On Time: Efficient and Personalized Hospital Service

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Abstract. For every kind of service, reduction of waiting time appears to be critical. Particularly, the occurrence of waiting time in a clinical environment gives patients negative impression of the clinic (or hospital). By observing the present state of hospital waiting time we suggest 'On Time', a mobile application design for when waiting time occurs. 'On Time' mobile application is efficient, personalized and patient centered hospital service that satisfies the patients by both using existing monitor service and big data.

Keywords: IT · Hospital service · Big data · Mobile application

1 Introduction

There are numerous studies that found out that waiting time is one of the primary determinants of patient satisfaction [3], [6]. Eilers (2010) have also pointed out that the speed of service is one of the major criteria to judge in medical quality care. To improve quality care, Plesk (2002) suggests a model and worksheet of 'moments of truth' to understand the level of the service. A study [5] showed that the satisfaction of patients in walk-in clinics, family practices and emergency departments also differ when it comes to waiting times. Although the aspects of satisfaction in the emergency department may be different to other [1], we researched the general medical services of a territory hospital. We selected two outpatient clinics in a tertiary hospital to collect information on actual waiting times and the method to inform patients. The patients in hospital outpatient clinic have limited information to predict waiting times although a computer monitoring system displays an ordered list of patients. In situations where patients should take multiple examinations and treatments, it makes difficult for patients to predict their waiting time. Based on the information, we developed a service system that can efficiently and personally provide hospital service to the patients using IT technology.

2 Related Work

Many studies show that hospitals are trying to increase patients' satisfaction related to waiting time. A relaxing and comfortable waiting environment such as, soothing colors, natural lighting and table lamps, can make patients think they have waited for a

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short amount of time [4]. The study performed by Eilers (2010) showed the dissatisfaction of patients' related to the waiting time, which was solved by an increase of same-day appointments. In our study, we focused on using data of patients in the hospital database [9] and the existing monitor service in the waiting room area. Using information technology (IT) can bring new efficient services in the hospital environment. By using healthcare IT can allow patients', give them a choice of their own in the healthcare environment [2]. The purpose of this study is to extract the actual problems that happen in the waiting environment and help patients to choose what to do with the given waiting time.

3 Patients in Clinic Environment

To understand the real situation, we observed the waiting environment, interviewing 10 patients and 3 hospital faculty members. Various problems were observed in the waiting environment such as, uncomfortable waiting room, a large number of patients and broken monitors. The only functioning only consists of simple information, such as the patients' names.

Fig. 1. Patients waiting in clinic environment

Most of the patients wait in front of the clinic area where they can hear the nurse. Through the interview, the reason they stayed close to the clinic area was to not miss there turn for treatment. The patients keep asking questions to the medical staff, making hard for them to concentrate on work. Because of these problems, the hospital provided various attractions, offering beverages and announcing the patients. However they turned out to be inefficient, increasing the necessity of system that reduces the waiting time (Figs. 1, 2 and 4).

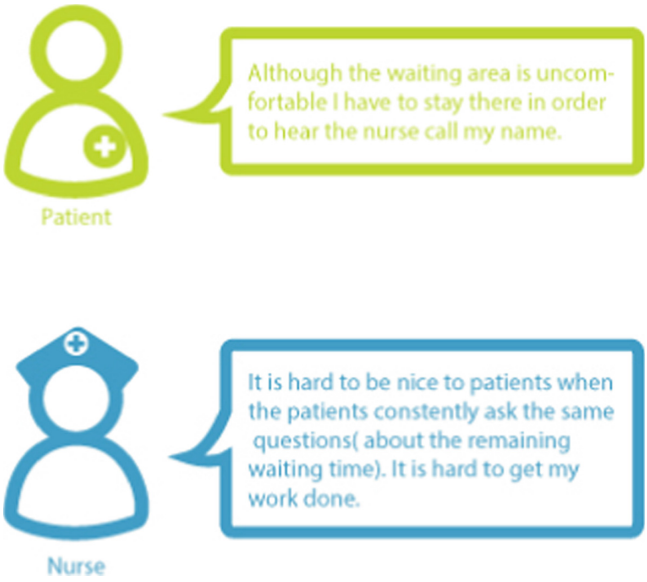

Fig. 2. Problem when waiting

4 Service System

4.1 Suitability of Smartphone

According to 2013 data, South Korea has the highest smartphone penetration rate. Because smartphone is the most typical IT technology we will only use this smartphone throughout this paper. To prove the high usability of smartphone in various age groups in South Korea, the graph in Fig. 3 proves that there are increasing rate of smartphone users in all age groups.

