

Original Research

Development of Implementation Strategies for u-Health Services Based on the Healthcare Professionals' Experiences

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Abstract

Objectives: The study develops strategies for implementing ubiquitous healthcare (u-health) based on previous experiences of the healthcare professionals. **Materials and Methods:** Qualitative content analysis, one of qualitative research methods, was used on in-depth interviews conducted between July 21 and October 4, 2009, with 11 healthcare professionals including medical doctors and community healthcare specialist nurses who have previously provided u-health services. **Results:** Four primary subjects were addressed: (1) subjective experiences on the usability, (2) the expectations, (3) the business prospects, and (4) the prerequisites for the success of u-health market. **Conclusion:** Based on the results of this study, desirable u-health services from the perspective of healthcare professionals were proposed.

Key words: u-health, in-depth interview, qualitative research, content analysis

Introduction

Decreased birth rate and increasing life expectancy result in a higher demand for medical services for the elderly. This, combined with the increasing number of chronic illnesses, causes a steady increase in medical costs, which will have a considerable impact on the societal responsibility of medical care. Further, because of the increase in the number of elderly people living by themselves, unfortunate incidents of the deceased not being immediately discovered occur more frequently.¹ Moreover, an increased number of people with medical coverage, higher income, and increased health awareness has shifted the consumer role of patients from passive to active. Such change in behavior pattern, as well as an increase in services based on ubiquitous technology in society, calls for the need of ubiquitous healthcare (u-health) that increases the medical service satisfaction and qualities of people's lives.

Further, demand for medical service specialization, diversification, and personalization is on the rise and the medical system is switching its focus from face-to-face treatment to preventative mea-

asures and personalized medical services. Globally, development of biosensors and smart medical systems, stabilization of wired/wireless networks, and standardization for the exchange and process of medical data are accelerating the realization of specific services.² Additionally, various u-health policies, including remote diagnosis and mobile health (a subbranch of social welfare service based on u-IT), are being promoted to address the growing population of elderly people and patients with chronic illness and increasing medical costs.^{3,4}

To promote the health of specific communities, the objective of u-health pilot project is currently to develop an appropriate model. When launching these pilot projects, understanding the demand of medical consumers and service providers is the most important aspect. However, such demands have not been the subject of careful research investigation until now. Therefore, this study aims to identify the qualitative demands as well as the advantages and disadvantages of u-health services by targeting medical staff who are experienced in u-health pilot projects. Additionally, it will develop plans for u-health utilization and determine the future direction of u-health services.

Materials and Methods

RESEARCH OBJECTIVES

The general research objective was to identify the advantages and disadvantages of u-health service and the expected service and functionalities by surveying the u-health pilot project participants. The results will be used to develop plans and to provide recommendations for improving the future u-health services. The following list provides more detailed objectives of this study:

- Analyzing the subjective u-health usability experiences of medical staff;
- Identifying the interface, service, and equipments that are expected to deliver the desired u-health services; and
- Identifying the aspects that need to be improved to implement the desired u-health services.

DEFINITION

U-health refers to health management and medical services that utilize wired/wireless networking such as remote monitoring and are capable of use at "any given" time and place.⁵

RESEARCH SUBJECTS AND METHODS

This study used the qualitative content analysis (QCA)⁶ to obtain straight-forward description and account of the result.⁷ Although lacking a logical foundation or philosophy, unlike grounded theory

phenomenology, the method supplements the new data and constantly edits the data analysis through insight, thereby having the advantage of being interactive and introspective much like other qualitative research methods.⁸ Additionally, the QCA has a minimal intervention compared with other qualitative research methods. There are three types of QCA: conventional, directed, and summative content analysis.⁹ This study used conventional content analysis, which is an active analysis method that summarizes the data content, and research result is directly derived from data.¹⁰

The study was approved by the Institutional Review Board prior to collecting research data. The data were collected from July 21 to September 4, 2009, targeting nine medical staff who participated in the current u-health pilot project and two medical staff who participated in the previous pilot projects through convenient sampling. The purpose of in-depth interview was to understand the individual experience in the researcher's perspective.¹¹

To have a complete record of the interview, including the specific expressions used by interview subjects, audio recording of the interview was done after obtaining the subjects' consent. No time limit was placed as to obtain sufficient and complete information about their experiences, and on average, each interview lasted about 30–60 min. The questions asked during the interview were carefully chosen as to have nonstructured and open-ended characteristics to the participants' reply being directed by the researcher's thoughts and decisions.

