

Influence of the Internet in an Orthopaedic Practice: Survey of 500 Patients

SELENE G. PAREKH, M.D., M.B.A.,^{1,3} CHARLES K. LIM, M.D.,¹ ROBERT E. BOOTH JR., M.D.,² AND
DAVID G. NAZARIAN, M.D.²

Abstract: The Internet represents a technological revolution that is transforming the way business is conducted in many industries. Internet-based healthcare companies have addressed issues such as cost-efficiencies, supply-chain relationships, and patient education. The Internet has also been used to provide medical information to patients, to sell goods and services, or to facilitate transactions between patients, providers, and payers. We conducted a survey among orthopaedic patients in a multi-specialty orthopaedic practice to characterize the adoption of the Internet by these patients and their attitudes regarding the Internet's role in healthcare delivery. A 27-question survey was distributed to 550 consecutive patients. Patients were stratified by age into six groups, and responses were compared. Statistical analysis was performed. Five hundred eight (92.3%) were returned: 63.7% of respondents use a computer, with a significant difference noted ($P = 0.001$) between age groups (89.1% for those less than 30 years old to 20.2% for those older than 70); 56.5% of the patients use the Internet, with a significant difference ($P = 0.001$) between age groups (77.2% < 30 years old to 15.5% > 70 years old); 46.9% of the patients who use the Internet retrieve general health and medical information; 20.5% use the Internet to learn about their medical condition, 16.2% to learn about their surgical procedure, and 10.6% to learn about their surgeon. The use of the Internet for medical information and management will likely continue to increase in the future. As the Internet becomes an increasingly integral part of our lives, creation and maintenance of a presence on the Internet is becoming a necessary adjunct to any orthopaedic office.

Introduction

Healthcare industry

The health care industry has at times been characterized as an antiquated, inefficient, duplicated system, representing a trillion-dollar industry that contributes 14% to the United States Gross Domestic Product. Although it has one of the most expensive healthcare systems in the world, the United States continues to have approximately 44 million uninsured people [1] and ranks seventeenth in life expect-

tancy [2]. During the 1970s and 1980s, health care costs became uncontrollable and the United States became the number-one per-capita health care spender in the world [3]. Indemnity insurance allowed for the development of many inefficiencies and redundancies in the system, as health care providers and systems were not held accountable for continuously expanding costs.

In the 1990s, the health care industry had been a major focus of the presidential political agenda. An initiative was begun to curb the escalating rate of healthcare costs by attempting to replace indemnity insurance plans with health maintenance organizations (HMO). HMOs gained widespread popularity, with enrollment in Medicare and Medicaid managed care above 50% [4]. New health care entities emerged, such as the independent practice organization, physician-hospital organization, and the practice-provider organization, which were innovative attempts to control health care economics. The Federal Government, in accordance with national insurance companies, implemented diagnostic-related groups and capitation sites in order to limit medical spending. Academic medical centers and non-profit organizations merged to form large health care systems in an attempt to reduce redundancies and gain greater market share.

Computer technology has been central to this revolution, because it affords improved delivery of information, more efficient transfer of information, and instant worldwide communication.

Internet

The Internet represents a technological revolution that is dramatically transforming the way individuals and organizations interact. The Internet was first conceived in the late 1960s by the United States Department of Defense to promote communication and collaboration between academicians and scientists. It gained popularity on university campuses during the mid-1980s as an electronic medium for messages and discussions.

During the early 1990s, two technological breakthroughs led to the exponential growth of the Internet. The first was the creation of the World Wide Web using a standardized programming language, which allowed pictures, audio, and video images to be transmitted and presented on a computer

From the ¹Department of Orthopaedic Surgery, Hospital of the University of Pennsylvania, University of Pennsylvania School of Medicine, Philadelphia, PA, ²Booth-Bartolozzi-Balderston Orthopaedics, Pennsylvania Hospital, 800 Spruce Street, Philadelphia, PA, and ³Wharton Business School, Small Business Development Center, University of Pennsylvania, Philadelphia, PA.

