

The role of e-commerce in health care

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Today's managers are faced with major challenges such as staff shortages, rising health-care costs, and current market pressures for new and advanced technologies and delivery methods. These challenges, among others, have a significant impact on the quality, efficiency, and cost of providing health care and laboratory services. Given the current health-care and laboratory environments, managers must seek innovative ways to improve quality patient care, while at the same time reduce the cost of services provided. To this end, e-commerce could have a significant impact on the cost, efficiency, and quality of the overall management and delivery of health-care services. Efficiency gains within the health-care arena have been attributed to the application of information technology and, most specifically, the Internet. E-commerce, as a relatively new technology, if deployed properly, could enhance the management of laboratory and patient-centered databases. Moreover, the sensitive issue of patient information will be escalated with the advancement of e-commerce. In this article, the authors emphasize the impact of e-commerce, also referred to as e-health, in creating improvements in the delivery of health services across the spectrum of care for health providers, laboratory managers, consumers, and funding organizations. They also present surveys on e-commerce issues, provide findings regarding the supply chain of the health-care industry, and identify the benefits of embracing e-commerce strategies, most specifically in the laboratory.

Scholarship of integration as a research tool

Utilizing the methodology of Ernest L. Boyer in his landmark book, *Scholarship Reconsidered: Priorities of the Profession*, the research model presented here is one of scholarship of integration. Scholarship of integration is a method used by scholarly practitioners and educators to examine and assess a body of knowledge to integrate trends and data from various disciplines in order to obtain a global perspective on issues. According to Boyer, the scholarship of integration involves conducting research on the

boundaries of various converging fields, placing one's own or others' research in its appropriate interdisciplinary context, and interpreting that research into "the larger intellectual patterns."

This research examined the growth of e-commerce and the role it plays in the supply chain of manufacturing and distribution of goods and services. Health care lends itself to the application of e-commerce strategies because of its size, the current inefficiencies of a paper-based system, and the critical need for up-to-date information. Consumers demand improved access to quality health-care information and services, while physicians want to track their patients over multiple care sites and have access to information about the latest diagnostic and treatment options. The industry as a

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whole, faced with increasing demand and rising costs, must improve its efficiency. E-health promises to create improvements in the delivery of health services for health-care providers, consumers, and funding organizations and agencies.

E-health is changing the way providers search for and retrieve medical information, communicate with their patients, and manage acute and chronic conditions. Web-based disease management programs are an important part of the e-health revolution, and are designed to alter the delivery of care through the use of technology to monitor patients daily to determine their health status, remind them to take their medications, and handle problems before they become more serious. These programs collect data without patients having to come to the office or go to the hospital, allow

patients to communicate with their physician and share information with others with the same condition, and have the potential to improve quality as well as control costs.²

Findings on the benefits of e-health

The benefits of embracing e-commerce strategies in the health-care arena are many, including:

1. Improved clinical outcomes through the application of on-line technology that monitors patient compliance, drug regimens, and overall health status, and alerts the health professional(s) of needed intervention strategies.

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2. Optimal delivery of services through on-line access to clinical advice, specialists' referrals, diagnostic test results, drug formularies, and adverse interactions.
3. Increased efficiency in the use of scarce physician resources, enabling nurses, physician assistants, and other support personnel to monitor treatment protocols and communicate complications and patient status.
4. Better monitoring of patient response and progress related to treatment interventions, prescribed and over-the-counter medications, level of patient compliance with medical regimen, and responses to educational efforts by the physician/nurse or multidisciplinary team.
5. Superior disease management programs to help physicians improve patients' adherence to treatment plans, deliver better care, reduce costs, and enhance overall patient satisfaction.

The benefits of e-health are illustrated below in two case studies. Case study 1 describes a prototype disease management program using speech recognition technology, and case study 2 shows an on-line and telephone patient information service provided

by a southern California health maintenance organization (HMO).

Case study 1: A disease management model

SB&E, Inc. (Science Business & Education) (Spokane, WA) conducted a proof-of-concept patient demonstration project to test speech recognition technology as a new information technology to support patient communication with health-care providers and transfer information to them. The prototype system's goal was to test and evaluate the capability and performance of telephone-based, speech technology as the technology of choice to support patients communicating with their physicians on an ongoing and timely basis.³ A total of 1515 patients, family members, or caretakers who accompanied the patient volunteered to test the prototype speech system in four cardiology offices when they came for scheduled appointments at a cardiology setting in the Pacific Northwest. Volunteers ranged from 15 to 87 years of age. They were not notified or informed of the test system before they were approached in the doctor's office but were instructed briefly before testing the system.

The system collected the following patient information: blood pressure, blood glucose, peak flow meter readings, weight, diet entries, and over-the-counter medications. Each volunteer called initially from his/her doctor's waiting room in the cardiology setting. Volunteers were asked to call a second and third time from home or work. Approximately 48% called multiple times as requested. Over the four-week test period, the system processed 2947 calls in which patients' data were collected. Findings indicate sound evidence that the method of using a telephone-based system for direct patient input of historical data is of value and is useful to patients in a significant way. That is, the voice interactive method supports the collection of timely, accurate data that become immediately available for ongoing patient care management. By eliminating time and distance factors, cost of care can be reduced and quality of care can be improved. The result is increased patient satisfaction and the opportunity to optimize the patient-provider relationship.

Findings of the beta test: Will patients use the telephone system?

