepudiation (i.e., making sure senders cannot falsely deny they sent a given message)
5. Establishing audit trails
6. Ensuring the confidentiality of messages

Various technologies and procedures are being developed to tackle these security problems, including the following:

1. Data encryption to protect data integrity and confidentiality, such as DES and RSA (private key or public key encryption technologies)
2. Digital signatures, the extra data appended to a message that identifies and authenticates the sender and message data using public-key encryption, hardware tokens, and biometric solutions such as fingerprint readers to authenticate users (Free Online Dictionary of Computing [FOLDOC], 1999)
3. Firewalls, virus protection software, smart cards (that store key information on a portable card that cannot be intercepted), and other hardware and software, all designed to protect network integrity
4. Once the technology is in place, ongoing procedures must be implemented to ensure continued security. These procedures, such as the use of passwords, multilayered access to different levels of information, and controls over physical access to information, must be rigorous but efficient; they mustn’t hold up the core processes of the organization.

Perhaps more significant than the interception of health care information or unauthorized release by an inside party is the possibility of institutional breaches of confidentiality; for example, the sale of individually identifiable information to marketers or the use of private data for medical underwriting by an insurer. These breaches don’t lend themselves to technical solutions, but rather to laws, detection of violations, enforcement, and punishment (Goldman, Hudson, & Smith, 2000; see also Katz & Aspen, Chapter 18, this volume).

The European Union already is enforcing strict medical data security standards. At some point in the next 10 years, the American market, government, courts, or some combination of the three, will demand improved security and confidentiality. The U.S. health care industry needs to get involved in this legislative process or risk the imposition of burdensome regulations. The industry must develop an understanding of the capital and operating costs of implementing system security techniques and factor this into the business equation.

Three competing tendencies will shape the perception of security on the Internet. First, health care organizations will develop, deploy, and publicize secure information systems—confidence will legitimately increase. Second, there will inevitably be several well-publicized incidents of people
being harmed by public releases of their health care information—those exceptional cases will shape the debate. Third, in the end, people and organizations will learn to live with a less-than-perfect combination of technologies and policies, just as the policy of limiting the fraud liability of credit card holders to $50 has largely allayed the fears of Internet shoppers.

The Characteristics of the Internet

Just as there are characteristics of the Internet that will drive its use in health care, there also are several characteristics that will impede its diffusion.

1. **Instability and Technology Churn.** The underlying technology of the Web is undergoing rapid mutation—“Web-years” are measured in human weeks. Most health care organizations traditionally are bureaucratic and slow to change, underinvest in information technology, and have to devote scarce resources to keep up with the pace of change.

2. **Browser Technology Is Weak.** Despite the additions of XML and Java, Web client software (browsers) is not very capable. It does a poor job, for example, of handling linking from on-screen forms to underlying databases. This will impede the linkage of the Web to the databases of health care legacy systems.

3. **Search Engines Can’t See Everything.** Dynamic Web pages make up an increasing share of all content on the Web. Because of how dynamic pages are created, the Web crawlers on search engines cannot see them. This means that a person searching for health care content will miss much of what is available. Of more than 13 million registered domain names, less than 20% are thought to be indexed and found by search engines (Kaiser, 1999).

4. **Low Bandwidth Links to Most Homes.** Health care information lends itself well to rich content such as images, animations, and video. Most users reach the Web through modems at data rates that do not give responsive performance for that type of content.

The Mixed Quality of Information on the Internet

The Internet provides ready access to a vast body of health information for consumers, information that at its best can equip consumers to lead healthier lifestyles, detect potential medical problems early, work more collaboratively with physicians to treat illness, and learn of effective treatments to which a local provider may not have access. At its worst, however, the information can undermine health objectives. Consumers can be misled into, for example, self-destructive beliefs and behavior changes, ineffective or harmful treatments, and false medical understandings that undermine relationships with their physicians.

Concerns about the quality of health information on the Internet are in some respects no different from quality issues faced in other communication channels. Indeed, advice from friends and family, never the most accurate, is perhaps the most common source of health information for consumers (Kyroz et al., 1998; see Napoli, Chapter 3, this volume). Some characteristics of information on the Internet, however, exacerbate problems of quality. These characteristics include:

1. **Inexpensive and easy publishing.** The Internet allows thousands of times more health information publishers to gain access to a national and global audience.

2. **Anonymity.** It is difficult to verify, without checking outside the Internet, who is behind a particular Web site or Internet message.

3. **Pace.** Internet sites can be readily added and changed. Furthermore, breaking news breaks more quickly over the Internet, pressuring publishers to be less rigorous with their fact checking.

4. **Transcending regulators.** With physical location of little relevance in cyberspace, fraudulent operations can readily access the American market from countries with limited regulation covering fraud and other potential infractions.

Several approaches will address the quality of health information on the Web. A number of rating services, such as Health On the Net (http://
www.hon.ch), which measures sites against its code of conduct focusing on credibility; and Health Summit Working Group (http://www.hswg.com), which measures credibility, content, disclosure, links, design, interactivity, and caveats, have been put in place. These likely will proliferate, leading to confusion about which provide reliable ratings.

Consumers will sort through the cacophony of health care sites the way they do any crowded product category—they will gravitate toward brands. Large health care organizations with established brands, such as the Mayo Clinic, will continue to extend them onto the Internet. Some Internet-based health care businesses will establish strong brands of their own.

Finally, some physicians, consumers, or others who are concerned about the quality of health care information on the Web will seek to regulate its content. Because the Internet, as a huge social communication experiment, is growing rapidly beyond any governmental purview, those attempts will likely be futile. Nonetheless, both Internet taxation and online prescribing are the subject of legislation pending before Congress.

**Physician Ambivalence**

Medical culture is extremely conservative and cautious, especially when it comes to technologies that could alter the doctor-patient relationship. The Internet is one such technology.

Physicians (or at least physician offices) have moved significantly to adopt information technology. Computers in medical offices are commonly used for routine administrative functions, such as scheduling, electronic claims, and checking eligibility. They also are used in some clinical applications. A 1997 survey of physicians by the Institute for the Future and the Lou Harris organization found that 46% of physicians and/or their staff had accessed background information like Medline via the Internet or an online service; for doctors only, the figure was 38%. For accessing clinical patient information, the percentages were 42% and 22%, respectively; for recording patients’ clinical information like histories, 30% and 15%; for transmitting clinical information to other doctors electronically, 28% and 13%; and for receiving computerized treatment records, 8% and 6%.

Doctors’ experience of the quality of information on the Internet is mixed. Hersh, Gorman, and Sacherek (1998), analyzing 639 pages retrieved in 50 searches seeking to answer common clinical questions, found that 99% did not disclose possible conflicts of interest, 89% were not appli-