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# Patients' Perceptions of Web Self-Service Applications in Primary Health Care

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**Abstract.** This paper presents the preliminary findings of a case study of patients' acceptance and usage of web self-service – online appointment system in a primary health care centre in a regional area in Australia. A structured interview was undertaken for three months to acquire patients' perceptions about the web self-service application after two months of system implementation. The findings of this study indicates that patients' acceptance of the web self-service application maybe hindered by their relative lower computer ownership or inadequate computer skills and access to Internet, their preference for flexible personal communication for appointment making and inadequate flexibility of the appointment system in comparison with phone call for appointment making. Although only 15% of the interviewed consumers accessed the web site of the medical centre, 61% of the interviewees were willing to adopt to use web self-service applications. Our preliminary findings may suggest that more than half of the healthcare consumers in the regional area are likely to accept the PCEHR initiative. However, the decision makers of the PCEHR system need to carefully design the strategies and practice for the introduction of the innovation to overcome the substantial barriers in consumers' capacity and access to Internet-based e-health solutions in the regional area in Australia.

**Keywords.** Web Self-Service, Personal controlled electronic record, patient-centeredness, technical acceptance model, diffusion of innovation theory,

## Introduction

Over the last two decades, primary health care has become the most important healthcare service in many developed countries. This is because it provides continuing and universally accessible health care services to individuals and families in a community [1, 2]. Recently, the concept of 'patient-centeredness' in primary health care has been recognized as a growing area of importance as it can greatly improve patients' access to their health information and better manage their health cost [3-6]. Unlike traditional 'disease-centered' or 'physician-centered' health care, patient-centered health care consistently addresses patients' concerns and adequately share management decisions and practices with patients [5-8]. According to Davis *et al.* the main attributes of patient-centered primary care practice are easy patient access to the health services and health information most important to them, the use of integrated clinical information systems to support smooth information transfer between different care providers, etc. [3]. Currently, some patient-centered care elements, which are relatively inexpensive, such as online communication, shared decision making between care providers and patients, team-based care, have already been incorporated into the primary health care practice [9, 10]. In the US, 'Patient-Centered Medical Home' (PCMH) has become a core concept for transformation of primary health care [11-14]. PCMH can enhance patients' access to psychological health care, physical health care and supportive social and community services [11, 12].

The quality of information and the frequency of communication between care providers and patients are essential components in patient-centered care practice [15]. Studies show that enhanced communication between patient and health professionals can decrease patients' worries or confusion about medical practice [16]. The quality of healthcare information and communication can be improved by healthcare information systems, including electronic medical records (EMR), decision support system or medical knowledge base management system, etc.[17-19]. These widely used computerized information technologies greatly improve the quality of information and communication by decreasing medical errors, increasing opportunities for shared decision making, and improving decision support [19, 20].

More recently, with the emergence of Internet and the rapid development of health information technology, many health providers have begun to deploy web self-service (WSS) applications to provide patient-centred medical practices which encourage patient involvement in the treatment processes [5, 7, 21-23]. A Web Self-Service

application is a type of computerized system which enables customers to access information and perform routine tasks independently through Internet without involvement of the traditional health care providers [22, 23]. Typical examples of WSS include online airline ticketing systems, ATMs, online banking and online bill payment systems [21]. Web self-service is used as a new medium to facilitate consumers to access primary healthcare service 24 hours a day, seven days a week, such as online appointment scheduling, personal health record management or other non-urgent medical requests [21]. It is anticipated that these online health services will help patients to make appropriate decisions and thus efficiently and effectively improve healthcare outcomes.

Although WSS is gradually being introduced into health care, consumers' acceptance and use of it and the impact of use on patient healthcare outcomes is still poorly understood since many researchers have focused on measuring health outcomes from the care providers' point of view [24, 25], despite the fact that some researchers believe that patients' views on patient-centeredness predict healthcare outcomes [26, 27]. Steward advises that the success of patient-centered innovation relies on the patient's decision to accept or reject it [26]. Several recent studies on the adoption of healthcare information technology (HIT) innovations used Rogers' innovation diffusion theory (IDT) and Davis' technology acceptance model (TAM) as their research framework [28-33]. Although IDT and TAM have been used to explore how care providers and organizations adopt information technology (IT) innovations, no HIT adoption studies have focused on the adoption process from the patient's point of view [26]. To address this knowledge gap, this study uses an online appointment scheduling system as a case study to investigate patients' perceptions of web self-service in a primary healthcare medical centre. Both innovation diffusion theory and TAM are used as the conceptual framework to identify and analyze major factors that could influence patients' adoption of web self-service applications.