The data analysis process focused on fully understanding the data, with special care in gaining case-specific insights and introspection. Therefore, the entire transcript was read and analyzed with this focus in mind. The more informative statements were codified and categorized into groups with similar subjects. These subjects were compiled into abstract form, and the detailed characteristics were recorded. To ensure that the participants' experiences are accurately reflected, feedbacks from other collaborating researchers were included. The steps of subject identification and categorization were repeated in the process of research review.

Results

The research subjects were six doctors (two in public health centers and four in private medical institutions) and five nurses (two in primary healthcare clinics, two in private medical institutions, and one in a research center). Six of them are in their 30s, four in their 40s, and one in his 50s. The following four primary subjects were addressed in data analysis: (1) the subjective experiences on the usability of u-health services; (2) the expectation for the u-health services; (3) the business prospects of u-health services; and (4) the prerequisites for the success of u-health market.

SUBJECT 1. SUBJECTIVE EXPERIENCES ON THE USABILITY OF U-HEALTH SERVICES

Advantages of u-health. Distinct meaning: With u-health services, public health center and subcenter's medical staff considered the accessibility and the decrease in time and cost as the biggest advantages, and hospital doctors who participated in remote diagnosis

considered the ability to monitor as the biggest advantage. Clinical Decision Support System (CDSS) enabled pilot project participants to consider countermeasures to emergency situations, decrease in patient anxiety, regular management of bioinformation, increase in quality of life, and overall management through the system as the major advantages of u-health.

Significant data:

- "Because there are small populations in an extended area, and as you know, the medical facilities are far and few in between. It is practically impossible for those to come all the way to the medical facilities. They can only follow the medical guidelines, which have its limits, and when we advise them to visit a hospital, they just give up on their medication. So, when we first implemented this, it was very good." (Case F)
- "Because we can gauge the patient's condition somewhat through the basic relay data and can also respond to emergency situations, it increases patient satisfaction." (Case C)

Analysis and implementation: U-health service is necessary in medically underserved areas, where medical accessibility is limited, considering the targeted local population is agricultural population, with the majority of them being elderly. Currently, either direct or indirect u-health service provision through healthcare subclinic in such areas is perceived to be efficient by the participants.

Disadvantages of u-health. Distinct meaning: In the case of private medical institutions, lowered quality of medicine, added pressure of monitoring service, and aggravation of medical condition are considered to be the disadvantages of u-health service. In the case of public health center and primary healthcare center, management of specific days for videoconferencing was listed among the disadvantages.

Significant data:

- "Patients upload their information at least three to four times a week. But the doctors only read it once or twice a month and feel guilty about that. When the patient makes the visit, they ask "Are you reading my data?," I do reply frankly "I do, but not as frequently . . ." (Case F)
- "The thing I worry about the most is that the patients don't visit as frequently if this kind of practice is continued, because they can get their prescription from primary healthcare center or home. We might not be able to catch the deterioration of patient's condition, and if the patient receives their medication in a month or two, they can be put in dangerous situations where they collapse at home. We still miss these signs even when they visit the hospital . . . but patients tend not to visit because they don't have to. That's my biggest concern." (Case K)

Analysis and implementation: In the case of outpatients, contact and complaint resolving are required only during visits. However, in the case of u-health services, more contacts are made with the patients, because of the 24-h service provision and connection. This may result in increased stress and burden. In such cases, specialized

systems such as CDSS with alarm and functionality to detect deteriorated condition will be helpful.

