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RFID in Health Care-Building Smart Hospitals for Quality Healthcare

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ABSTRACT

RFID is a new technology that is quickly gaining ground in healthcare industry. RFID is being used in many areas of healthcare from asset tracking to patient care to access control. RFID can also be used to provide real-time information for decision support and to create a smart hospital supported by a secure and reliable smart hospital management information system (SHMIS). Such system can enable hospitals dynamically control different objects and transforms operational processes while minimizing any potential risks to patients and staff. The objective of this article is to discuss how RFID can be used to build a smart hospital and how healthcare industry can gain long-term benefits from smart hospitals. Findings indicate that use of RFID to develop smart hospitals require various enablers. There also exist ethical/cultural issues related to smart hospital implementation that require close collaboration among RFID products manufactures and healthcare providers. This article also provides several recommendations for healthcare industry in order gain competitive advantage from the use of smart hospitals.

KEYWORDS

Barriers, Enablers, Issues, Radio Frequency Identification, Trends

1. INTRODUCTION

The healthcare industry is one of the largest sectors in many economies (Payton et al., 2011). Healthcare sector in USA created approximately 14.3 million jobs in 2008. This sector was expected to provide an additional 3.2 million jobs by 2018 (United-States-Department-of-Labor, 2010). At present, global healthcare sector is facing many challenges such as increasing operating costs, increasing number of medication errors, and ageing patient population. US healthcare expenses were expected to reach almost 20% of the GNP by 2017. That amounted to an increase of 15% in healthcare expenditure since 1963 (Middleton, 2009; Wurster et al., 2009). In Canada, healthcare expenses were expected to be almost 7.1% of the GNP by 2020, an increase of 1.1% since 2000 (Brimacombe et al., 2001). In Australia, healthcare expenses were estimated at 10% of the GNP (GS1-Australia, 2010). Each year, approximately 1.5 million Americans suffered from medication errors and these errors resulted in significant additional healthcare costs (National-Academy-of-Sciences, 2007). A study done in 2002 estimated that the population of people aged 85 and above in western countries would increase by 350% in 2020 (Wiener & Tilly, 2002). Another study estimated that by 2050 the population of older Americans would increase by 135% (Newell, 2011). It is evident that there would be an increased pressure on healthcare expenditure, which will become more complicated given that, due to the economic crisis, several countries are facing critical challenges in providing healthcare services. