

## Original Article

## A Paradigm Shift in the Healthcare Delivery System with the Emergence of the 'Ambient Care' Environment

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### Abstract

**Objective:** Patients are becoming more active in communicating with doctors, forming e-communities, and participating in decision-making process of their treatment plans. However, only a few studies have examined how digitalized healthcare affects patients' and doctors' attitudes towards medical care services and deliverance structure, and the problems that might stem from these changes. In this study, we 1) explored the current changes in patients' healthcare utilization patterns and delivery structures, 2) examined the emerging behaviours and awareness of the participants, and 3) proposed how to prepare for such changes. **Methods:** Face-to-face interviews and a group discussion with both Korean and US experts on consumer health informatics were conducted. Interview guidelines were developed based on reviews of recent studies on consumer health informatics. **Results:** While the American scholars had larger expectations about the scope of the changes in the health care system induced by the digitalization of healthcare, compared to the Korean scholars, the interviewees and group discussion participants from both countries all agreed on the changes in medical environment and the increasing importance of medical information. The changes induced by the digitalization of healthcare were categorized as follows: (1) in the structure and location of healthcare service delivery, (2) in the doctor-patient communication methods, and (3) in the role of patients and increasing emphasis in empowerment. **Conclusion:** We expect that digitalized healthcare will continue to affect the doctor-patient relationship and change the deliverance structure. In order to better prepare for the fundamental paradigm shift in the healthcare system and increase the benefits to society of these changes, continuous and concerted policy efforts to protect the privacy and security of private information, alleviate the digital divide, and secure the quality of digitalized clinical knowledge will be required. (*Journal of Korean Society of Medical Informatics 15-3, 313-320, 2009*)

*Key words:* E-health, Consumer Health Informatics, Patient Empowerment

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## I. Introduction

A new paradigm that has a potential to change awareness, behaviours, and expectations of patients and people who are related to healthcare service production, consumption, and provision is in the near future. At the same time, changes in the infrastructure of healthcare services and a higher level of efficiency in the healthcare service management are expected. Health informatics is predicted to bring such revolutionary changes in production, service, and management of healthcare system. Popularity in computer and speedy growth in the internet spread healthcare information into the general public, providing medical information, that were only available to medical professionals in the past, to the general population.

Factors, including rising demands for healthcare services, fast advances in medical technology, increased competition among health providers, and expansion of the elderly population, are responsible for these revolutionary changes, from a provider-centered healthcare delivery structure to a patient-centered one that regards the patients' expectation and needs as its highest priority. Also, these factors change not only the tools and methods to deliver medical technology and health information, but cultural awareness and values toward healthcare services. This creates an 'ambient care' environment, "a responsive and proactive environment that enables easy participation of individuals in their own healthcare management, better and direct communication with professional healthcare providers, friends, family and a wider community<sup>1)</sup>."

Recently, there have been tremendous efforts made in Korea to utilize the benefits of adopting computer technology and medical technology within the healthcare industry with expectations that these changes will heighten the quality of medical care, lower the cost, and expedite economic growth of the nation. In spite of much increase in this type of attention, however, there has not been enough attention to conceptualization of consumer

health informatics and its potential impacts on healthcare system in a larger perspective<sup>2-4)</sup>. Majority of the debate focuses only on technological side of the issue, lacking research on how digitalized healthcare affects patients' and doctors' attitudes towards medical care services, the deliverance structure between doctors and patients, as well as the problems projected to stem from these changes. The purposes of this study are 1) to examine recent changes in patients' healthcare utilization patterns and delivery structure, 2) to predict the emerging behaviours and awareness of the participants, and 3) to propose how to prepare for such changes.

## II. Materials and Methods

The framework of this study was developed first by a thorough review of past studies, including academic journals, books, policy reports that were published in Korea, in the United States as well as in European countries. Keywords that were used to review previous studies include the followings, but not limited to: "E-health", "health information technology", "computer-based care", "physician-patient electronic communications", "consumer health informatics", "online healthcare", "hospital information systems", "electronic medical record", "digital hospital", "medical informatics", "telemedicine", and "health knowledge management." In particular, we focused on studies that addressed changes in behaviours of consumers and doctors as well as relationships between them. In addition, statistics from domestic as well as international resources were used to understand trends of developments in medical informatics, changes in the public and providers' attitudes, as well as recent changes in the patterns of healthcare delivery system.