Issues to improve instruments and systems. Distinct meaning: Regarding the equipment and systems, the doctors reported dissatisfaction with the accuracy of diagnostic equipments. Frequent changes in software and equipments and slow response rates are also perceived as disadvantages. Whenever a new pilot project is implemented, usage and upgrade of current equipments will reduce the burden of learning new sets of skills. And even though it might stress the budget, it is practical to purchase useful equipments rather than those that have lower usability.

Significant data:

- “From the doctor’s point of view, rather than using new equipment right away, current equipment has a better interface and relays directly to doctor’s viewer automatically. And because we are mixing different equipments, there are crashes, and we have to power them on individually one-by-one, which is very inconvenient. . . .” (Case F)
- “All government sectors have budgets and are limited accordingly. Each pilot project, second and third, each change where previous equipments are included. So our efforts all go to waste at one fell swoop. If something were to start with new group of people, at least it needs to be prepared in a previous step, otherwise it feels so disconnected and we need to start from the scratch. I wish we can upgrade while keeping the current practice. That way we don’t feel stressed about using something new and just learn one or two new things. . . .” (Case H)
- “Because current program is not connected with previous programs, we need to use two computers at once and local medical staff receive the prescription and enter it into the previous program, which are all inconvenient and complex.” (Case B)

Analysis and implementation: It is important to determine whether the equipment has high accuracy; systematic and realistic educational programs for u-health participating medical staff are urgently required. Because not every u-health system interface is made up of general specifications familiar to medical staff, a convenient interface needs to be implemented. Also, because of specific environments, it may be difficult to establish continuity between the programs being used and the pilot project programs. In such cases, duties need to be modified to avoid duplicate or inconvenient duties and decrease the unnecessary complexity in work flow.

Skepticism for the operational efficiency of pilot project. Distinct meaning: The participants pointed out the following practical problems regarding the pilot project management: inequity of incentives among participants, lack of specialized taskforce and systematic education of u-health participants, and inefficient service structure.

Significant data:

- “Public health doctors receive 200,000 KRW (South Korean currency “won” which is equivalent to approximately \$10 USD)

per month from the local municipality. This university hospital’s doctors receive specific amount of pay per incidents. Frankly, there is nothing for the public health nurses who do the work locally in remote patient visits. Not even 10,000 KRW.” (Case H)

- “Frankly, it feels like we are pushing the patients into the pre-made mould in the name of the business. Because of that, in every step of the way, everything needs to be bought and supported. For example, video interview with doctors results in medicine delivery through mail, and it seems like going to the hospital would be faster. . . .” (Case H)

Interpretation and implementation: Problems with inequity of incentives result in reduced motivation, participation, and the level of service activation. Therefore, it is crucial to determine a fair payment structure and establish a remote advisory system to address the lack of specialized taskforce. More importantly, u-health service participating medical staff need to be systematically educated through structured process, so that they may obtain the required knowledge and skills.

Issues for the social, psychological, and legal system. Distinct meaning: The possible obstacles of u-health service addressed by the participants are low awareness, possibility of reversed discrimination with regular patients, aversion from certain medical staff or specialty, unclear designation of responsibilities, lack of administrative support of hospitals, and medical reimbursement problems.

Significant data:

- “24-hour service is required but administrative support from the hospital and medical fee problems only allow us to interview them during day time, and there is limited awareness among hospitals and patients regarding u-health.” (Case D)
- “Regular patients are required to make appointments weeks prior to visits and that may seem a little weird, and providing services over phones or Internet may seem like discrimination to some people.” (Case A)

Interpretation and implementation: It is crucial to establish the consensus regarding u-health services and convenience. Services that fully reflect the needs of the consumer is the only realization of truly successful u-health. Also, medico-legal system, distribution of medical information, and modification of policies regarding u-health equipments are needed. Additional requirements include technological activation, generalization of medical information, such as the service under national health benefits, and cooperation of large hospitals’ and small clinics’ medical facilities. These analyses’ results are summarized in *Table 1* using the excerpts from the participant interview.

