TRACKING AND MONITORING PATIENTS AND ASSETS IN SAUDI ARABIA' HEALTHCARE ENVIRONMENT

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TRACKING AND MONITORING PATIENTS AND ASSETS IN SAUDI ARABIA' HEALTHCARE ENVIRONMENT

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ABSTRACT

The Saudi healthcare system still faces a number of challenges despite numerous initiatives that have been taken by the Ministry of Health and relevant healthcare authorities. Most of these challenges relate to the underutilisation of electronic health (e-Health) strategies, and the development of a national system for health information. This paper looks into current issues and barriers in Saudi Arabia healthcare environment. The paper descries the collections and analysis of quantifiable data to support tracking and monitoring of patients and assets in Saudi Arabia's healthcare environment. The paper also compares current practises with a proposed system for an e-Health framework using Radio Frequency Identification (RFID) and ZigBee technologies. A survey was conducted on respondents from Saudi Arabia to ascertain the need of tracking and monitoring in a hospital environment. The survey results indicated that implementing tracking system will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures.

KEYWORDS

1. INTRODUCTION

Developing countries, such as Saudi Arabia, have experienced many challenges in e-Health systems, services and applications implementation. Over the past few years, efforts have shown that there is a clear need for an approach and methodology which hold the most promise for success (Healy & Jc, 2008). In recent years, e-Health systems have been started in some hospitals and other health institutions across Saudi Arabia. However, the underutilization of e-Heath systems has raised much concern. A lack of proper health informatics systems and applications has been ranked among the major challenges facing the health sector in Saudi Arabia as indicated by the Saudi government Health Reform Committee. One of the prominent issues in the Saudi Arabian healthcare sector is patient misidentification. A recent study shows that in a Saudi tertiary care hospital, 3.1% reported patient incidents were related to patient misidentification (Aljadhey et al., 2014). Another issue is the long waiting time to be seen by a doctor. The average patient waiting time in outpatients' clinics in UK and USA is 24 minutes (Press Ganey Associates, 2009), while research shows average patient waiting time in outpatients clinics in the Middle East Region is 161 minutes (Mohebbifar et al., 2014). Poor patient flow raises healthcare costs by failing to make the best use of skilled staff time and also increases the possibility of harm to patients as the medical staff spend most of their time looking for required medical devices to conduct required medical treatment (De Silva, 2013). Another challenge is the late arrival of physicians. In a Saudi tertiary care hospital, more than 20% of the physicians arrived more than 60 minutes late (Clinic Management Department, 2014). According to several surveys, one of the most common complaints patients have, is that they have to wait too long in the waiting area before being attended to, by the doctor. Patient-centred medical practices seek to make patients feel better, both physically and emotionally (Press Ganey Associates, 2009). Medical equipment is another challenge in the Saudi Arabian Healthcare environment as keeping track and managing costly mobile equipment is challenging and labour-intensive. A significant portion of asset inventories are lost, stolen or misplaced, affecting productivity every day in a busy environment like hospitals. Medical staff waste significant amounts of time searching for devices. For example, studies find that, a majority of the healthcare practitioners (85%) spend up to 60

minutes per shift searching for supplies including wheelchairs and infusion pumps (Dare, 2009). These challenges lead to significantly increased costs stemming from several issues such as low efficiency, poor risk management, high inventory etc. This paper explores potential needs for tracking and monitoring patients, staff and medical assets in Saudi Arabian hospital using non invention emerging technologies such as RFID and/or ZigBee. A survey was conducted on respondents from Saudi Arabia to ascertain the need of tracking and monitoring in a hospital environment. The survey results indicated that implementing tracking systems will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures. The research revealed that implementing a tracking and locating system for patients, staff and assets will increase performance and efficiency for healthcare decision support in healthcare institutions in Saudi Arabia.

This paper proposes a tracking and monitoring system for patients, staff and medical assets, for healthcare decision support in Saudi Arabia. Attention is given to use of RFID and ZigBee technologies. This system will be at a strategic-level, and will be developed by using knowledge management concepts in relation to visualisation; to identify an appropriate managerial decision support framework in order to identify patients, medical staff, and medical equipment locations; to improve efficiency, and decision support systems to meet the needs of Saudi Arabia's healthcare sector.

