CNE SERIES

Jeffrey P. Harrison
Angela Lee

The Role of *E-*Health in the Changing Health Care Environment

Executive Summary

▶ The role of the Internet in health care information access and delivery is increasing rapidly as evidenced by the fact that 86% of adults with Internet access have used it for health-related information and health queries represent 37% of their total Internet usage.

▶ Consumers (50%) demonstrate significant interest in accessing their own medical information via the Internet as well as describe themselves as likely to switch providers in order to communicate electronically with their physician (33%).

▶ While privacy and information quality present notable risks, the opportunity for *e*-health technology to improve access to information, reach rural or underserved populations, reduce care delivery costs, and integrate health care services and information is significant.

▶ The role of nursing in this growing *e*-health market will be best supported if nurses play a role ranging from system architect to expert end-user, all requiring additional basic training and continuing education.

THERE ARE OVER **100,000** Web sites worldwide with varying quality of health information that are used by consumers and professionals (Kwankam, 2004). Additionally, several hundred million people worldwide use the Internet (Maloney, Ilic, & Green, 2005). In 2001, 86% of all adults in the United States with Internet access consulted it for health-related information and 90% of primary care physicians used the Internet (Kwankam, 2004). Of those adults using the Internet, health information results in approximately 37% of their Internet usage (Appleby, 2000; Maloney et al., 2005).

The study results presented here are significant because they provide the latest data on leveraging information technology to improve quality and efficiency in the health care industry. Key to

this improvement is use of the Internet as a global communications network.

The volume of health and medical research information continues to grow. Consider, on an average day, there are 55 new clinical trials taking place, 1,260 articles indexed in MEDLINE, and 5,000 papers published in the biomedical sciences (Kind & Silber, 2004). As a result, there is an urgent need for tools, referred to as *e-Health*, that can aggregate information from multiple sources to give an overall understanding of clinical modalities and the health care system. According to Kind and Silber (2004), there were only 52 articles listed in Medline with *e*-Health in the title until the year 2000. However, there is growing interest in *e*-Health within academic medicine and the Internet is being integrated into health care

JEFFREY P. HARRISON, PhD, MBA, MHA, FACHE, is an Assistant Professor, Department of Public Health, University of North Florida, Jacksonville, FL.

ANGELA LEE, MSH, CHES, is the Wellness Director, Avanti Wellness Center, Saint Augustine, FL.

professionals training programs (Kwankam, 2004; Maloney et al., 2005).

The speed with which new technologies and treatments are being developed means that many clinical providers are dependent on the Internet to gain current information on clinical practice guidelines. As a result, the use of the Internet has significant potential to improve health care decision making, enhance health management, and produce better patient outcomes (Maloney et al., 2005).

Defining *E*-Health

E-Health emerged early in the 21st century and is an all-encompassing term for the combined use of electronic information and communication technology in the health sector. This term refers to that technology used for clinical, educational, research, and administrative purposes, both at the local site and across wide geographic regions. The use of *e*-Health has enhanced networking, facilitated global thinking, and improved health care on local, regional, and national levels (Cashen, Dykes, & Gerber, 2004).

While some definitions associate *e*-Health strictly with the Internet, the term broadly refers to any electronic exchange of health-related data collected or analyzed through an electronic connectivity for improving efficiency and effectiveness of health care delivery. Therefore it is often used to describe virtually everything related to computers and medicine (Cashen et al., 2004; Deluca & Enmark, 2000; Kind & Silber, 2004; Kwankam, 2004).

The goals of *e*-Health can be summarized to include increased efficiency in health care, improved quality of care, increased commitment to evidence-based medicine, empowerment of patients and consumers, and the development of new relationships between patients and health professionals (Austin & Boxerman,

2003). From a global perspective, *e*-Health can be used to disseminate health information as well as ensure that the most current information is used to improve people's health (Kwankam, 2004). Rural areas may be the greatest benefactors of *e*-Health by having easier access to information and access to telemedicine services (Kwankam, 2004). According to Richards and colleagues (2005), the use of *e*-Health in rural areas is important because 95% of respondents have used the Internet and many have access to scanners, digital cameras, and videoconferencing. *E*-Health networks can remove time and distance barriers to the flow of health information and can help to ensure that collective knowledge is brought to bear effectively on health problems throughout the world (Kwankam, 2004).

Austin and Boxerman (2003) describe four areas of *e*-Health: *e*-Business, consumer marketing, organizational management, and clinical customer service. Some of these are accessed via the public Internet, while others are restricted by passwords on Intranets or local area networks.

According to Deluca and Enmark (2000), *e*-Business includes online procurement processing between health care providers and suppliers, online electronic claims processing, eligibility authorization from insurance companies, and consumer purchase of prescription drugs and health insurance. As of 2000, electronic claims submission and materials management were the most widely implemented *e*-Health technologies in health care. As an example, one large practice association automated nearly half of their claims volume with an Internet-based claims submission system and reduced their per-claim processing cost by almost 40% (Deluca & Enmark, 2000).

Consumer marketing includes the use of Web sites to showcase

organizational information to attract new patients and provide wellness information and disease-specific information to existing patients. Organizational management includes posting employee information on a company Intranet Web site, delivering educational programs, listing job announcements, and announcing employee health benefit programs. It also includes administrative processes such as billing management and strategic planning.

Clinical customer service includes patient access to medical information via electronic health records allowing them to conduct risk assessments of their own health and include patient-physician interaction using e-mail. According to Kind and Silber (2004), e-mail communication can provide an opportunity for patients with Internet access to e-mail questions and receive responses from their physicians. This form of electronic contact shows promise as a means of enhancing communication and facilitating interactions between patients and the health care delivery system (Kind & Silber, 2004). One survey found that 50% of patients expressed an interest in accessing their personal physician's Web site or e-mailing their physician, and one-third considered themselves likely to switch providers in order to e-mail their physician (Deluca & Enmark, 2000).

Additional clinical applications include real-time alerts, clinical screening, and access to reference materials for physicians. Many clinicians now keep patient information in an electronic format and access this information by downloading into handheld computers or personal digital assistants (PDAs) whenever patient-specific decisions need to be made (Pancoast, Patrick, & Mitchell, 2003). In 2004, 40% of practicing physicians owned a PDA, up from 19% in 2001 (Chin, 2005). This represents more than four times

Table 1.
Status of Information Technology (IT) in U.S. Hospitals

Variable N = 3,927	Mean or Frequency
Average annual hospital expenditure on IT	$2.3 million
Percent of total operating expense spent on IT	2.3%
Chief information officer has responsibility for biometric technology	14%
Hospital uses biometric technology for security	13.8%
Hospital plans to purchase biometric technology for security	8.4%
Chief information officer has responsibility for telecommunications technology	58%
Computerized practitioner order entry (CPOE) system purchased	25%
Computerized practitioner order entry (CPOE) system use mandated	4.3%
Hospital has contracted to provide IT services to other health care delivery organizations	2.1%

SOURCE: HIMSS Analytics^{SM} Database, 2005

greater PDA usage among physicians than the usage rate of consumers (Chin, 2005). However, PDA's have yet to be used to their fullest potential in medicine and new developments may encourage greater usage. Smart phones will continue to evolve into mobile computing devices that will have computer capabilities and still fit in your hand (Chin, 2005).

Current Status of *E*-Health

According to Appleby (2000), health care has historically underinvested in information technology (IT); however, *e*-Health is receiving a significant portion of new IT spending. Data for this research was drawn from the 2005 HIMSS Analytics database which surveyed almost 4,000 hospitals in the United States and provided extensive data on the hardware, software, and information technology infrastructure within health care organizations. Access to the HIMSS analytics 2005 database was obtained from HIMSS Analytics by the University of North Florida Health Administration Program for research purposes. Data were collected and updated by the HIMSS Analytics staff. The HIMSS Analytics 2005 data represents a comprehensive

collection of public and private U.S. hospitals.

As noted in Table 1, the HIMSS Analytics database found that of those hospitals responding, the annual expenditure on information technology was 2.3% of total operating expenses resulting in an average annual investment of $2.3 million. The data also indicate that 13.8% of hospitals currently use biometric technology and an additional 8.4% plan to purchase biometric technology.

The data show that 25% of responding hospitals purchased a computerized practitioner order entry system while only 4.3% mandated its use. It is also interesting to note that 2.1% of reporting hospitals provide contract information technology services to other health care organizations through outsourcing agreements.

According to Deluca and Enmark (2000), the Internet drove the initial development of *e*-Health applications. Now, it is suggested that employers and engaged consumers are fostering the continued development of new *e*-Health applications (Austin & Boxerman, 2003). Access to health care on the Internet by women is growing with eight out of ten women choosing their chil-

dren's doctors and two-thirds of women choosing their family's health plan via online *e*-Health applications (Boeke, 2000). This supports the premise that *e*-Health via the Internet creates more flexibility and options among health care consumers. According to Austin and Boxerman (2003), by 2004 the *e*-Health industry will have generated $370 billion in revenues.

According to Deluca and Enmark (2000), the early adopters of *e*-Health are willing to accept the risks inherent in technology development as well as low return on investment in order to take advantage of consumer-oriented programs.

Pros and Cons of *E*-Health

As discussed by Austin and Boxerman (2003), the key stakeholders in the *e*-Health industry include employers, patients, providers, and health plans. Employers want to analyze health care costs and utilization by their employees. Patients want information about their own health. Providers want to save time and money by streamlining communications. Health plans want to strengthen relationships with members and providers while

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reducing the cost of doing business (Austin & Boxerman, 2003).

For patients, who can also be viewed as consumers, *e*-Health represents an opportunity to change their relationship with providers and insurance companies. Opportunities for improved communication include provider messaging, access to electronic medical records, and the ability to access information about alternative approaches to medical treatment. Patients generally get only 10 minutes of face-to-face time with their physician and through *e*-Health have access to thousands of health care Internet sites where they can gain unlimited health information. Also, it can take a week to get a return phone call from a physician and almost a month to get a regular office appointment (Deluca & Enmark, 2000). According to Cashen et al. (2004), the potential for *e*-Health technologies to educate patients and promote improved self-management skills is well documented.

Employers face growing health care costs, which jeopardize their competitive position in the international market. Since health care costs are a large share of product cost, employers are seeking new and innovative approaches to improve efficiency and quality in health care. As a result, employers are becoming engaged in activities such as the Leapfrog Group, which review the cost and quality in health care because they see this involvement as essential to economic viability. Some organizations consider the Internet as a way to streamline health care administrative costs and improve communication among the various health care organizations (Meyers, Van Brunt, Patrick, & Greene, 2002). Since employers negotiate benefits packages, review geographic coverage, and maintain a benefits administration staff, it is estimated that administration costs add up to $10 billion a year to U.S. health care costs (Meyers et al., 2002). In addition,

many of the company health promotion activities are offered through the organization's Intranet site because they reduce health care costs and improve productivity (DeGroot & Kiker, 2003; Sofie, 2000).

Providers view *e*-Health as an opportunity to improve efficiency, reduce administrative costs, facilitate communication, and enhance patient care (Kirshenbaum, 2002). While providers are also interested in the use of PDAs at the point of care, the cost and lack of connectivity with electronic medical records and clinical practice management software are continuing problems (Kirshenbaum, 2002). According to Chin (2005), U.S. medical schools are increasingly requiring the use of PDAs and related information as a mechanism to promote efficiency and safety in health care.

As the public use of the Internet grows, health care organizations are using this opportunity to reach a large part of the population cost effectively (Deluca & Enmark, 2000). This includes using the Internet for marketing, patient education, administrative transactions, establishing new relationships with consumers, and increasing operational efficiency (Appleby, 2000).

The greatest barrier to *e*-Health is the difficulty for consumers to find accurate and reliable information (Maloney et al., 2005). According to Dutta-Bergman (2004), the two critical indicators of *e*-Health information quality are source credibility and information completeness. Medical experts suggest that health information provided by a source that is not credible is detrimental to consumer outcomes. Also, unless health information is complete, it is likely to mislead the consumer into making incorrect decisions. The completeness of health information is considered the single most important criterion in health care decision making (Dutta-Bergman, 2004).