Based on extensive reviews of past studies and international case studies, key questions for group and individual interviews were developed. Face-to-face interviews were conducted with two Korean medical sociologists. Also, in-depth interviews with two scholars on

medical informatics in the United States were conducted. In addition, a group discussion was conducted with a group consisted of a medical sociologist, medical providers, and health policy experts in Korea. Interviews were recorded and transcribed for in-depth qualitative analysis. Both individual and group interviews were focused on participants' views on recent developments of medical informatics and related changes in the doctor-patient relationship, healthcare service utilization patterns, and the service delivery system. Policy implications concerning these changes were also discussed.

### III. Results

#### 1. Changes in healthcare environment

Participants in the group discussion as well as individual interviews expressed similar views regarding recent changes in healthcare environment that are increasing importance of digitalization of medical information. Domestically, there were significant changes in the healthcare environment, including a series of the healthcare system changes, increasing competition among institutions, changes in medical culture in our society, changes in treatment patterns and advances in technology<sup>5)</sup>.

Both domestic and international participants observed that the 21<sup>st</sup> century, characterized by aging and globalization, is experiencing significant changes in the healthcare service utilization patterns and its delivery structure, in both qualitative and quantitative ways. Medical informatics was referred to play a significant role amid such changes in the healthcare environment. Increased acquirement in knowledge via various channels that are available for patients regarding the cause of diseases and cure as well as advances in medical technology resulted in raised expectation of consumers. Also, through extensive use of internet, patients can easily obtain information regarding various treatment options. At the same time, patients often form internet forums and share information with each other.

This seems to lower the level of information asymmetry between healthcare providers and consumers, and increase demands for their participation in health-related decision making.

#### 2. Effects of digitalization of health care

##### (1) Changes in the structure and location of healthcare service delivery system

According to the interviewees from the United States, information and communication technology advances are already bringing power shifts from providers to consumers. Emergence of various information websites and development of telemedicine increased the informational power of consumers and allowed self-management of diseases, resulting in the emphasis of the role of patients in healthcare service delivery and more direct expression of their needs towards healthcare service providers. This is providing a momentum for changes in healthcare service delivery structure and locations. Interviewees summarized the changes in the healthcare service delivery system in the following 3 dimensions: 1) ambulatory substitution, 2) home substitution and 3) patient-centered medicine.

First, a trend of ambulatory substitution is occurring. Formerly, surgical procedures were only available as inpatient services, but now it is changed so that the surgical procedures may be done without the admittance to the hospital and patients can be discharged from the hospital after a "Day surgery". This type of change is the result of advances in medical technology with which a simpler procedure could substitute complex surgeries that previously required hospitalization. This advancement is welcomed by medical providers, insurers, and policy makers as it enables significant decreases in healthcare cost.

Second, US interviewees observed that a trend of home substitution is also occurring. Development in telemedicine allows for treatment and simple self-man-

**Table 1.** Changes in the structure and location of healthcare service delivery system

Dimension	Before e-Health (Industrial age medicine)	After e-Health (Information age healthcare)
Ambulatory substitution	<ul style="list-style-type: none"> <li>• Medical surgical treatments only in the hospitals</li> <li>• Surgical procedures only in in-patient services</li> <li>• Medical diagnosis only by the visit to the hospitals</li> <li>• Healthcare only in fixed location</li> </ul>	<ul style="list-style-type: none"> <li>• Day surgery available by the advancement of medical technology</li> <li>• Telemedicine makes diagnosis possible without in-person visit</li> <li>• Mobile technology actualizes mobile healthcare</li> </ul>
Home substitution	<ul style="list-style-type: none"> <li>• Healthcare institution-centered</li> <li>• Hospital is the only place for the healthcare</li> </ul>	<ul style="list-style-type: none"> <li>• Home-centered</li> <li>• Treatment and self-management at home using e-health and ubiquitous healthcare technology</li> </ul>
Patient-centered medicine	<ul style="list-style-type: none"> <li>• Provider oriented paternalistic model of care</li> </ul>	<ul style="list-style-type: none"> <li>• Consumer oriented partnership model of care</li> </ul>

gement to take place at patients’ homes. Such changes result in numerous positive effects such as an increased access to care, a higher level of equity, continuation of treatment, emphasis in prevention and anticipation of health promotion, and decreased healthcare cost.

Finally, there is a rising trend of patient-centered medicine. Expansions of and variations in demands in both quantity and quality of healthcare services are forcing healthcare institutions to face the urgent needs for changes in healthcare delivery system, from the current “provider-first” style to the “consumer-oriented” one that emphasizes the consumers’ expectation and needs. Traditional treatment methods that is doctor-centered and healthcare institution-centered, where patients visit the doctor’s office according to the doctor’s schedule, and patients relinquish all decision making power to the doctor, is changing into patient-centered treatment that respects the patients’ convenience and decisions through the use of various e-Health tools (Table 1).

**(2) Changes in the communication patterns between patient and doctor**

Participants all emphasized that recent changes in the deliverance structure and location in healthcare services have been accompanied with changes in the doctor-patient communication patterns. Even before the development of internet, various communication methods such as counseling, mail, phone and fax existed, but the emergence of internet allowed a wider choice of options for communication. Especially, in today’s age where patients’ needs are continuously becoming more varied

and complicated, two-way communication between doctors and patients becomes a very important tool.

Communications that are web-based and two-way interactive is referred to as “E-encounter”. Recent studies on consumer health informatics present several models proposed to describe the “E-encounter.”<sup>6)</sup> In particular, MacDonald et al.<sup>3)</sup> indicated which types of communication is two-way communication and may be considered as “E-encounters.” Models of two-way internet communication process between patients and doctors can take various forms, varying from *the One-on-One Physician-Patient Email model* (a simple model where a patient e-mails the doctor with the description of his or her health information, upon which the doctor explains and records the dangers of patient’s status via email), *the Practice-based Email Model* (diagnostic assistant is present between the doctor and the patient), *the Communication Application Model with Patient Personal Website and Broadcast Messaging* (adaptation of the previous model where applications that substitute the diagnosis assistant), *to the Home Monitoring Model with Case Manger Linkage* (the general self health management of patients with diabetes and high blood pressure who uses small medical devices that records the results which allows for home monitoring).

Communication types based on the web such as those listed above have several advantages over the traditional ways of communication. First of all, they allow informal communications, therefore mimicking the effect of traditional ways of communications through telephone. At the same time, unlike telephones or other traditional communications, they allow patients and doctors a lon-

**Table 2.** Potential benefits to participants in e-Care

Type of E-care	Participants			
	Patient	Physician	Practice site	Health plan/employer
E-communication • Administrative reminder • Clinical reminder	• More frequent targeted reminders • Improved compliance	• Improved patient compliance • More proactive communication with patients	• Reduced cost of routine communication	• Patient satisfaction with care and service • Improved patient compliance
MD-patient email • Clinical • Administrative	• Increased access to advice • Ability to avoid unnecessary visits • Ease of routine communication	• More productive use of face-to-face encounters • Patient-satisfaction/retention • Increased capacity to see new patients	• Reduced administrative overhead • Ability to deliver improved customer service	• Patient satisfaction with care and service • Reduction in medically unnecessary visits
E-disease management • Patient self-report • Home monitoring upload • Outreach/assessment between face-to-face encounters	• More information for self-management • More frequent support and feedback • Increased access to advice for self-management	• More frequent updates on patient status to supplement encounters • Opportunity for earlier intervention • Increased ability to meet needs of chronically ill patients*	• Increased capacity to support organized disease management for targeted patients • Reduced cost of care due to support and early intervention†	• Patient satisfaction with care and service • Increased capacity to support disease management for targeted patients* • Reduced costs of care due to support and early intervention†

Source: MacDonald K. Case J and Metzge, J. E-Encounters. California HealthCare Foundation. 2001. p.10

\* If sponsor of disease management program

† Applies to physician practice or host provider organization if providing prepaid care to population

ger time to contemplate about the issue, resulting in increased quality in the communication. Third, in case of e-mail information exchange, doctors are not obligated to respond to the patients' emails immediately. Even in the absence of either party the continuation of communication is possible. Fourth, the information content can be stored permanently. Fifth, Internet communication promotes future encounters between the patient and doctor and is effective for patient-doctor relationship improvement. Finally, the cost is relatively lower compared to mail or telephone communications and most of all, time and cost of visitation is reduced (Table 2).