2. RESEARCH ANALYSIS

2.1 Methodology

The population of this study comprises individuals who regularly visit or work in hospitals. The data for this research were obtained from a sample of the population of Saudi Arabia. A self-administered questionnaire (written in English and Arabic versions) was completed by the respondents and the data was gathered via the web. The survey was distributed to the target population through appropriate multiple social networks channels including Twitter, emails and WhatsApp etc. A questionnaire was designed specifically for this research based on the reviewed literature to obtain the necessary data. The respondents were asked to indicate their agreement level with a specific set of statements on a single 5-point Likert scale. A pilot survey was sent to ten individuals to review the preliminary questionnaire. Based on the feedback from the pilot survey responses, amendments to questions were made. The survey was divided into three parts. The first part included questions related to demographic information, such as age, gender, computer skills and educational level. The second and third parts involved the main questions on the needs for tracking and monitoring patients, staff and medical assets in Saudi Arabia. To ensure consistency and accuracy of meaning, all items were prepared in English language and then translated into Arabic language, and back-translated into English by trilingual translator. The 3rd version questionnaires were stored on Google document application (English and Arabic). To check the reliability of the question items, Cronbach's alphas were used and found to range from 0.57 to 0.81, and were thus acceptable.

2.2 Survey Results

Systematic analysis of the survey results produced comprehensive quantitative information which provides the basis for the conclusions developed in this paper.

2.2.1 Respondents' Profile

The online survey produced a total of 360 responses; however, only 220 responses were used, because some of the questionnaires were not fully completed. In terms of gender, the majority were male 85% and 15% were female as shown in Figure 1. The structure of the sample by age, showed 39.1% of respondents were aged from 18-30; 44.5% from 31-40, 13.2% from 41-50; 2.7% from 51-60 and 0.5% above 60 years of age respectively (Figure 2). In terms of computer skills, the majority have medium computer skills 68.2% (Figure 3). Regarding the education level, 75 % of the respondents are graduated people with bachelor degree or higher certificate while the rest of respondents have either diploma, high school or other qualifications (Figure 4). The respondents' jobs are various as follow: 58% are visitors, 19% are administrative staff,

medics/healthcare providers about 15% while the remaining respondents either ancillary staff or IT specialists equally (Figure 5).
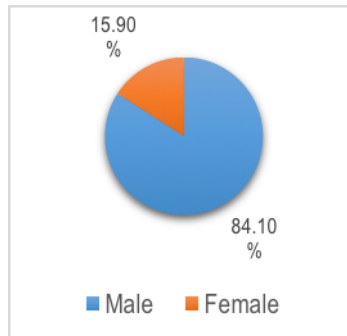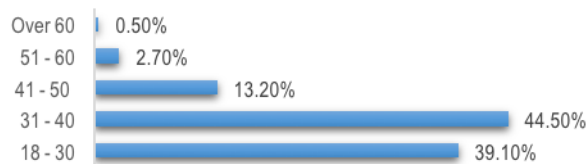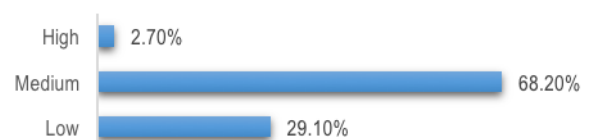