Address correspondence to: Dr. Parekh, Hospital of the University of Pennsylvania, Department of Orthopaedic Surgery, 2 Silverstein, 3400 Spruce Street, Philadelphia, PA 19104.

screen. The second was the development and commercial availability of a free web browser, a software program that allowed widespread access to the World Wide Web using personal computers [5].

As we enter the new millennium, the Internet is quickly becoming the dominant medium for sharing information and conducting transactions throughout the world. In the United States, the Internet has surpassed newspapers and magazines in annual per-capita media consumption [6]. Several surveys conducted by Internet marketing and research organizations indicate that up to 40% of the entire U.S. population (106 million) currently access the Internet [7,8].

Although still in its infancy, the Internet has already transformed the way that business is conducted in many industries. Its appeal results from universal connectivity amongst users and ubiquitous as well as continuous availability. The Internet has enriched the individual consumer with readily available, easily accessible information. It facilitates both business-to-consumer and business-to-business interactions by reducing the inefficiencies in the transactions normally found in standard "brick-and-mortar" businesses.

The Internet is poised to revolutionize a healthcare industry that is highly fragmented and has many redundancies with multiple participants that frequently share vast information. The majority of current information exchange is executed in a paper-based manner. Traditionally, information that would fill ten standard sheets of paper is produced for each medical procedure performed. Internet technology is ideal for organizing and accessing large quantities of this medical information as well as providing direct, real-time communication between patients, providers, payers, and suppliers. By facilitating communications between these parties, the Internet may potentially reduce costs and improve the quality of healthcare.

Since the Internet may provide access to a large healthcare market, many Internet-based healthcare companies and ventures have emerged. There are currently over 20,000 healthcare websites, with an additional 1,500 sites created monthly [9]. These websites and their corresponding companies are leveraging the Internet to provide healthcare information, products, technologies, or services.

The Internet healthcare industry is commonly divided into four segments: content, commerce, connectivity, and care. Content refers to websites that provide health and disease information and facilitate online communities. Commerce represents on-line markets that sell pharmaceuticals and medical supplies. Connectivity represents companies that electronically link the major participants of the healthcare industry, offering services such as claims processing, authorizations, and electronic prescriptions. Lastly, the care segment represents companies that use Internet technology to record, measure, monitor, manage, and deliver care [9].

Unlike other industries, the healthcare industry has been slow to integrate with the Internet. Patients and consumers have been faster than payers or providers to adopt the

Internet. While there are numerous potential clinical benefits, the transformation to online healthcare raises significant issues such as the quality, reliability, security, and privacy of health and personal information that is exchanged. A recent random telephone survey conducted by an Internet research firm, Cyber Dialogue, indicated that more than 22 million U.S. adults use the Internet to access health information [10].

There is little reported data in the medical literature which characterizes the adoption and acceptance of the Internet by any given patient population. In this study, we sought to characterize the prevalence of Internet usage in a defined population of orthopaedic patients and their acceptance of Internet technology.

Materials and Methods

The orthopaedic practice of the two senior authors (R.E.B., D.G.N.) is part of a major university health system located in a large city and offers sub-specialty services in joint reconstruction, sports medicine, and spine surgery. A two-page, 28-question survey was drafted and distributed to 550 consecutive patients over a four-week period. The surveys were distributed to the patients in the office waiting room and were completed and returned by the patients prior to leaving the office.

The patients were stratified into six age groups, and the responses to questions were analyzed. Biostatistical analysis was performed with the χ^2 and two-sided Jonckheere-Terpstra tests.

Results

Five hundred fifty surveys were distributed, and 508 completed patient surveys were returned, for a 92.3% response rate. Table 1 summarizes the demographics of the patients who responded to our survey. The mean age of the respondents was 52.3 years (range 12–93). There were 49.8% males and 50.2% females. The number of patients for each of the age groups is as follows: <30 ($n = 57$), 30–39 ($n = 78$), 40–49 ($n = 77$), 50–59 ($n = 103$), 60–69 ($n = 99$), and >70 ($n = 94$). Overall, 63.7% of respondents use a computer, with a significant difference ($P = 0.001$) ranging from 89.1% in the <30 age group to 20.2% in the >70 age group (Fig. 1). As a group, 56.5% of the patients use the Internet, with a significant difference ($P = 0.001$) ranging from 77.2% in the <30 age group to 15.5% in the >70 age group (Fig. 2). In addition, 22% of the patients state that they plan on obtaining Internet access within the next year.