It was notable that while the two interviewees from the United States recognized increasing changes in the patterns of doctor-patient communication that are described in literature and acknowledged the advantage of new ways of communication, they also indicated that even in the United States, healthcare service providers' evaluation in reality towards the web-based patient-doctor communication might not be always considered in favorable terms. According to them, doctors, on the surface, seem to show interest in this new communi-

cation model. However, U.S. interviewees also warned against considering the seeming interest as real ones and expressed considerable amount of concerns on the hasty adoption of the new model. This was even more prominent among Korean participants and interviewees, who said that while the technology is almost ready, medical culture in Korea was not yet ready for rapid changes in doctor-patient relationships.

**(3) Changes in patients' role and empowerment of consumers**

'Empowerment' is one of the OECD's proposed healthcare policy objectives, 4E's (Equity, Efficiency, Effectiveness, and Empowerment)<sup>7</sup>. The concept of 'Empowerment' denotes the role and right of patients and is closely related to patient participation and consumer sovereignty. Participants of interviews and group discussions all emphasized that the foremost character and contribution of e-Health are that it proposed a new paradigm where the former practice of healthcare provider-centered notion switched to the one where patients

became the first priority<sup>8)</sup>. Unlike in the past where patients only acted as non-participating consumers, now the role of patients who are better equipped with increased knowledge is more emphasized and their active participation in treatment and procedure process decision is encouraged<sup>9)10)</sup>. Based on interviews and literature reviews, we examined the empowerment of healthcare information consumers in two different aspects, e-patient and e-community.

### **1) Empowerment of e-patient**

Empowerment of e-patient is apparent in the following three dimensions; a) patients' access to their own medical history and records, b) an active participation in treatment decision making, and c) better access to medical knowledge. First, the US interviewees emphasized the importance of patients having an easy access to their own health records. The construction of electronic health records is expected to improve patients' access to their own health records<sup>11)</sup>. According to one of the US interviewees, digitized health records of patients is bringing a different type of revolutionary changes, where a patient becomes the 'writer and editor of his/her own health records.' This is a major departure from the current practice of a hospital or a doctor being the sole manager of health records. Ultimately, the patient can promote self-management of their health in their daily routine through approaching their own health records and also actively participate in communication with healthcare providers through various communication channels.

Second, interviewees emphasized the importance of patient's active participation in the clinical decision-making. For example, automatic and customized online disease prevention program is expected to satisfy the needs for better information, self-control, self-efficacy, and social support system in the healthcare service delivery process, thereby providing decision support to the patients<sup>12)</sup>. At the same time, this will allow doctors to minimize incorrect diagnosis or medical errors, if work-

loads of doctors from having to analyze data and make complex decisions can be decreased<sup>13)</sup>. It was also noted that in order for the patients to actively participate in the decision making, they have to become an 'expert patient'. It was suggested that future tasks in patient sovereignty include propagation of medical knowledge without highly specialized, out-dated technological and medical lingo so that patients can acquire medical knowledge more easily and precisely. Finally, empowerment of e-patient means better access to medical knowledge. Internet search engine allows increased gain of general health information, as well as more hard-core medical knowledge that was only available through healthcare service providers.

It is interesting to see that while everyone agrees on the need for information gain through internet and web communities is increasing fast, they also predicted that the quality and the actual effect of information gain on the patient's health improvement and their treatment decision were still debatable. While its potential as a catalyst to switch to patient-centered healthcare service structure is anticipated, medical sociologists in Korea expressed strong concerns that individual doctors' resistances towards the changes towards patient sovereignty would not be negligible.

There also are increasing efforts to provide more information on healthcare providers to the patients. Whether such efforts actually lead to consumer empowerment is still being debated, and majority of past studies show that availability of such information has no direct effect on consumer behaviors<sup>14)</sup>. However, it was reported that healthcare institutions pay more attention to the study results and make serious efforts to improve the quality of service<sup>15)</sup>.