Figure 1. Gender

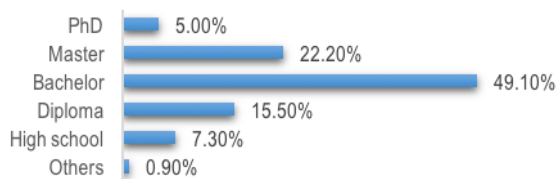
Figure 2. Age Group

Figure 3. Computer Skills Level
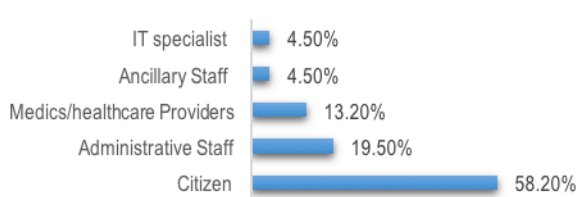

Figure 4. Education Level

Figure 5. Respondent Profile

2.2.2 Current Issues and Challenges in Locating and Monitoring Patients, Staff Members and Assets

The survey analysis shows in Figure 6a to 6c clearly the size of the issue in locating and monitoring patients, staff members and assets. More than 75% of the healthcare workers answered No when asked this question, 'currently, can you track and locate patients and assets in your hospital when needed?' (Figure 6a). Also, more than the half of them (51%) admitted that they often found it difficult to find medical assets and mobile equipment's in their hospitals when they need them (Figure 6b). In addition, more than 88% of the respondents confirmed that there is no system in place to measure productivity and determine the attendance for the doctors, nurses and other staff members (Figure 6c).

Figure 6a. Currently, can you track and locate patients and assets in your hospital when needed

Figure 6b. Do you find it difficult to find a medical device and mobile equipment's in your hospitals when needed.
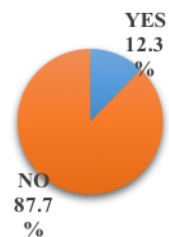

Figure 6c. Is there any system in place to measure productivity and determine the attendance for the doctors, nurses and other staff members?

2.2.3 Patients Waiting Time

In USA and UK, the average patient waiting time in outpatient clinics is 24 minutes (Press Ganey Associates, 2009). However, as shown in Figure 7, the results show that over 70% of the patients have to wait 30 minutes or more to be seen by a doctor, this is due to number of reasons. Firstly, the shortage of healthcare professionals, such as physicians, nurses, pharmacists, etc. According to the Ministry of Health (MOH) in Saudi Arabia the total healthcare practitioner numbers, are about 248,000. The rates of physicians and nurses in Saudi Arabia are 16 and 36 per 10.000 population respectively. This is lower than other countries such as Japan (12 and 95 per 10,000), France (37 and 81 per 10,000) and the United States of America (27 and 98 per 10,000) (Almalki et al., 2012). Secondly, there are no systems or tools to remind the healthcare providers about those waiting patients. Thirdly, reports show that in some hospitals more than 20% of the physicians arrived more than 60 minutes late (Clinic Management Department, 2014).
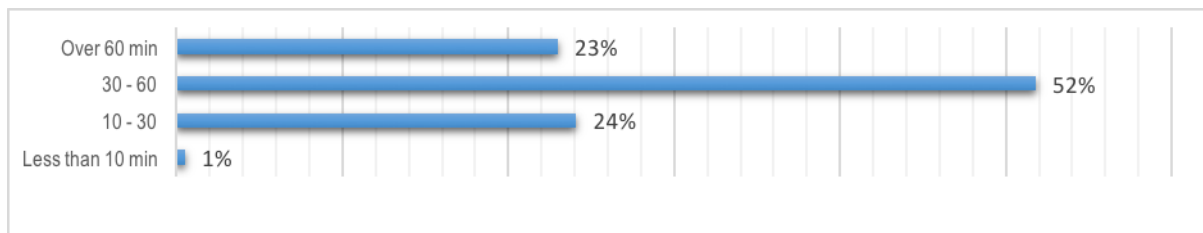

Figure 7. How long patients have to wait until seen by a doctor?

2.2.4 Short Supply or No-Supply of Necessary Medical Equipment

As shown in Figure 8, when healthcare providers have been asked about how often clinics and /or emergency rooms are in short supply or no-supply of required medical equipment, the results show that more than 60% have answered either always, very often or sometimes. These results are due to the lack of assets control and this lead to consuming a considerable amount of time in searching for supplies and this could affect patients' safety.
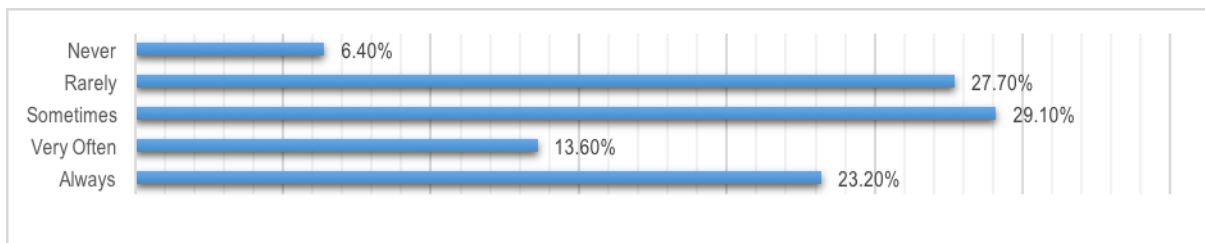

Figure 8. How often are clinics and /or emergency rooms in short supply or no-supply of needed medical equipment?