Table 1. Demographics of the patient population surveyed

	<30	30s	40s	50s	60s	>70	Total
Total	57	78	77	103	99	94	508
Mean age	22.3	34.6	44.4	54.6	64.5	76.4	52.3
% Male	57.7	65	58.9	52.9	35.3	35	49.8
% Female	42.3	34.8	41.1	47.1	64.7	65	50.2

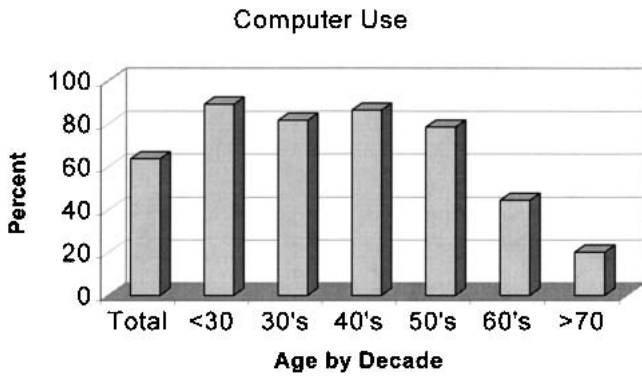


Fig. 1. Average computer use and use by decade for the patient population surveyed.

E-mail use in our patients ranged from 85.7% in those <30 age group to 16.4% in the >70 age group (Fig. 3). Table 2 shows the use profile among the Internet-using patients. Of note, 46.9% of the patients currently use the Internet to retrieve health and medical information. Our survey also reveals that 80.7% of the patients would use a practice web site if one were available.

This survey also addressed patient attitudes regarding the reliability and trustworthiness of medical information available on the Internet, the privacy of personal information on the Internet, and the security of Internet transactions. Approximately 98% of the patients <49 years old think that the information on the Internet is reliable and trustworthy. Those >50 years old have increasing reservations regarding the information on the Internet (Fig. 4); 17% of patients <49 years old believe that there is no privacy on the Internet; however, this distrust nearly doubles in those >50 years old (Fig. 5). Also, 89% of those <30 years old believe that transactions are secure over the Internet, compared to 58% in those patients >70 years old (Fig. 6).

Table 3 shows various healthcare services on the Internet and the percentage of patients who are currently using these services or those who would use these services in the future. There is a significant dichotomy in many of these services and information, such as information regarding patient's disease processes, procedures, and latest breakthroughs. Also, more patients expressed a desire to obtain information

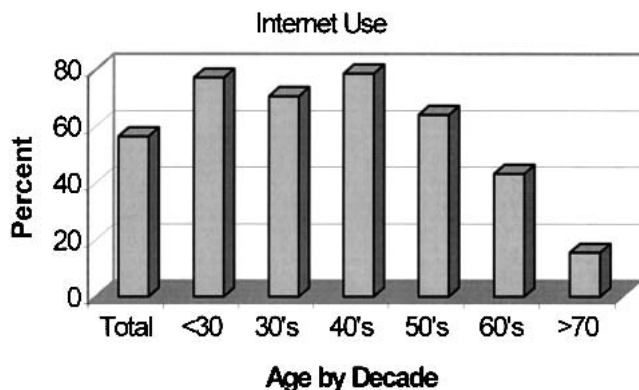


Fig. 2. Average Internet use and use by decade for the patient population surveyed.

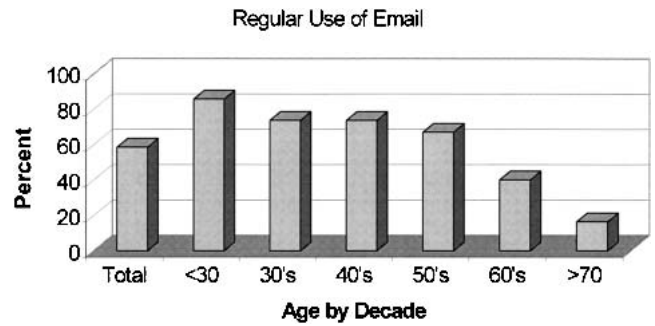


Fig. 3. Regular use of e-mail for entire population surveyed and then by decade.