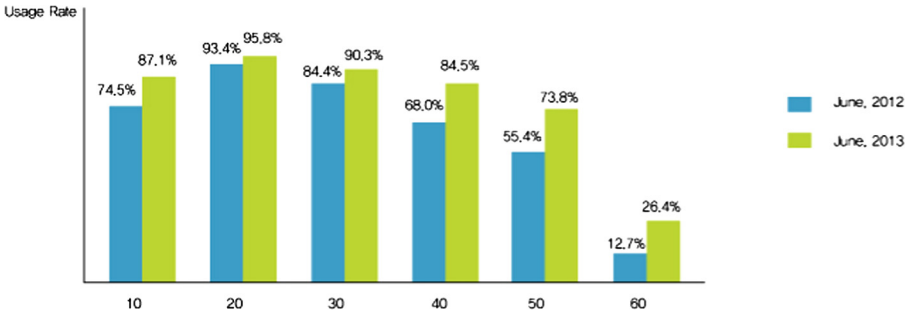

Fig. 3. Smartphone usage rate depending on age range (Source: KT economy and business research center customer data).

4.2 Application and Service Overview

'On Time' is proposed mobile application provides information that is related to healthcare and hospital. The primary function of this service is to notify the patients' waiting time in real-time, and this big data would allow patients to be more accessible on informing. Below is how to use the mobile application.

1. A patient downloads the 'On Time' medical service application and goes to the clinic.
2. When the patient registers at the relevant outpatient clinic for treatment, the nurse will send patient's information to the application database. By doing this would allow patient to check the remaining time regardless of their location.
3. When the nurse enters the patient's information, it would be shown on both application and the clinic monitor. The monitor only presents the last names and their total waiting for the patients'.

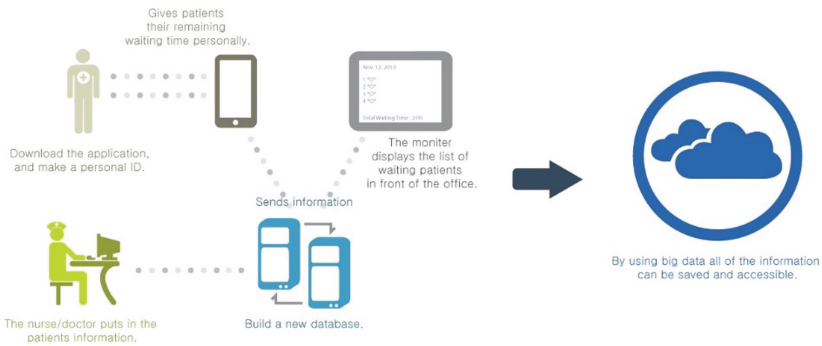

Fig. 4. Hospital service system

Patients who have chronic disease should take multiple examinations and treatments before getting medical examination from a doctor. However, they frequently are not noticed to take those steps before they consult with the doctor, increasing their time to wait in the waiting room. 'On Time' will eliminate this inconvenience by informing through the smartphone. The patients frequently forget to ask the questions to the doctors while they are consulting. 'On Time' would also have a category for these patients, sending specific questions that they would like to ask while they are

waiting, making consulting time to be more valuable. My Waiting Time, Step by Step, Medical Examination Consult, and Self Examination are the main categories (Table 1).

Table 1. On time application main functions

My Waiting Time	Exposed on the main page of application. Shows the remaining waiting time individually. The time can change flexibly, adjusting to the various situations that can occur in the hospital.
Step by Step	A menu for patients who need extra examinations. Inform the multiple examinations and treatments the patient needs step by step before getting medical examination from a doctor.
Medical Examination Consult	Before getting a medical examination it is possible to enter in questions that can be answered by the doctor. It also can be used afterwards to ask additional questions that can be forgotten. Dissatisfaction of long waiting and short medical treatment with the doctor can be reduced.
Self Examination	Helps keep track of the users health daily.The application can measure data such as users bio rhythm, blood pressure and the number of steps walked.

4.3 Information Architecture

'On Time' application uses a newly built database connected to the existing hospital information system. By using a connected database it is possible to send information to the existing clinic monitor and individual patients. Figure 5 below shows the detailed architecture of the application.

4.4 Graphical User Interface (GUI)

Figure 6 shows easily accessible designated GUI of the main function. The most important function of the application'My Waiting Time' is located on the top center of the main screen. The time changes flexibly, adjusting to the various situations that can occur in the hospital. Other functions such as 'Step by Step', 'Medical Examination Consult' and 'Self Examination' are also located on the main screen of the application.

