A Survey on Mobile Computing in Healthcare

COSC7388 – Advanced Distributed Computing

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Abstract— **Mobile computing is speculated to have a major impact in usage of information technology and information system in healthcare industry. Given the fact that healthcare can be needed anywhere and anytime, the ubiquity of wireless and mobile devices can easily be leveraged for improving the quality of care. There seems to be many promises of mobile computing for both patient as well as medical practitioner. However, many prior applications have either failed in the past or have not been implemented as predicted. Acceptance of the technology by healthcare professionals play significant role in success of Mobile Healthcare System (MHS). This survey is a review about possible areas of healthcare where mobile computing can potentially benefit and also a brief discussion about factors that affect adoption of this system in real world.**

Keywords-mobile healthcare

I. INTRODUCTION

Mobile computing is speculated to have a major impact in usage of information technology and information system in healthcare industry. Given the fact that healthcare can be needed anywhere and anytime [1], the ubiquity of wireless and mobile devices can easily be leveraged for improving the quality of care. Mobile computing can also help centralize complete information about a patient furnished by various health care professionals like clinicians, providers, pharmacists and lab personnel. Such complete information can facilitate appropriate decision at point-of-care.

Numerous mobile applications have been deployed in various countries for emergency and general care [2]. However, many applications have either failed in the past or have not been implemented as predicted. Acceptance of the technology by healthcare professionals play significant role in Mobile Healthcare System (MHS). Section 2 of this report discusses possible areas of healthcare where mobile computing can potentially benefit [4]. Section 3 discusses about envisioned implementation of an activity-aware system [3] and section 4 presents survey on mobile computing acceptance factors in healthcare [2].

II. WHAT ARE THE POSSIBILITIES?

Healthcare professionals are primarily involved in activities that directly or indirectly correspond to a patient's ailment, it's diagnosis, treatment and care. Taking an example of a hospital setting, there are different types of medical staff involved in the system, such as physician, nurse, medical intern etc. They are involved in different sets of activities and use varied collection of instruments. Though varied in responsibilities, an observational study in [3] suggests that most of the hospital workers spend time in clinical case assessment, information management, coordination, preparation and patient care. Keeping this scenario in mind, changes that can be brought about by mobile and wireless can be broadly classified into three types – Information Management, Communication, and Process Automation.

A. Information Management

- Doctor Terminal: A mobile device with sufficient display area can be a fascinating mode of data input for a doctor who is in regular round visiting patients. It can also act as a means of retrieval of past information about the patient.

- Online record editing: Through wireless access, information is almost always at the tip of finger. A patient's information can reside in a centralized server and can be updated by a doctor in a real time from virtually anywhere.

- Patient access: A patient can be allowed to access his own information about personal health so that he can plan and manage his health in a better way.

B. Communication

- Online Reports: Whenever a report is generated for some diagnostic test, it can be updated to the system and a doctor would be able to review it online from remote location.

- Patient Monitoring: Some smart phone applications can capture vital information about a patient and send it to medical staff that's monitoring the patient.

- Alerts and Reminders: Alerts can be set to monitoring if some readings go beyond certain level. Apart from automated alerts, the system can be tuned to send reminders to patient about timing of medication.

- Virtual Team: Doctors can consult with others in the field to get second opinion about a patient's condition.

Electronic sharing of medical logs can be quick and easy for such virtual teaming.

C. Automation

- Charge Capture: Charge capture and health insurance management can be done by patient from his personal device.

- Prescription Management: Drug prescription can be posted to patient's information pool which can be made automatically available to pharmacist. This can help control prescribed drug usage.

III. ACTIVITY AWARE COMPUTING

Activity-aware computing is a way of computationally augmenting information to the environment based on a situation. A case study about this has been discussed in [3] in more detail. A situation can be physical state of patient being monitored. As an example, say a patient whose renal transplant had just been done is being monitoring for amount of urine evacuated. The authors of [3] show an envisioned implementation of bracelet coupled with activity-aware mobile device. The bracelet would indicate that an activity has happened for a particular patient. It's coupling with mobile device can then be used for visually drilling into detail of the patient. Such paradigm can actually help health care provider to be automatically suggested about a situation, after which course of action can be planned and determined by the care provider efficiently. This type of system can also help health care provider to identify urgency of patient's need and prioritize which patient to attend first.

Apart from activity monitoring, online patient's history could be used to review what medication has already been administered and avoid any problem that has occurred in the past for a specific patient.

IV. MOBILE COMPUTING ACCEPTANCE FACTORS

Most of the past failures of mobile healthcare systems can be attributed to lack of user acceptance. A system that uses computational technology might not require a medical practitioner to be tech-savvy; however it might not be accepted due to personal judgment of what one can do. This naturally would affect the effort put upon by practitioner in using the new system. Acceptance model has been designed and surveyed in [2] by using revised form of Technology Acceptance Model (TAM). Factors like perceived ease of use, perceived usefulness, attitude towards using, effectiveness of MHS, technical support & training, compatibility with current system in place, etc. are inferred using questionnaire to physicians, nurses and medical technicians. The authors have done statistical analysis of responses collected from questionnaire and reached the conclusion that perceived usefulness, ease of use, compatibility, MHS effectiveness are important for behavioral intention to use. Out of these, compatibility of the system is the most influential factor that affects the intention to use.

V. CONCLUSION

Most of the mobile applications for a mobile health system is still under conceptual and developmental process. Use cases have been envisioned and tried upon in some scenarios. Some of them like monitoring ambulance location through mobile using GPS have been successfully used in some countries. Prescription management and patient's medical history have also been deployed. But there are many possibilities in healthcare industry with mobile and wireless being widely available. In present day, it is tough to imagine a financial institution that does not have online access to details. Such an online presence of healthcare industry seems to be seeing a dawn due to popularity of mobile devices.

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