Table 2. Current activities on the Internet

	Age						Total
	<30	30s	40s	50s	60s	>70	
Entertainment	82.4	88.7	61	63.9	40.8	61.5	67.1
News	43.1	54.7	50.8	52.5	34.7	38.5	47.2
Health information	31.4	62.3	57.6	50.8	30.6	38.5	46.9
Shopping	41.2	52.8	49.2	47.5	28.6	38.5	44.1
Finances	31.4	47.2	44.1	45.9	30.6	30.8	39.9

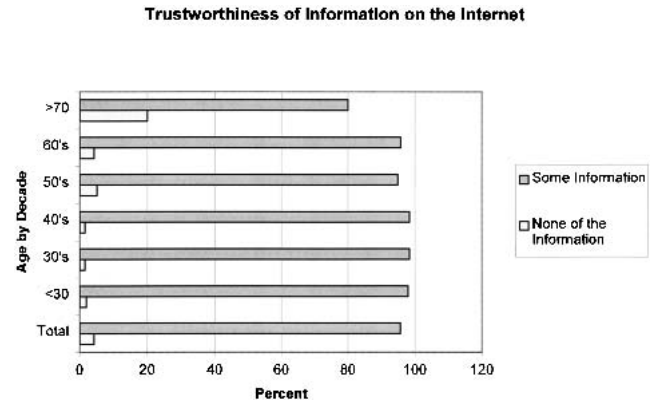


Fig. 4. Percentage of patients who trust some or none of the information on the Internet.

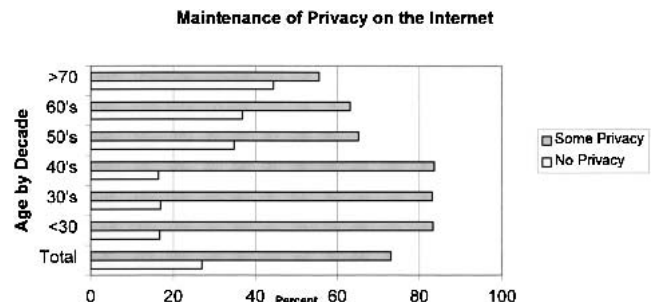


Fig. 5. Percentage of patients who believe that their privacy is maintained some or none of the times while they are using the Internet.

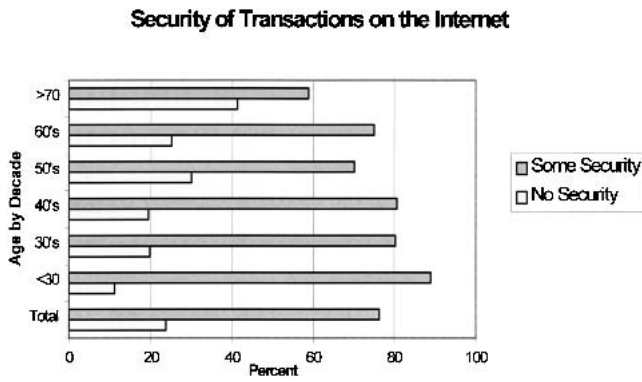


Fig. 6. Percentage of patients who believe that there is some or no security of transactions on the Internet.

regarding the hospital and surgeon performing their procedure. Finally, more than 50% of patients surveyed would like to e-mail their doctor’s offices, schedule their own appointments, maintain electronic medical records, and interact with their insurance companies or HMOs.

Discussion

With a response rate of 92.3%, our survey reveals that 56.5% of the patients are currently using the Internet. This figure is slightly higher but comparable to published figures from other surveys conducted by Internet marketing and research firms. According to these surveys, the percentage of Internet users among the general U.S. adult population ranges from 33% to 50% [7,8].

In this survey, 46.9% of the patients who use the Internet, use it to retrieve health and medical information. This percentage is higher than that reported by Cyber Dialogue, an Internet research firm, which used a random telephone survey [10]. They report that, of the estimated 70 million U.S. adult Internet users in 1999, 25.5 million (approximately 36%) are projected to use the Internet to access health information. Cyber Dialogue estimates that the number of health information retrievers on-line will grow to 33.5 million during the year 2000.