### **2) Empowering through e-communities**

Formation of e-communities where the patients, family and healthcare providers can form a network within the healthcare system and share information, exchange ideas and experiences, and promote emotional

stability is also becoming popular. E-community allows participants to share their first- or second- hand experiences and ultimately brought the change from a situation where the patients were considered outside consumers to a structure where they are regarded as insiders. The characteristics of the e-community are, first, they promote common understanding among the members. Second, members promote beneficial gains by sharing their own experiences. Lastly but most importantly, by forming trusting relationships among themselves members work as a team to achieve the goal of information sharing and comforting<sup>16)</sup>. Also, to those isolated due to diseases, comforting environment that encompasses differences in location, time and culture is provided. Usually e-communities are managed by patients and their family, and sometimes by nurses, at a very low cost<sup>17)</sup>. In a study done by Chung<sup>18)</sup>, health related e-communities in Korea, such as groups for health promoting, health counseling, and patient communities, were formed under the mission of creating a network centered around patients and their families and providing emotional and social support.

#### IV. Discussion

Based on these findings, we suggest the following tasks in preparing for the future paradigm shifts in the healthcare system. First, protecting privacy and security of private information will become an even more important policy issue. With increasing dependency on health informatics, dangers for online illegal activities such as false advertisement, breach of privacy, and criminal intentions can easily occur. Efforts to protect security of private information have to be emphasized and access to the website that contains private information regarding patients needs to be strictly monitored.

Second, societal efforts to alleviate digital divide are required. Digital divide is 'a situation where a group can approach and use digital information and economy, while another group cannot do so due to various rea-

sons including socio-economic status'<sup>19)</sup>. This harbors a potential of facing an unequal distribution of resources, a similar problem faced by current metropolitan areas that have a dense distribution of hospitals compared to rural areas.

Third, quality management of digitalized clinical knowledge becomes an important task. Therefore, appropriate and strict evaluation criteria are required to ensure the reliability and accuracy of information available on the internet. An ethic guideline, called 'e-Health Code of Ethics' and the 8 rules for the promotion of internet healthcare information quality, proposed by the International Healthcare Coalition<sup>20)</sup> can be a useful example.

Fourth, changes in medical culture and social awareness will be an important prerequisite for future paradigm shifts. Medical culture is known to be conservative and prudent, and especially defensive against implementation of new technologies that may bring changes to patient-doctor relationship. On the surface, doctors show positive reactions towards implementation of computer technology itself. However, they let most of it only deal with scheduling, electronic billing and other administrative purposes and, overall, they showed very defensive attitudes towards technology implementation regarding their treatment decisions. Most of all, the medical culture and awareness towards the empowerment of patients is not always positive. Optimistic interpretation regarding patient's increased access to healthcare information and verification of such information in community activities persists, but there also are a higher level of worries regarding the difficulties in understanding highly specialized medical knowledge by the general public. Therefore, developing a system where technological and highly specialized medical terms are translated into lay terms or providing electronic dictionary to promote participation by patients is required.

Finally, at the national level, well-coordinated strategies should be promoted. Individual efforts of developing policies regarding digitalization of healthcare may result in an uncoordinated administration and ma-

agement, and ultimately bringing a chaos. To anticipate synergetic effects of a well-designed system under a unified vision, diverse aspects, such as clinical information on the net, electronic commerce, data collection, automated decision-making system and disease management tool, need to be well concerted with one another. Also, when developing legislation and policies related to the digitalization, we should put “digitalization” at a merging point, in order to encompass both health-related and IT- related areas and harmonizing the diverse views and perspectives.

In conclusion, our study was an attempt to examine how digitalized healthcare affects patients’ and doctors’ attitudes towards the medical care services, the deliverance structure, as well as potential problems that could come from these changes. Future studies should expand the findings from this study with empirical findings. For example, conducting surveys with doctors and patients will produce interesting evidences how fast these changes that were predicted by scholars are occurring in reality. Such efforts will better prepare us to face the fundamental paradigm shifts in the healthcare system and to allow these changes to truly benefit the future society.

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