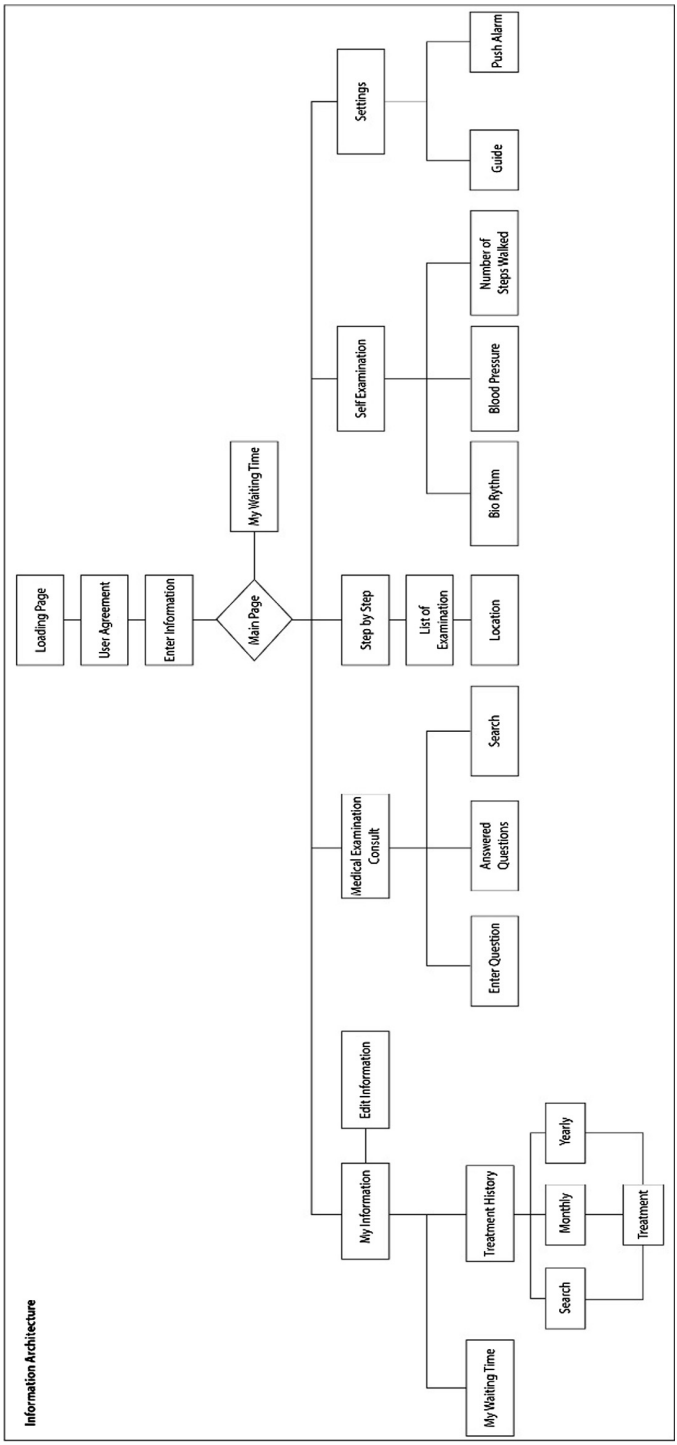

Fig. 5. On time application IA

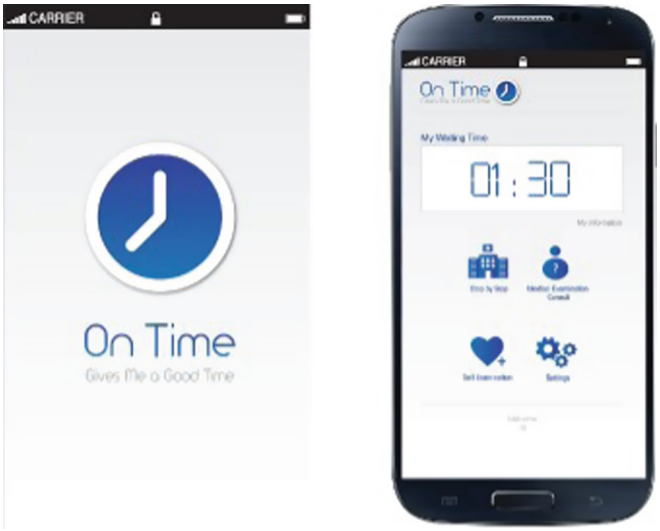

Fig. 6. On time application GUI

5 Conclusion

This research outlined the actual problem that patients encounter, and suggests a solution by applying 'On Time' service. We expect that this service would increase the patient's satisfaction by allowing them to use their time efficiently. Firstly, they will reduce their anxiety by experiencing reduction in their waiting time. Secondly, they can be informed about what steps they should take before they see the doctor. Lastly, patients can be prepared before consulting with the doctor. Because the system is based on the research of a tertiary hospital it has a limit to generalize it to all hospitals. Our future research suggests testing the validity of the design application to actual patients, and also suggests a design that can be applicable to the universal hospital service will suggest more advanced in the future.

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