SUBJECT 2. EXPECTATIONS FOR THE U-HEALTH SERVICES

Expected equipments. Distinct meaning: The expected functionalities of medical equipments used in u-health are accurate measurements, convenient usage, easy connectivity with other equipments, noninvasive data recording and automatic transfer, speedy diagnosis, and digitized and codified data. When patients cannot visit the

Table 1. Experience-Based Evaluation of u-Health Service

ADVANTAGES OF U-HEALTH	
Doctor's perspectives	Continuous monitoring of data
	Early management of emergency situations
	Regular management of biometric information
	Ease of checking patient's data
	Systematic management
Patient's perspectives	Accessibility (solution for the inconvenience of transportation or backwoods residents)
	Reduced time and cost
	Reduced anxiety
	Early diagnosis
	Improved satisfaction (quality of life)
DISADVANTAGES OF U-HEALTH	
Degradation of healthcare quality due to combining telemedicine (u-health pilot project) and general treatment (regular work)	
Burden for monitoring services	
Risk of lack of monitoring up-to-date deterioration of symptoms	
The pre-determined date to provide u-health service which is not flexible	
ISSUES TO IMPROVE INSTRUMENTS AND SYSTEMS	
Inaccurate diagnosis due to the inaccurate equipments	
Frequent changes of u-health programs and equipments	
Program is too slow	
Inexperienced manipulation with equipment and program	
Inconvenient work process which is not incorporated with existing program	
Inconvenient interface for health personnel	
Inconvenient operation to power on each equipment	
System error due to complexity using of several machines	
Lack of system for accurate examination (difficult to hear the different auscultation site)	
Lack of notification system for significant patients' information	
Lack of disease detection system	
Lack of necessary instrument	
SKEPTICISM FOR THE OPERATIONAL EFFICIENCY OF PILOT PROJECT	
Problem with equitable incentives (physician-centered incentive)	
Lack of specialists	
Absence of practical and professional education for healthcare personnel in pilot project	
Inefficient structure of pilot project (forcing the patient into the systems)	
Telemedicine takes more time compared with face-to-face treatment	

Table 1. (continued)

Noncomprehensive operation of several projects (separate progress among similar pilot projects)
Increased cost for tailoring, because data transmission from equipments are not commercially sustainable
Telemedicine takes more time compared with face-to-face treatment
Almost no profit from the business model
Difficult to operate on fixed date and time
ISSUES FOR THE SOCIAL, PSYCHOLOGICAL, AND LEGAL SYSTEM
The elderly patients who are not familiar with equipment feel shy, so they do not tell all symptoms they are experiencing
The possibility of patients' distrust because of incomplete techniques such as network disability and system error
Lack of awareness of the patients or hospitals about u-health
Possibility of reverse discrimination (the appointment waiting time is longer for the patient with regular treatments compared with that of telemedicine case)
The antagonistic feeling of some healthcare personnel or medical profession
Lack of political support from hospitals and problems with cost
Concerns that telemedicine degenerated as pharmacy
Unclear accountability

medical facilities because of their physical impairment, primary healthcare center's practitioner who visits them requires equipment that enables videoconferencing.

Significant data:

- "It's unavoidable for primary healthcare center to be the intermediate step. We have a laptop that can be used when making visits, but it's useless when there is no Internet. So I have to either do it myself if there are software's available, using a personal digital assistant (PDA) or more ideally, have a tech-support that can connect to PDA and view the patient's data right away." (Case G)

Interpretation and implementation: If accuracy of the bioinformation cannot be ensured, the data cannot be used for medical procedures, which makes accurate measurement a prerequisite for u-health establishment. Additionally, accuracy and convenience of sensing technology will be the source of competitive power. Also, as many rural households have no high-speed Internet connectivity and structures that allow easy connection with other equipment, equipments that can be connected at any given time and place need to be developed.

Expected service. Distinct meaning: Many public health and primary healthcare centers require e-prescription services through remote diagnosis and test kits, health management practices including personalized physiotherapy, early detection of conditions, and lifestyle

modification education that can be offered through u-health equipments and services. In hospitals, practical CDSS and emergency situation alarm to alert the medical staff in real situations are wanted. They required services that can aid effective communication among medical personnel.