2.2.5 Tracking and Monitoring System Needs

As shown in Figure 9, the respondents strongly agree (68.2%) that implementing a tracking system; will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures. Also as shown below in Figure 10, they strongly agreed (77.3%) that implementing a tracking and locating system for patients, staff and assets will increase performance and efficiency for healthcare decision support in healthcare institutions in Saudi Arabia. The proposed solution as shown in Figure 11 is a smart e-Health framework for tracking and monitoring patients and assets, for healthcare decision support in Saudi Arabia. Attention is given to use of RFID and ZigBee technologies. This framework will be at a strategic-level, and will be developed by using knowledge management concepts in relation to visualisation; to identify an appropriate managerial decision support framework in order to identify patients, medical staff, and medical equipment locations; to improve efficiency, and decision support systems to meet the needs of Saudi Arabia's healthcare sector.
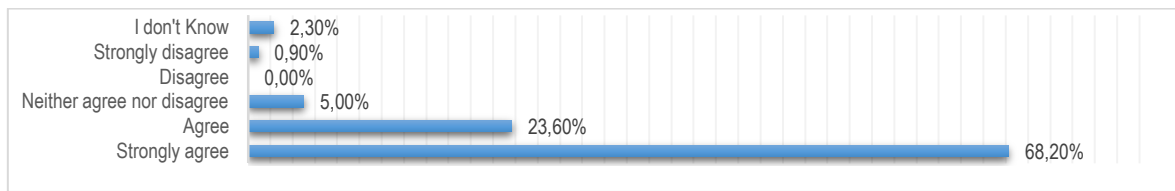
Figure 9. Implementing a tracking system, will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures.
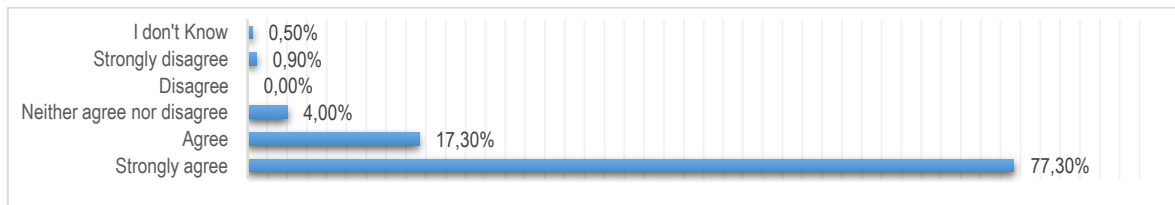

Figure 10. A tracking and location of patients, staff and assets system in Healthcare institutions in Saudi Arabia will increase performance and efficiency.

Current Practise

Proposed System

Figure 11. Current practice and the proposed system.

3. CONCLUSION

This proposed solution has many advantages as it can help in preventing and eliminating human and medical errors such as patient misidentification. Secondly, it will measure productivity of the doctors, nurses, administrative staff and their attendance which will result in improving efficiency. Thirdly, patients can be tracked as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures. Fourthly, a tracking system will enable better protection of vulnerable patients by sounding an alarm when patients leave designated areas. Finally, locating life-saving and critical care equipment quickly, will improve patient care and staff productivity. One possible application is increasing the safety and accuracy of verifying the individual's status regarding access to sensitive areas such as maternity to prevent switching of new born babies. This system can also update responsible staff when beds, wheelchairs and other equipment are unavailable or misplaced. In conclusion, the proposed systems will help in improving efficiency and decision support systems to meet the needs of Saudi Arabia healthcare sector.

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