The findings of the beta test (elicited verbal response from each patient after testing the system) indicated that approximately two-thirds of the patients who called the patient telemonitoring system from

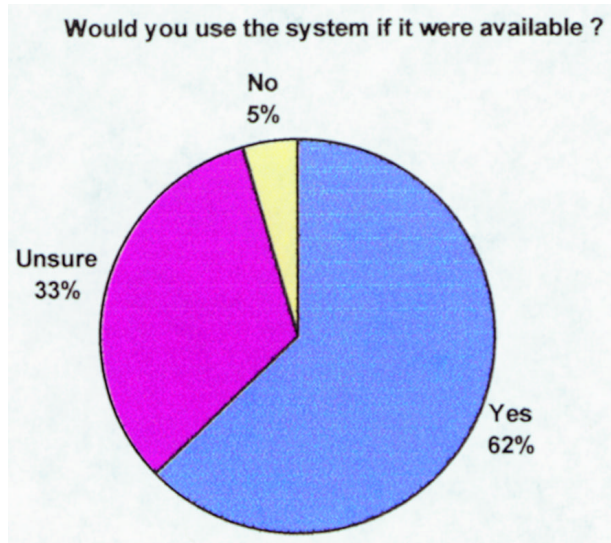


Figure 1 Sixty-two percent (952/1515) of volunteers said they would use the patient telemonitoring system if it were available, 33% (494/1515) said they were unsure, and 5% (69/1515) reported they would not use a voice-interactive computerized system.

their doctor's offices said "yes" to the question posed in *Figure 1*. Some of the reasons for those responding "don't know" were a function of the time the research nurse had to explain the potential use of the system to each individual following their testing of the system. At times there were so many patients waiting to use the system while they waited for their appointments that there was no time to explain how to use the system to those waiting and simultaneously interview and explain the potential use to those completing the test call. Thus, the percent of those who responded "don't know" who may have responded "yes" if they had received the post-call explanation is unknown.

Benefits

The benefits of this application of e-health related disease management are realized by immediate access to patient data, instant capacity to document patient data and care, with the capability to immediately communicate and share patient information among physicians, nurses, and other health-care professionals through a voice-interactive data-sharing communication network. The aggregate of these factors reduces overhead and cost of care. Intangible benefits of using speech technology are the immediacy of communication and quality of information yield by which patient management and quality of care can be ensured. Addi-

Table 1

Uses of voice-interactive system in various health-care settings

Organizational settings	Clinical application examples
Health agencies	Monitor patient compliance with prescribed and over-the-counter medications
Health-care programs in the workplace	Responses to educational efforts and Employee Assistant Programs
Physician offices and clinics	Monitor patient response and progress related to treatment interventions
Inpatient/outpatient services in community-based health-care systems	Screen, monitor, and track patient responses to prescribed medical regimens

tional benefits are maintaining market share of patient clientele through patient satisfaction and the fact that the capability of receiving maximum reimbursement for documented care can be more easily managed and ensured. Benefits to physicians and nurses are increased productivity and the capability to effectively and efficiently coordinate patient management when there is easy access to accurate, current, and ongoing patient information.

Some examples of health-care settings that could best utilize the voice-interactive system appear in *Table 1*

Case study 2: Telephone and on-line retrieval of laboratory results

Kaiser Permanente (Oakland, CA), the largest non-profit, group-practice HMO in the U.S., serves 8.1 million members in nine states and the District of Columbia. With over 6 million members in the state of

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California, **Kaiser Permanente** is an integrated health-delivery system that organizes, provides, and coordinates members' care, including preventive care and hospital, medical, and pharmacy services. This case study serves as a model for telephonic and on-line access to laboratory information.

Members of the **Kaiser Permanente** system are assigned individual medical records numbers that allow them, at no cost, to access patient information. This case illustrates the practical application of the use of technol-

ogy to facilitate communication between the health-care provider and the patient. Utilizing the e-health applications that are available through the **Kaiser Permanente** system, members can access preventive health information, pharmaceutical information, physician credentialing information, and laboratory and radiologic test results. The **Kaiser** Web site provides members with the opportunity to communicate with the health-care team at no additional cost.

To obtain laboratory test results via telephone, the member is guided through a simple set of prompts. At any time, the member can choose to speak directly to a **Kaiser** representative or to a voice messaging system. For laboratory test results outside the normal range, the member is advised to telephone his or her **Kaiser** health-care provider.

Conclusion

E-health holds the promise of reducing the overall cost of health care while improving access and quality of services. These positive attributes will become increasingly important when viewed in the context of changing demographic trends. In the last 50 years, while the population has increased by 3.5 billion people, the global economy was able to generate an increase in real income of approx. 3.8% on average (www.shop.org/learn/status_usnet_general.html). The challenges of the next 50 years will be quite different. By 2050, the number of people over 60 will triple to 2 billion worldwide. As the population ages, the number of young people in the workforce will decline sharply, due primarily to declining fertility rates (number of children per women of childbearing age).⁴ Coupled with these demographic trends, there has been an increase in the incidence of obesity, a common risk factor for congestive heart failure and diabetes.

As health-care costs continue to rise nationally and globally in light of demographic trends and health status indicators, providers, suppliers, and payors will continue to look for innovative ways to become more efficient while maintaining and improving quality of care. Use of the Internet in innovative ways will continue to develop. E-health, like e-commerce, is transforming health care. Standards have been adopted to protect the privacy and confidentiality of patient-specific medical information. Private organizations have created networks and standards to monitor the accuracy of medical information exchanged on the Web. As e-risks are minimized, the growth and reach of e-health will continue.

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