## **Research Methodology**

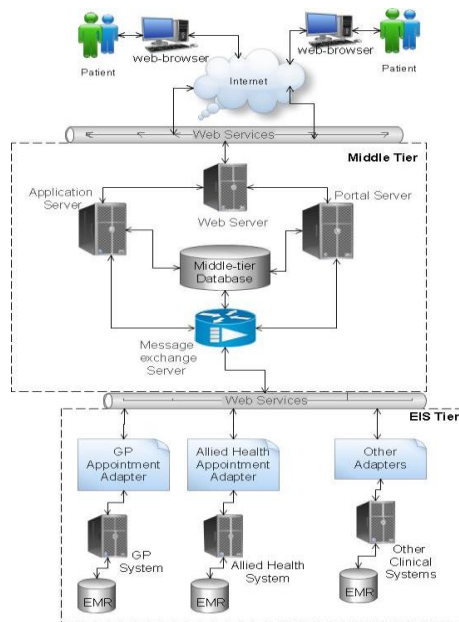
### **1. Research Setting**

The case study was conducted in a primary health care Centre Health Complex (CHC) located in Shellharbor, a regional area in Southcoast NSW, 100 kms south of Sydney. The centre provides family medical practice, specialist medical services, allied health services and wellness services to the local community.

### **2. The design and implementation of a web self-service application: an online appointment scheduling system**

One main characteristic of patient-centered primary health care is that a patient can easily make an appointment on their preferred date and time and with doctors of their choice [3]. With a shortage of doctors in semi-rural regions in Australia and an increasing ageing population that requires more health care services, patients' access to doctors can be problematic [34, 35]. One of the difficulties has been identified as the current phone-call based appointment system which is often congested [35]. The same challenge was found in CHC. An online appointment scheduling system was identified by the CEO of CHC as urgently needed in order to relieve the congestion of phone-call based appointment system and provide patients with the opportunity for 'self-service' available 24 hours a day and 7 days a week.

As there already were several clinical information systems (CIS) such as Medical Director 3 (MD3) for general practitioners (GPs) in the medical centre, a three-tier architecture was developed to enable communication and information exchange between the online appointment system and the existing CIS, or be scalable to integrate with any CIS that might be introduced in the future. In the first-tier, patients can access appointment information with a web-browser through Internet. The third-tier - enterprise information tier (EIS) - is composed of a group of adapters to connect with the existing CIS or any future CIS. The middle-tier connects the first tier with the third tier. The overall system architecture is illustrated in Figure 1.



**Figure 1.** Overall architecture of the online appointment system

Figure 2 shows the appointment selection web page. Patients can select their preferred appointment date, time and doctors. If the initial preference cannot be met, an alternative choice will be presented automatically, including the available time, date and doctors in the medical centre. After patients make their final choice, a confirmation web page will be displayed, and a confirmation e-mail instantly sent to the patient.

**Figure 2.** Appointment selection web page

### 3. The implementation of the online appointment system

The online appointment system was developed by the first author and installed in a server machine in the CHC at the end of January 2011. There is a web link at the home page of the medical centre Web site, clicking on it would allow a person to enter the web-based online appointment system.

Information about the online appointment system was disseminated to consumers through the following channels: (1) fliers to be left at the reception desk for anyone to take for free; (2) posters placed at the prominent locations in the medical centre; (3) advertisement at CHC web site. The information disseminated includes the web link to the online appointment system and the steps to follow to make an appointment using the online appointment system.

#### **4. The methods to investigate patient's acceptance and usage of the online appointment system**

In order to understand patients' acceptance and usage of the online appointment system, a survey was conducted two months after the system was implemented, in April to June in 2011.

In consideration that patients may be reluctant to fill in a questionnaire survey form, a structured interview was considered the best research method. The interview guide was developed through brainstorming among the team of researchers. The interview questions were designed to address the acceptance issues suggested by the Technology Acceptance Model (Davis 1989) [36]. It consisted of a number of multiple choice and Likert scale questions that sought patients' feedback on four major issues: (1) their awareness of the existence of the online appointment system and the communication channel through which they get the information; (2) their perceived usefulness of the system; (3) their perceived ease of use of the system; (4) their preferred method to make appointment with GPs: phone-call, online appointment or walk-in the clinic; and (5) their intention to use online appointment system and web self-service applications in the future. In addition, patients' basic demographic information, such as age, gender, work status and educational level, was also collected.

Convenience sampling was used for selecting patients for interview. The researcher would approach a patient who was waiting in the waiting area that not appeared to engage in other activities. First the researcher orally explained the purpose and procedure of the interview to a patient, then presented an information sheet with written explanation of the study to the person. Only after an oral consent was given, would an interview start. Each interview was audio-recorded and transcribed in full for further qualitative and quantitative analysis. The study was approved by institutional ethics review committee.

In addition to the interview, data was also collected from the online appointment database which stored patients' online appointment information, including date, time, and the name of the GP to be visited. All of the collected data was coded and entered into EXCEL for further analysis. Further statistical analysis was conducted in IBM SPSS 19.

## **Results**

### **1. The age profile of the surveyed patients**

In total, 100 patients in the waiting area participated in the interview. 54 respondents were male aged between 18 and 70 years, with a mean age of 43 years (standard deviation 13), and 46 respondents were female aged between 17 and 74 years with a mean age of 45 years (standard deviation 14). The top three age groups of survey participants were 40ys, 30ys and 20ys for male; 30ys, 40ys and 20ys for female. A comparison of the participants' demographic profile with the historical patient profile in the medical centre suggests that the sample was representative of the patient population in the medical centre.

### **2. Patient's awareness of the online appointment system and the communication channel for them to get the information**

Eighty five percent of the interviewed patients ( $n = 85$ ) were not aware of the availability of the online appointment system at the time of the interview. Only 15% of the respondents ( $n = 15$ ) were aware that appointments could be made online. 13 of them used the online appointment system for making appointments at least once. They got the information about the availability of the online appointment system through the web advertisement by the medical care when they visited the web site. At the time of the interview, none of the patients mentioned that they noticed the existence of the online appointment system through posters or fliers.

### **3. Patient's perceptions about usefulness of the online appointment system**

Eleven of the 13 respondents (84.6%) who used the online appointment system at least once agreed that they could schedule an appointment as soon as they need it. One respondent said:

*"Online system gives your available slots, or just straight away what's available and what's not."*

Another aspect of perceived usefulness of the online appointment system over phone-call based appointment system was less waiting time to make an appointment. One respondent commented:

*"They don't answer the phone quickly. And sometimes you just got to ring back again."*

This view was agreed by another patient, who also pointed out that:

*"They take too long to answer the phone. When they do answer the phone, they put you on hold."*

#### **4. Patient's perceptions about ease of use of the online appointment system**

Patient's perceptions of ease of use of the system was measured by asking a patient to give 'yes' or 'no' answer to the question asking 'whether the online appointment system was easy to use?' Twelve of the 13 respondents (92.3%) who used the online appointment system at least once agreed that the system was easy to use. However, some feedback also suggested that the flexibility of the online appointment system needs to be improved. One patient suggested to:

*"Enhance the appointment search to support 'find next available appointment for Doctor X'. My usual aim is to find the earliest appointment for one of a select group of doctors, rather than find a doctor that fits my desired time-slot".*

Another suggested that the online appointment system should provide more flexible time slots and include more available clinical services:

*"I find the times allocated very restrictive, e.g. one is unable to choose on the half hour (appointment). There are many services available at the centre and it would be good if one was able to slot in the required time and not have to wait for over an hour".*

#### **5. Patient Preferred method to make appointment**

At the time of the field survey, the medical centre provided a patient with three options for making an appointment to see a GP: phone-call, online self-service or a walk-in appointment. Seventy two percent of the respondents (n = 72) only used the phone call to make appointments to see a GP. Only 13% of the respondents (n = 13) used the online appointment system. The rest 15% of the respondents (n = 15) were walk-in patients in the medical centre over the three month survey period.

