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Original Research Article

Assessment of participant compliance with a Web-based home healthcare system for promoting specific health checkups

Toshiyo Tamura [a,*], **Sohichi Maeno** [b], **Takumu Hattori** [c], **Yutaka Kimura** [d], **Yuichi Kimura** [b], **Masaki Yoshida** [a], **Kotaro Minato** [c]

[a] Osaka Electro-Communication University, Neyagawa, Osaka, Japan
[b] Chiba University, Chiba, Japan
[c] Nara Institute of Science and Technology, Japan
[d] Kansai Medical University, Japan

ABSTRACT

We investigated the effectiveness of a Web-based healthcare system that allows participants to record measurements of blood pressure, body weight, and the number of steps walked per day. After receiving a medical examination, participants were registered on the Web-based system and encouraged to record data. A total of 223 participants initiated contact with the system; however, only 27 monitored their blood pressure on more than 60 days during the 3-month period. Furthermore, only 46 participants monitored their body weight, and 79 monitored the number of steps taken per day. Although specific health checkups are important to prevent diseases, we conclude that existing health checkup monitoring is not sufficient, and we should develop a new Web-based health checkup and monitoring system that is more familiar to the participants.

1. Introduction

In an aging society, the healthcare requirements of the population are expected to grow over time, with consequences not only for the health of the members of that society but also for medical costs and medical insurance. More personalized healthcare is one approach to improve how healthcare is delivered. To achieve this, information on the health of individuals is required to predict and prevent diseases.

The most common application of information communication technology to healthcare is telemonitoring and telecare of post-operative patients, in particular for heart failure and stroke patients [1–10].

Rapid technological advances have prompted the development of a wide range of telemonitoring systems to enable the prevention, early diagnosis, and management of chronic conditions. Remote monitoring can reduce the number of recurring admissions to hospital, facilitate more efficient clinical visits through improved data collection, and may reduce the length of hospital stays among individuals living at home. Telemonitoring can also be applied on a long-term basis among elderly persons to detect gradual deterioration in their health, which may aid their ability to live independently.

Mobility is a good indicator of health status, so clinicians may assess the health status of elderly persons by monitoring their mobility.

However, the economic viability of telemonitoring is uncertain, because no in-depth cost-minimization analyses have been performed. Home telemonitoring of chronic diseases is a promising patient management approach that produces accurate and reliable data, empowers patients, influences their attitudes and behaviors, and potentially improves their medical condition. However, more studies are required to build the evidence base related to the clinical and cost effectiveness, impact on service utilization, and acceptance by healthcare providers.

We have proposed several home healthcare systems that focus on automatic monitoring of physiological parameters [11] and activity [12]. To achieve automatic monitoring of participants physiological condition, we built monitoring systems with sensors attached to the participants' beds, baths, and toilets that required no attached equipment such as skin electrodes [11]. Activity monitoring was carried out using physical sensors including pyro-sensors and magnet sensors, and use of the TV remote control was monitored to provide additional information about people's lifestyle habits [12]. We have extended these systems to the home healthcare environment; however, these systems were never popularized and we were not able to gather evidence of their effectiveness.

Beside this, a system to monitor health in companies has been introduced, and several network providers have developed health-management assistance systems using information communication technology (ICT) [13].

Following recent developments in industrial health and safety law [14], specific health checkups and health guidance are now required in Japan. To avoid increases in the cost of medical treatment, public health promotion is a major issue. The ability to monitor information associated with healthcare outcomes at home and in the workplace is expected to be highly beneficial in achieving these aims. In this paper, we present an outline of specific health checkups that the Japanese government recently introduced, and describe a trial of a current Web-based healthcare monitoring system. Problems with the current system are extracted and examined, with the aim of further development of the system.

Table 1 – Japanese criteria for the specific health checkups.

Items	Threshold values
Primary risk	
Waist circumference	≥85 cm for men
	≥90 cm for women
Visceral fat equivalence	≥100 cm^2
Additional risks	
Blood pressure	≥130/85 mmHg
Triglycerides: (neutral fat)	≥150 mg/dl
Reduced HDL ("good") cholesterol	<40 mg/dl
Fasting glucose	≥110 mg/dl

2. Specific health checkups and specific health guidelines

The Japanese government has recommended specific health checkups and health guidelines for those aged 40–64 years. The purpose of this system is to identify individuals with metabolic syndrome and pre-metabolic syndrome, and to provide them with guidance on to how to change their lifestyle to prevent the occurrence of lifestyle-related diseases [15,16].

Metabolic syndrome is defined as a state in which a person has, in addition to excessive visceral fat estimated by waist circumference, two or more of the following risk factors: high blood glucose, hypertension, and lipid abnormalities, as detailed in Table 1. Pre-metabolic syndrome is defined by an excessive waist circumference and one of those additional risk factors. After receiving health checkups, individuals were classified into the two groups according to their health risks. The two groups provided different types of health guidance: positive support and incentivized support. Table 2 lists details of the classification scheme.

Health guidance was based on interviews with physicians, public health nurses, and registered dieticians and was focused on preventing lifestyle-related diseases via actions including weight loss, increased exercise, and dietary changes. Following assessment interviews, each participant was given individual recommendations of strategies to help them achieve their goals.

Those in the positive-support group were evaluated every 3 months, and those in the incentivized-support and information groups were evaluated every 6 months. During health

Table 2 – Support system with specific health guidelines. Participants with positive support were aged 40–64 years, and had a waist circumference greater than 85 cm (men) or 90 cm (woman) or a BMI > 25, and two or more of the additional risk factors (or who smoked and had one or more of the additional risk factors). Participants who did not meet these criteria were given information.

Abdominal circumference	Additional risks	Smoking	Subjects	
	Blood glucose, lipids, blood pressure		40–64 yrs	65–74 yrs
≥85 cm (male)	≥2		Positive support	Incentivized support
≥90 cm (female)	1	Yes		
	0	No	Incentivized support	
	3		Positive support	Incentivized support
BMI ≥ 25	≥2	Yes		
		No	Incentivized support	
	1			
None of the above	0		Information provided	Information provided