Significant data:

- “For those that are isolated, old or sick, in health management perspective. . . this is really desirable. U-health needs to go to the direction of health improvement. It needs to have early detection capabilities so that we can nip the disease at the bud. Expanding it to cardiac conditions, or this and that, connecting it to everything is not its concept.” (Case F)
- “When progressing, there are lots of instances where the related medical staff need to be consulted and confirmed, so I want services that enable communication.” (Case C)

Interpretation and implementation: Specialized system that can analyze the biological and health information obtained through u-health will reduce the stress and burdens related to work. Effective services that aid communication among medical staff are required for efficient u-health service.

Expected interface. Distinct meaning: Expected interface and design include aspects of easy visualization of patient data with previous equipments. Also, the capabilities to choose between numbers or graphs to represent the patient data from any given time as well as 3- or 6-month data connectivity that does not require manual entering of dates are required. The view screen for remote diagnosis can be adjusted, but larger screen was used most of the time for convenient use by old patients, and to appeal to patients, designs that make the equipments seem like household appliances were preferred.

Significant data:

- “If it’s too small, because of their poor eyesight, they cannot see the doctor. They have big screens and smaller picture-in-pictures for looking at themselves. These are almost never used, so they just use the big screens to communicate with doctors.” (Case G)
- “U-health devices that don’t seem like computers but household appliances like refrigerator or fan so that it doesn’t require lots of installment. . . . Current design requires lots of wires connected to here and there making it seem really complicated.” (Case A)

Interpretation and implementation: Convenient interface for medical staff to refer and make decision using information from various sources is required. Capabilities that enable access to previous diagnosis, drug administration and test results, drag and copy function for duplicate drug administrations, and fast response time for opening up data are required. Therefore, when designing the interface, active participation of medical staff who will be using the equipments in the field is crucial.

These analyses’ results are summarized in *Table 2* using the excerpts from the participant interview.

Table 2. Experience-Based Expectation for u-Health Service

EXPECTED EQUIPMENT
Accurate measurement (stable equipment comparable to clinic examination)
Easy to use
Flexibility to connect equipment with other machine
Data compression and transmission
Rapid test, data coding, and digitalization
PDA type (the tools that support display service anytime and anywhere for the people who cannot use Internet)
EXPECTED SERVICE
Hyperlipidemia management service (for public health center and health clinic use)
Expansion of telemedicine and drug distribution services beyond diabetes and hypertension management
Simple blood test
Healthcare services for medically vulnerable population (e.g., early detection of disease, tailored sports service, education of lifestyle changes)
Practical CDSS
Provide automatic alarm and informing services to the doctor in emergency situations
Communication service between healthcare personnel and patients
EXPECTED INTERFACE
Interface that is familiar with the existing one
Easy interface for the operator to check patients’ document (treatment, administration, examination, etc.)
Interface that easily views and compares previous treatment, administration, and examination records
Copy the duplicate drug administration information by drag function
Interface that views the data as number or graph type for desired period
Resizable monitor; however, big size is preferred for elderly people
The harmonious design of equipments, that is, as nested as electronic home appliances, and patient preferred design, that is, not similar to medical equipments
No delay time function and structure to open the documents
CDSS, Clinical Decision Support System; PDA, personal digital assistant.

SUBJECT 3. BUSINESS PROSPECTS OF U-HEALTH SERVICES

Distinct meaning. Currently, u-health service participants in the government sector showed high satisfaction and positive attitude because they expect various services targeting medically vulnerable population with limited accessibility. The positive outlook is also based on the fact that the next generation will be more familiar with computers. However, they have some concerns on the future of

u-health that the service may be limited to the current status of medical system.