Our patient population also demonstrated significant dif-

ferences between age groups regarding Internet usage. There is a significant difference among the different age groups in computer usage, computer ownership, Internet usage, and e-mail usage (Figs. 1–3). These results were expected since members of the younger generations have been raised during the emergent popularity of personal computer usage. One Internet survey shows that 56% of the U.S. population is under age 45 but accounts for 69% of the Internet users, suggesting that they are more familiar with and willing to adopt this technology [7]. The so-called baby-boomer generation in our patient population (ages 40–59) has a high computer and Internet adoption rate. This suggests that baby-boomers are facile with computer and Internet technology, which should not be a barrier to their adoption of Internet-based healthcare applications as this group ages. The over-60 age group, however, revealed a significant decrease in the prevalence of computer, Internet, and e-mail use.

Table 3 forecasts the potential market for various Internet-based healthcare applications in the content, commerce, connectivity, and care segments. Few patients are currently using these services. However, potential use of these services is great, as reflected by the significant percentage of patients who deem these services to be useful in the future. For example, only 10.6% of the patients currently research information about their surgeon, while 79.1% state they would like to use the web to learn more about their surgeon; 2.7% of the patients currently use e-mail to communicate with their surgeon’s office, while 68.4% state that they would like to communicate via e-mail. Similar differences exist for other healthcare applications and services.

News headlines concerning hacker attacks, computer viruses, and misuse of personal information by Internet advertisers indicate that there are significant challenges to universal adoption of the Internet, particularly within the healthcare industry. Responses from this survey revealed their attitudes regarding the trust, privacy, and security of medical and personal information on the Internet. Most patients believe that only some of the medical information available on the Internet can be trusted, privacy is maintained only some of the time, and only some of the Internet

Table 3. Current and (future) medical uses of the Internet

	Age						Total
	<30	30s	40s	50s	60s	>70	
Disease information	18.9 (73.6)	34.3 (57.1)	21.7 (75)	17.5 (68.8)	14 (78)	6.9 (75.9)	20.5 (70.2)
Procedure information	13.2 (79.2)	26.5 (69.1)	20 (83.3)	13.8 (76.3)	12 (72)	3.4 (72.4)	16.2 (75.6)
Breakthroughs	10.0 (64)	19.7 (63.6)	15 (63.3)	17.5 (66.3)	8.0 (76.0)	10.3 (65.5)	14.3 (66.3)
Peer/support groups	5.9 (33.3)	10.9 (43.8)	3.3 (36.7)	1.3 (30.0)	2.0 (54.0)	3.6 (35.7)	4.5 (38.4)
Hospital information	1.9 (84.9)	12.5 (75.0)	15.0 (83.3)	8.8 (78.8)	2.0 (84.0)	7.1 (71.4)	8.4 (80.0)
Surgeon information	3.8 (83.0)	19.4 (71.6)	15.0 (83.3)	12.5 (73.8)	2.0 (92.0)	3.4 (72.4)	10.6 (79.1)
Email physician’s office	1.9 (63.1)	3.1 (76.6)	5.0 (73.3)	1.3 (63.8)	4.0 (56.0)	0.0 (65.5)	2.7 (68.4)
Schedule own appointments	1.9 (69.2)	3.0 (72.7)	1.7 (75.0)	0.0 (63.8)	2.0 (52.0)	0.0 (62.1)	1.5 (66.5)
Maintain an on-line medical record	0.0 (75.5)	1.5 (63.1)	1.7 (73.3)	0.0 (58.8)	0.0 (58.8)	0.0 (58.6)	0.6 (64.7)
Interact with HMO/insurance company	2.0 (66.7)	1.5 (66.2)	0.0 (60.0)	1.3 (53.8)	0.0 (50.0)	3.6 (35.7)	1.2 (57.2)
Purchase medications/supplies	1.9 (48.1)	1.5 (52.3)	1.7 (51.7)	1.3 (43.8)	2.0 (50.0)	0.0 (21.4)	1.5 (46.6)

transactions are secure. There are equivalent percentages of patients (approximately 20%), who feel that either the Internet information is trustworthy, secure, and private, to those who feel it is not. Age differences also appear in patient attitudes regarding privacy and security. Although there is no significance difference in the various age groups regarding the reliability of medical information on the Internet, there were significant differences in the age groups for the ability of the Internet to maintain privacy of personal information and security of Internet transactions. Not surprisingly, younger people have grown up with computer and Internet technology and have more confidence in Internet technology.

