Yaygın Sağlık Hizmetleri İçin Elektronik Anket Yaklaşımı

E-Survey Based Approach for Pervasive Healthcare

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Özetçe—Nüfus artışı ve buna paralel olarak artan sağlık harcamaları, hekim sayısının yetersiz kalması ve insanların kendi evlerinin konforunda sağlık hizmetlerine erişme konusundaki artan ilgisi sağlık sistemlerinde ciddi bir dönüşüm ihtiyacı doğurmuştur. Bu durum sağlık uzmanlarının hastaların sağlık durumunu uzaktan izleyebilmelerine ve değerlendirebilmelerine olanak veren çözümler geliştirmek için araştırma yapmalarını tetiklemiştir. Bu çalışmada, hasta veya sağlıklı olarak tanımlanmış bireylerin sağlık durumlarının uzaktan takibini sağlayan elektronik anket tabanlı bir sistem önerilmiştir. Önerilen sistemde hasta veya sağlıklı bireyler, uzman ya da uzmanlar tarafından belli tıbbi durumları değerlendirmek amacıyla hazırlanan anketleri cevaplandırarak kendi sağlık durumlarını raporlamaktadır. Uzmanlar anket cevaplarına göre ilgili tıbbi durum açısından bireyi değerlendirmekte ve gerekli görürse önerilerde bulunmaktadır. Bu sistem ile özellikle mevsimsel ve salgın hastalıkların erken teşhisi, takibi ve haritalanması yapılabilir. Ayrıca hastanelere yapılan gereksiz başvuruların azaltılmasına da katkıda bulunacağı düşünülmektedir.

Anahtar Kelimeler — elektronik anket; yaygın sağlık hizmetleri; uzaktan hasta takibi, kendini raporlama.

Abstract—The population growth and the parallel increase in health spending, inadequate number of physicians and the growing interest of people to access health services in the comfort of their own homes necessitated a serious transformation in health systems. This has prompted health professionals to conduct research to develop solutions that enable them to monitor and assess patients' health remotely. In this study, an electronic survey-based system was proposed that remotely monitors the health status of patients or healthy individuals. In the proposed system, patients or healthy individuals report their health status by responding to surveys prepared by healthcare professionals to evaluate certain medical conditions. According to the survey responses, the healthcare professionals evaluate the individual in terms of the relevant medical condition and make suggestions if necessary. This system can be used especially in the early diagnosis, monitoring and mapping of seasonal and epidemic diseases. It is also expected to contribute to the reduction of unnecessary applications made to hospitals.

Keywords — electronic survey; pervasive healthcare; remote patient monitoring, self-reporting.

I. INTRODUCTION

Worldwide, the costs of health care are rising at an unsustainable rate. For example, in the United States, health spending is expected to be $ 4.8 trillion by 2021, which is close to 20 percent of the gross domestic income [1].

Among the factors leading to the increase in health spending are chronic diseases, unnecessary treatments and tests [2]. Also, the proportion of the elderly population can be seen as a factor that increases the cost of health services. Taking the cost of health care to a sustainable level is an urgent issue [3].

One solution to the problem faced by the healthcare industry is the follow-up of patients who are suitable for remote monitoring from their home or wherever they are. Thus, since the number of applications made to hospitals is reduced, the cost of health care services is also reduced. This approach is commonly referred to as pervasive health care. This study offers an e-survey based approach for pervasive healthcare which is expected to contribute to early diagnosis, monitoring and mapping of seasonal and epidemic diseases and reduction of unnecessary applications made to hospitals.

II. PERVASIVE HEALTHCARE

Pervasive healthcare can be expressed in a framework that includes information consumption, production and sharing, as shown in Figure 1. Patients are often involved in the process of collecting personal health data in order to obtain better health outcomes [4].

Such data may include vital signs measured by sensors, such as raw physiological data or collective information. In this case, patients are considered "information consumers" because the information is generated by the devices and sent to them. In addition to consuming information, patients can also produce information by manually recording the problems or symptoms they meet during their daily activities, their health behavior, their physiological measurements, and their laboratory analysis [5].
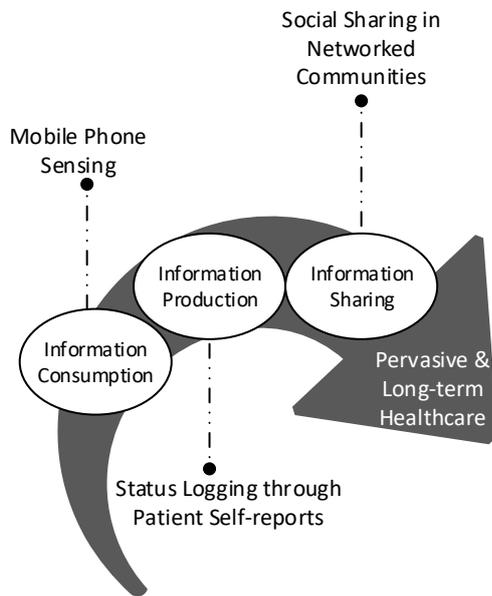

Figure 1. The framework of pervasive healthcare [5]

Examples of common health services for information consumption include the following.