#### **6. The adoption trend of the online appointment system over the survey period**

The adoption rate of the online appointment system was gathered from the log record of the online appointment system. It was increased slowly but steadily from 3.20% to 3.70%, then 4.40% at four, five and six months after the online appointment system went alive. The patient throughput in the medical centre per day is around 300 people, among them 10, 11 or 13 people made their appointments to see their GPs through online appointment system in the 4, 5, or 6 months after the online appointment system was implemented, respectively.

#### **7. Patients' intention to use the online appointment system in the near future**

Positive results were gathered for this question. 61% of respondents expressed their intention to use the online appointment system next time when they need to see a doctor. 23% of respondents preferred to use a phone call for the following reasons:

(1) A Phone call is easier. For example, one patient said:

*"Because I don't use Internet for the appointment, I probably don't know. I probably use the phone. I find it is easier (to use the phone)."*

(2) They prefer speaking to someone through phone call. One respondent said:

*"I prefer to talk to someone in person. In case there is nothing is available. Or the nature of my illness, it requires them to fit me in somewhere because it is urgent than just go to the computer to make an appointment".*

(3) They trust a person more than a computer, as a participant said:

*"I would prefer to use the phone because I prefer to speak to someone and confirm. I would rather to trust the person than trust the computer".*

(4) For urgent cases, a phone call is more reliable.

*"Because we won't be sure if there is an appointment (available) here. And when we do want an appointment, we want it urgent, not for next week, that's probably why".*

(5) Mal function of the online appointment system discouraged usage, as one participant mentioned:

*"I have tried twice, but each time it said 'not available'. The site wouldn't let me get into it".*

## **8. Patients' use or intention to use web self-service applications in the future**

Fourteen percent of respondents (n = 14) often used the Internet searching for different health information, such as symptoms of a specific disease, the location of hospitals, or general health information. For example, one respondent said:

*"Maybe (web-based self-service applications can be used to get) some sort of information about normal illness, like normal common flu, normal things like that we can get some basic information that may not requires us to see a doctor, or know what to do".*

However, the majority of the respondents (n = 86) suggested that they did not need to use web-based health services. The reasons were:

(1) They did not even have a computer or Internet access at home.

(2) Not an 'Internet' person. For example, one participant said:

*"I don't know about (online appointment system). I won't use Internet for that. I definitely use the phone, because I'm not an Internet person".*

(3) They trusted the credibility of the information delivered by health care providers they had therapeutic relationship with than that from the Internet. For example, one respondent said:

*"Because when you search for Google for common illness, you get all different sorts of information. But coming from this organization, it's creditable, because it is written by actual doctor that you can trust. Things like that, maybe new medication, reminds of flu, vaccination and things like that".*

## **Discussion of key findings**

Although this is a preliminary study of the adoption of a particular type of web self-service application – an online appointment system - in a primary health care centre at the early stage of system introduction, it does provide some insight into the patients' perceptions and willingness to use web self-service applications in primary health care. The issues to be investigated include patients demographics, the communication channel for them to receive the information about the availability of the online appointment system, their perceived usefulness and ease of use of the system, their preferred method to make an appointment to see a doctor, and their intention to adopt to use the online appointment system in particular and web self-service applications in general.

### **1. The impact of the demographics on the choice of use of web self-service application**

The average age of the survey participants are all over 40 years for both male and female patients. As the computer was introduced into high school education system in Australia in 1980s, it is likely that people in this age group missed the opportunity to receive basic computer training in their school age. This may be the reason that online appointment system was not receivable to the majority of the survey participants (86%).

### **2. The communication channel for the diffusion of the innovation of online appointment system was not effective**

Roger's Diffusion of Innovation Theory (DOI) indicates that the communication channel for the dissemination of an innovation is one of the key determinants of the rate of innovation adoption [37]. In this study, the message disseminated through the Web site of the medical center is the most effective way for disseminating the information about the availability of the online appointment system. Of course, only those patients who visited the web site of the medical center would have the opportunity to get the information. The patients who did not visit this web site did not appear to receive the information about the innovation at all. This was unfortunately happened even though the message was also disseminated through the purpose-built fliers placed at the reception area or the posters on the

prominent locations in the medical center. The patient's lack of awareness of this innovation suggests that the channel for the dissemination of the online appointment system needs to be improved.