Significant data

- “The outlook for u-healthcare is not positive because it is an area that matures through business care, autonomy, and self-evolution, but currently it is limited by current medical logic and goes against the norm of medical system. So in some ways, the business model that has most potential in u-health gets ruled out and considering all the indifference towards the whole thing, I doubt its success as a business. Optimistically, there are positive aspects in having various business characteristics with good models and spread it more and more. . . . U-healthcare is great, but we need a new approach accordingly, modifying the current system, and those with little problems for start up, they have no business outlook.” (Case A)
- “I think the future is bright for u-health equipment. As we go through different generations, usage will increase and the technology will advance. Therefore, for the next generation, they will have higher usage and satisfaction.” (Case C)

Interpretation and implementation. For people living in rural areas with low medical accessibility, u-health service through public facilities will have positive effect after verification and sequential expansion. However, to realize wide-spread u-health services successfully, nontechnological aspects need to be considered. Cultural and behavioral aspects that affect the current healthcare system need to be considered. Moreover, careful analysis is required for systematic service model, along with modification and supplementation of healthcare-related policies and legal system.

SUBJECT 4. PREREQUISITES FOR THE SUCCESS OF U-HEALTH MARKET

Distinct meaning. The following items were listed as the most important requirements to improve u-health: safety in equipment use, accuracy of data, heightened awareness regarding the service being crucial for those who need to spend a lot of money and time, legal issues that can address any problems that arise, suitable reward, flexible service that is not rigid and is personalized to each patient, standardization of equipments, system that can control and maintain the medical delivery system, cooperation among all interest groups, and acceptance that perceives u-health as something that not only reduces cost and increases citizen’s health, but also meets everyone’s needs for their wellbeing.

Significant data

- “There is a medical society’s perception toward u-health, that it’s not a do-it-all service that lets you diagnose over video chat and deliver drugs, that it won’t cause all the patients to crowd

towards the big hospitals. That the service is crucial for those who spend a lot of money and time on hospitals that require constant health monitoring and can’t visit the hospitals due to physical impairment. . . .” (Case D)

Interpretation and implementation. To properly establish the u-health service, ensuring safe equipment use is the foremost aspect to consider, making it crucial for the industry to research and develop more accurate and safe equipment and make considerable efforts in proving its objective safety. Also, awareness that this service is crucial for those with limited accessibility, developing successful business model that addresses the customers’ needs, and appropriate rewards and legal support are all required for successful establishment of the u-health service. Lastly, a persuasive argument that will address and persuade the medical community that sees u-health expansion as a threat that will monopolize the medical market led by big hospitals. *Table 3* includes practical summary of results and recommendations from the participant interviews.

Discussion

This study was conducted in the Korean environment, which could be unique in its settings and stages of healthcare information technology adoption. Therefore, these context-sensitive characteristics should be considered by the international readers as not a general overview but of a culturally specific case study of u-health and its adoption. However, the following arguments could be applied as the common playground for those who are interested in advancing information technology-driven healthcare system in the future.

The survey targeting u-health pilot project participants regarding the advantages and disadvantages of u-health and the expected services and functions revealed that there is high satisfaction in u-health services for medically vulnerable area. The perceived advantages included patient monitoring and management. On the other hand, remote treatment and diagnosis, reduced quality of medicine due to overburden with outpatient visits, and limited days that allow remote diagnosis are perceived as the difficulties of service. Therefore, to reduce the workload of u-health service providers, specialized systems such as CDSS that provide systematic alternatives and support are required.

Also, majority of the medical community is still dissatisfied by the accuracy of u-health equipments. This was partially alleviated through development of better equipment; however, more proactive research and development that prove the safety, accuracy, and speed of this equipment is still required to gain the physicians’ trust. Development of new medical guidelines through research and analysis is required to ensure noninvasive and minimally conscious measurement of bioinformation, which is the basic foundation of medical practice. Specialized systems that analyze health information obtained through u-health and foundational structure that protects private information during transmission of medical and private data through wired/wireless network are also required. Security verification of system and services must include not only hardware equip-