- Teledermatology [6]

- Activity detection [7]

- Stress and Sleep Apnea Detection [8, 9]

- Blood Pressure Monitoring [10]

- Drug usage follow up [11]

In some cases, sensors may be considered annoying, expensive, or inadequate when used for self-monitoring of the patient. Health status (primarily vital signs and symptoms) can be captured manually by the patients themselves, through a variety of tools designed for self-measurement and understanding [12].

Mobile applications are ideal for self-reporting as a result of their presence all the time and anywhere. Especially the life diary and the mobile diary for their own reporting behaviors and habits represent the latest technology [13].

The following applications can be considered in the context of information production section for pervasive healthcare.

- Mobile diary for healthcare management [14]

- e-diary for self-monitoring [15]

- SMS diary for asthma management [16]

- Emotional reporting and therapeutic exercises [17]

- Diabetes self-management [18]

Pervasive healthcare has some limitations and problems as well as the advantages it brings to health services. These are limitations and problems can be given as follows [5].

- Usability

- Integration of health data

- Frequency of user interaction

- Confidentiality and reliability

- Real life verification

III. PROPOSED METHOD

In this study, a pervasive healthcare application was proposed, which allows health professionals to monitor patients and healthy individuals independently from time and place, while at the same time allowing individuals to report their health status. The proposed method not only makes it possible for health professionals who are currently inactive to actively follow individuals, but also brings individuals' own health status to action by ensuring self-reporting.

The proposed system can be examined in two parts, as healthcare professional side and the individual side as shown in Figure 2.
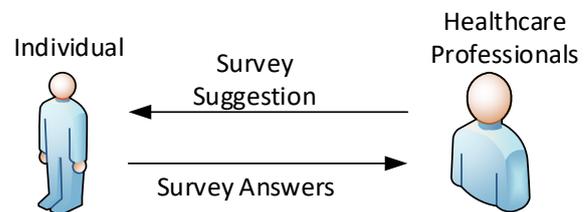

Figure 2. Proposed method

Health professionals send surveys to relevant individuals to measure specific medical conditions via the proposed system. Individuals report their health status by answering surveys. According to the answers given to the surveys, the healthcare professionals evaluate the related individuals in relation to the medical condition and if necessary they transmit their suggestions through the system. The block diagram of the proposed electronic survey system is shown in Figure 3.
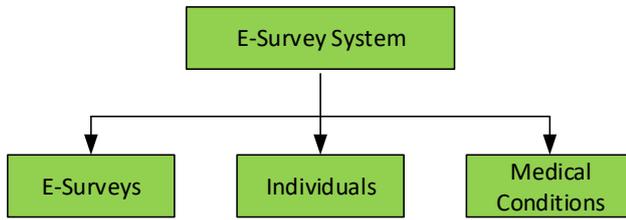
Figure 3. Block diagram of the proposed electronic survey system

The proposed system consists of three parts: electronic surveys, individuals and medical conditions. These three parts are accessible to healthcare professionals from the control panel. From the survey section, new surveys can be created and edited. Healthcare professionals can add new individuals from the Individuals section and make changes on existing individuals. They can also define medical conditions to be followed in the medical situations section.

Using the electronic survey system, health professionals also send surveys to relevant individuals and follow the responses given by the individuals to the surveys. The health professional analyzing the survey responses can make suggestions through the system when deemed necessary. In Figure 4, health care professional side of the system can be seen.

Figure 4. Health care professional side of the system

Individuals can respond to surveys sent by healthcare professionals on a mobile device, tablet, or computer. The survey interface that the individual answers is given in Figure 5. Since the electronic survey system is designed in responsive structure, it is easily accessible from all electronic devices. The Bootstrap 3 CSS framework is used in the front-end design of the interface. In the back-end of the system, PHP and MySQL technologies are used to ensure the dynamism.

Figure 5. Survey interface

IV. CONCLUSIONS AND DISCUSSION

The main objective of pervasive healthcare is to provide health services more efficiently and quickly by establishing a communication channel independent of time and space between health professionals and the individuals they are responsible for. The communication channel created in this study served this purpose.

In particular, the population per family doctor in Turkey is between 3000 and 4000. Thus, it is not possible for health professionals to reach and actively monitor all the individuals they are responsible for. This system enables active follow-up of the health status of patients or healthy individuals.

This system also provides an active control over individuals' own health status by providing an assessment and reporting of their own situation but needs to be evaluated in terms of efficiency, usability, reliability and effectiveness.

In the existing health care system, health professionals can intervene to the individual's health status only when the individual applies to a health institution. With this system, the healthcare professionals can reach the individual without the need for the individual to apply to a health institution. Thus, this system will be an important assistant for health professionals, especially in predicting and monitoring seasonal and epidemic diseases. It is also

possible to create geographical risk maps of diseases using this system.

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