Since the Internet as a communications system is relatively uncontrolled, initiatives have been introduced in an attempt to improve the quality of Internet-based health information. One such control is the Health on the Net (HON) code, which offers a stamp of approval for Web sites adhering to agreed quality principles. Similarly, Health Internet Ethics (Hi-Ethics) has developed the "*e*-Health Code of Ethics" in an effort to respond to concerns regarding reliability of information, privacy, and confidentiality (Kind & Silber, 2004; Maloney et al., 2005).

The Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule expanded federal regulations about the confidentiality of patient information and some organizations are reluctant to implement *e*-Health technology. However, a major provision of HIPAA was to expand electronic data exchange between payer and provider entities (Kind & Silber, 2004). Therefore, the adoption of electronic data exchange has the potential to improve efficiency, facilitate electronic claims processing, and enhance patient outcomes. However, it also imposes a requirement to safeguard patient data in the face of increased risks (Pancoast et al., 2003).

From a societal perspective, there are technological, organizational, managerial, and ethical implications associated with *e*-Health proliferation (Deluca & Enmark, 2000). According to Cashen et al. (2004), the most vulnerable people in our society may be the least able to benefit from *e*-Health due to cognitive, social, and cultural barriers. These barriers include literacy, cultural differences, language differences, access to technology and educational deficiencies (Cashen et al., 2004). Only through conscious efforts to address these barriers can *e*-Health initiatives be expanded to meet a broad range of society's needs.

Future Developments in *E*-Health

As technology continues to improve, the *e*-Health industry will revolutionize health care in America. Providers will increasingly utilize automated systems to verify eligibility from payers as well as process claims; patients will have access to electronic medical records as well as condition-specific clinical data from providers; and employers will sponsor disease management and wellness programs for their employees (Deluca & Enmark, 2000).

As discussed by Austin and Boxerman (2003), *e*-Health will become a major factor in the infrastructure of health care. However, due to the open architecture of the Internet, organizational policies and procedures are needed to guarantee the privacy and integrity of *e*-Health systems. These policies need to focus on data security as well as the other ethical issues pertaining to *e*-Health (Kind & Silber, 2004). The emerging field of biometric technology provides the capability to enhance data security through the identification of an individual's biological trait. According to Altee and colleagues (2004), biometric security technology will be in common use by 2010 to protect patient information. Additionally, Narayanswamy, Johnson, Silveira, and Wach (2005) document the biometric use of the human iris in the area of security recognition applications.

However, the full potential of *e*-Health will only be realized through greater investments in telecommunications equipment and supporting information technology (Richards et al., 2005). According to Chun, Kang, Kim, Park, and Kim (2005), the use of clinical biometric technology through a personal wearable device allows patients to be monitored at home via a telehealthcare system.

Managerial Implications

These results have important managerial implications as the U.S. healthcare industry faces a more competitive environment. Low profits, combined with increasing health care inflation, place health care organizations at a distinct disadvantage. As discussed by Harrison and Sexton (2004), many hospitals are experiencing low return on assets which, when combined with high levels of debt, make further investment in expensive information technology difficult. Health care executives who wish to improve efficiency and profitability are challenged to implement meaningful programs that can positively affect the organization's financial status. This study demonstrates that the implementation of *e*-Health programs may be an opportunity to improve efficiency and reduce costs in their institutions. Additionally, the coordination of care across multiple facilities within an integrated health system may enhance efficiency. This was supported by Harrison, Nolin, and Suero (2004) who found that greater coordination of clinical services enhances operational efficiency and improves organizational profitability.

Implications for Nursing Leadership

As key stakeholders in the health care industry, nursing support is critical to the development and implementation of *e*-Health initiatives. Additionally, as coordinators of health care services, nurses function as patient advocates as well as resource sponsors. These factors make nurses critical to the delivery of high-quality and cost-efficient health services (Harrison et al., 2004; Ramsey, Ormsby, & Marsh, 2001).