Table 3. Lessons and Recommendations from the Extracted Subjects

MAIN SUBJECTS EXTRACTED		LESSONS THAT WILL BE USED IN PLANNING THE NEXT STEPS	RECOMMENDATIONS
Subject 1. Subjective experiences on the usability of u-health services	Advantages of u-health	The benefits such as accessibility, cost reduction, preparedness and responsiveness, efficient health information management, and psychological support should be fully realized.	Deploying and expanding u-health service should be realized step-by-step, starting from the underserved, older population using lower-end technology and then moving toward the high-end technology to the population who are able to afford it.
	Disadvantages of u-health	The risks such as lowered quality of healthcare services, stress caused by increased workload, and inefficiency of operation management should be avoided.	Specialized systems such as CDSS with alarm and deteriorated condition detection functionalities and Executive Information Management System should be adopted.
	Issues to improve instruments and systems	Trials and errors related to HW/SWs used for the pilot projects caused too much overhead of the resources.	Education and training programs for medical staff, and standardized HW/SWs should be developed for u-health services.
	Skepticism for the operational efficiency of pilot project	Lack of motivation and inefficiency on the part of the participants should be avoided.	Regulations on systematic financial incentives and formal training should be adopted for the participants.
	Issues for the social, psychological, and legal system	Possible obstacles of u-health services are medical reimbursement problems, aversion from medical staff, and lack of administrative support and leadership issues.	Legislations on the operation and reimbursement for the u-health services, cultural changes in medical communities, and strong leadership should be established.
Subject 2. Expectation for the u-health services	Expected equipments	Accuracy, convenience, connectivity, security, and speed are important.	Five expansion advantages of u-health with regard to time, space, service, provider, and consumer should be fully adopted and realized.
	Expected service	E-diagnosis/treatment/prescription and e-health promotion, CDSS, and communication functionality for professionals are essential.	
	Expected interface	Familiarity, convenience, easiness, flexibility, and preference are important. Active user participation is crucial.	
Subject 3. Business prospects of u-health services		Positive outlook and negative outlook for business prospects balance out each other.	Cultural, behavioral, political, and legal aspects that affect current healthcare system need to be considered.
Subject 4. Prerequisites for the success of u-health market		Awareness, rewards, standardization, and cooperation among stakeholders should be clearly addressed.	Medical community, u-health market stakeholders, and policy makers need to share long-term vision and collaborate accordingly.

HW/SW, hardware/software.

ment that makes up u-healthcare services but also administrative aspects and software solutions. Evaluation criteria that include medical system-specific characters are also needed.^{1,12} The main differences between e-health and u-health by definitions are as follows: “E-health typically concentrates on information sharing between patients (patient access to their records and participation in

their health outcomes), healthcare professionals (knowledge- and information-based decision support systems), solution providers (interoperability), and the general public, for example, health portals, whereas u-health dramatically shifts the place where healthcare and health procedures takes place from traditional institutions, for example, clinics and hospitals, to the work place and home.”¹³

Simply put, the primary difference is the information sharing versus expansion of space. However, according to another argument on the characteristic of u-health, the main characteristics of u-health are the expansions of five dimensions: space, time, service, provider, and consumer.¹⁴ Therefore, the partial barriers to e-health and u-health are common in terms of expansion of space, time, and service, but it is different with regard to the perspectives of the providers and consumers. This means that when the professionals consider implementation of the both of the HIT-driven healthcares, u-health may have more barriers but more positive potentials in reality.

In the future, u-health will be further integrated into our daily lives such that we will not perceive its presence consciously, and it will allow us to monitor our health status naturally and continuously. However, even the most highly developed technology can be neglected by consumers if it is not user-friendly. Therefore, u-health needs to fully reflect the required services to obtain maximal participation and behavioral change.¹² Further, systematic educational guidelines need to be established for the u-health pilot plant participants. At the time of system development, to achieve smooth workflow in application, an interface that enables easy and convenient use by medical system needs to be considered, and frequency of usage for each system needs to be identified. U-health service needs to be understood as a crucial service for those with limited accessibility to medicine. And along with legal support and suitable rewards system, a business model that fully integrates consumer's needs and is robust to various challenges is required. We recommend a further in-depth research with participant survey of medical staff to aid the proper establishment of continuously evolving u-health service.

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