### **3. Patient's perceived usefulness and perceived ease of use of the online appointment system**

Perceived usefulness (PU) is defined as the degree to which users believe the system will enhance their performance through increasing the speed of completing the task, productivity, effectiveness and ease of use [36, 38]. Perceived ease of use (PEOU) is defined as the degree to which end users believe that using an information system (IS) will be free of effort [36, 38]. David's Technology Acceptance Model (TAM) suggests that PU and PEOU are the key determinants of users' intention towards using an IS system [36, 38]. The survey results show that patients chose to use the online appointment system because they perceived the system provided an effective and easy way to make a medical appointment with reduced waiting time in comparison with the phone-call based appointment. Therefore, perceived usefulness and perceived ease of use are the encouraging factors for the participants to adopt to use the online appointment system.

In this study, although 13 out of 15 patients who were aware of the availability of the online appointment system used the system at least once, the adoption rate (4.4% at 6 months after implementation) suggested by the computer log record is substantially lower than the rate of 13% of interviewees who used the online appointment system at least once recorded in this study. It appeared that about 9% of the users stopped to continuously use the system after a trial to use the system. The reason may be the patient did not need to see the doctor from the first online appointment making to the time of the survey; or they directly made follow-up appointment after seeing a GP in the clinic. The third possible explanation is that the workflow for appointment making by the online appointment system is yet to be improved to reach the same level of flexibility as phone-call based appointment making.

### **4. Patient's preferred method to make an appointment to see a doctor**

Preference for communication with the receptionist through phone call or direct walk-in appointment making is the main reason why patients preferred to use these appointment methods rather than web-based online self-service, in addition to the limitation of the flexibility in appointment making through the online appointment system. Lee et al. suggest that consumer's need for interaction influences their intention to use self-service [39]. Possibly the convenience and preference for oral communication with the receptionist because of the humanly nature, the flexibility and effectiveness in negotiation and problem solving through oral communication were also the reasons for the patients' preference to make a medical appointment through the channel of oral communication with a receptionist rather than the web-based online appointment system.

### **5. The adoption rate of the online appointment system suggests that only the innovators in the patient population adopted the innovation**

The diffusion of innovation theory indicates that the adoption process can be divided into five segments: innovators, early adopters, early majorities, late majorities and laggards [37]. Rogers suggests that innovators constituted around 3% of the total population [37]. As it is shown in the results section, the overall adoption rate of the online appointment system had slowly increased from 3.2% to 4.4% over the three months survey period. It appears that only 'the innovators' in the patient population had adopted the IT innovation – the online appointment system. The innovators belonged to the 15% of the patient population who used the Internet to access the web site of the medical center. This may indicate that Internet-based healthcare delivery is still far from the reach of the general public in the regional Australia, where the study site belongs. However, 61% of the patient population expressed their intention to use web-based self-service applications. This message is supportive of Australian government initiative of introducing Personal Controlled Electronic Health Record Systems (PCEHR) in Australia.



## Limitations of the study

As the research is at the preliminary stage, a number of issues are yet to be further investigated to fully understand the various factors impacting on patients' acceptance of web self-service applications. For example, the impact of demographics (e.g. age, gender, education and income) on the adoption of web self-service needs to be further analyzed. A systematic, longitudinal study needs to be continued to fully understand the factors, processes and outcomes for the adoption of the web self-service application in primary health care in regional Australia.

## Conclusion

This paper provides a case study in a relatively new area of patient's acceptance of web self-services from the patient's perspective. An online appointment system was developed and used as an exemplar web self-service application in the case study. Patients' perceptions about the online appointment system and their willingness to use it have been investigated. The findings show that the users of the online appointment system were those patients who visited the web site of the medical centre and only 15% of the interviewed patients belonged to this group. Our case study may suggest that the capability and access to web-based self-service for the majority of the patient population in regional Australia are still hindered by their lack of computers, access to Internet or inadequate computer skills. However, it is optimistic to see that the majority of the patient populations are willing to adopt the web-based self-services in primary health care.

This case study serves as a preliminary study for the future analysis of consumer's acceptance and usage of e-Health applications, such as PCEHR in primary health care in regional Australia. Future statistical analysis of qualitative and quantitative results will be undertaken to improve our understanding of the patient's behavior in adopting e-health application and the factors that impact on the adoption behavior. Our preliminary findings are highly valuable for the decision makers charged with the responsibility of implementing PCEHR to consider in designing their strategies and plans for the introduction of the PCEHR system in regional Australia.

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