Therefore nurse leadership must understand the technical characteristics of health information technology as well as the clinical capabilities of *e*-Health within the health care system.

Since the health care information technology landscape is changing so rapidly and health information courses are not routinely included in nursing curriculum, it is incumbent on nursing leaders to foster an environment among the clinical staff to support new and innovative uses of information technology. More importantly, nursing leadership is in a unique position within the health care industry to take the lead in leveraging health information technology to enhance the quality of patient care.

Policy Implications

This research shows that health care organizations are investing in information technology and are implementing *e*-Health programs. Additionally, the data indicate that *e*-Health initiatives such as telecommunications systems have the potential for significant improvement in health status in rural communities. However, further study is necessary to determine whether barriers to *e*-Health in rural communities such as the lack of resources, lower education levels, or large Medicare populations negatively impact the implementation of *e*-Health programs.

From a policy perspective, directing additional resources into *e*-Health initiatives has the potential to reduce health care cost while improving the health status of patients at the regional and national levels. Faced with the rapid growth of the elderly population, *e*-Health initiatives may help meet the challenges of providing efficient, cost-effective care for this population. Successful *e*-Health programs should be studied not only for financial impact but also to identify opportunities to integrate care within local and regional health care organizations. Policymakers at the local and national levels need to further evaluate *e*-Health as a mechanism to coordinate preventive services, outpatient care, and inpatient health services.

According to Kwankam (2004), *e*-Health systems are essential to keeping pace with the exponential growth of health information and to applying this knowledge to resolving world health problems. *E*-Health technology has already demonstrated the ability to provide access to information that will result in improved quality of care for patients. It will also allow for more efficient use of medical resources, a reduction in administrative costs, and facilitate collaboration across the continuum of care (Kirshenbaum, 2002). While not addressed by this study, *e*-Health has the ability to reduce health care errors by providing the most appropriate disease-specific clinical care protocols. Additionally, it supports evidence-based medicine as a mechanism to increase the quality and efficiency of the health care system by providing the information technology necessary for communication within provider networks. By linking researchers, clinicians, health care providers and patients, *e*-Health can reduce malpractice liability while enhancing quality of care.

Future initiatives in *e*-Health will empower consumers to use health information technology to enhance their knowledge of disease processes and improve their health status. However, we must recognize that *e*-Health is designed to support the relationship between patients and their health care providers and can never substitute for the personal interaction between patient and provider (Kind & Silber, 2004).**$**

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Answer/Evaluation Form: NEC J610
The Role of *E*-Health in the Changing Health Care Environment

This test may be copied for use by others.

COMPLETE THE FOLLOWING:

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Answer Form:

1. If you applied what you have learned from this activity into your practice, what would be different?

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The offering met the stated objectives.

2. By completing this activity, I was able to meet the following objectives:

    a. Define *e*-Health.   1   2   3   4   5

    b. Discuss the current status of *e*-Health in the   1   2   3   4   5
        health care environment.

    c. List the pros and cons of e-Health.   1   2   3   4   5

    d. Describe the policy and managerial   1   2   3   4   5
        implications of e-Health in the health care
        environment.

3. The content was current and relevant.   1   2   3   4   5

4. The objectives could be achieved using   1   2   3   4   5
    the content provided.

5. This was an effective method   1   2   3   4   5
    to learn this content.

6. I am more confident in my abilities   1   2   3   4   5
    since completing this material.

7. The material was (check one) ___new   ___review for me

8. Time required to complete the reading assignment: _____minutes

I verify that I have completed this activity: _____

Comments_____

Jeffrey P. Harrison, PhD, MBA, MHA, FACHE, and Angela Lee, MSH, CHES, discuss the impact of e-Health technology in health care information access and delivery. See page 283.

Vernon W-H Lin, MD, PhD, and colleagues evaluate and grade California's 24 regions based on size and working RN populations. See page 290.

Perry C. Goldstein, BSN, RN, reveals how disease management programs are changing the way basic medical care is provided in the United States. See page 308.