In addition to patient concerns, a recent report by the National Academy of Sciences [11] highlights many of the concerns and reservations of healthcare providers in the transformation to online healthcare. As a group, physicians feel that the infrastructure for network communications on the Internet must be made more secure and reliable, as well as providing certain guaranteed levels of performance. In addition, the federal government must resolve public policy issues regarding privacy and security standards for personal information, liability, and reimbursement standards in the practice of Internet healthcare.

Other barriers for the adoption of the Internet in healthcare includes the lack of access to the Internet among the socioeconomic poor, and differences in the educational level of patients. Internet surveys show that web users are wealthier and more educated than their peers. For example, the 44% of U.S. households with incomes greater than \$50,000 make up 66% of Internet users. The 48% of Americans with at least a college-level education make up 75% of Internet users [7].

There are several limitations of this study. First, in contrast to a general population of patients, this private-practice, orthopaedic-patient population may represent a more economically affluent selected group. All of these patients were insured by Medicare, HMO, or private insurance. The economic profile of this patient population is reflected in that 61.1% of the patients own computers compared to the national average of 52% [12]. In addition, many adult orthopaedic patients have led healthy and active lifestyles without severe chronic medical conditions such as diabetes, cancer, and cardiopulmonary disease. For this reason, it may not be possible to extrapolate the findings from our survey to the entire spectrum of patients in the United States. A similar survey among patients afflicted with chronic medical conditions would provide a useful comparison.

Conclusion

The results of our survey in a population of orthopaedic patients reveal that over half of the patients use the Internet. Patients are increasingly reliant on the Internet for medical information. They are becoming better educated by the Internet and are demanding better quality and access to healthcare. Patient education, the potential for economic savings, and improvement of quality care will continue to drive the adoption of Internet technology in the healthcare industry. The further spread of the Internet into healthcare is likely inevitable. As providers of care, physicians must be familiar with current Internet technologies. A recent AMA survey indicates that up to 27% of physicians have built Web sites to promote their practices and make patient education available on their Web sites [12]. Those physicians unwilling to accept and adopt the Internet may face the risk of losing market share by other more Internet-savvy providers and commercial Internet companies. More importantly, physician acceptance and leadership are essential to address critical issues such as quality, reliability, privacy, and security of medical and personal information and to shape the future of the Internet healthcare industry.

References

1. WebMD. Consumer Union Calls for Universal Health Coverage, August 2000. URL: <http://onhealth.webmd.com>
2. U.S. Census Bureau. International Data Base, 2000. URL: <http://www.census.gov>
3. Schieber GJ, Poullier J, Greenwald LM. Health spending, deliver, and outcomes in OECD countries. *Health Affairs* 1993;12(2):124.
4. Health Care Finance Administration. Trends, 99. URL: <http://www.hcfa.gov>
5. Golladay GJ, Kirschenbaum IH, Matthews LS, Biermann JS. Internet resources for orthopaedic surgeons. *Current concepts review. J Bone Joint Surg* 1998;80-A(10):1525-1532.
6. Lawrence S. Internet in media time. *The Industry Standard*. May 8, 2000.
7. Lake D. Spotlight: How big is the U.S. net population? *The Industry Standard*. November 29, 1999.
8. Lawrence S. The net world in numbers. *The Industry Standard*. February 7, 2000.
9. Bernard S. Evolution of the eHealth space. *Pharm Exec Suppl* 2000;March:8-14.
10. Cyber Dialogue. American Internet users survey, July 1999. URL:<http://www.cyberdialogue.com>. Accessed
11. Chin T. Healthcare web use limited by technology, doctor resistance. *Am Med News* March 20, 2000.
12. Chin T. More doctors are catching web fever. *Am Med News* January 17, 2000.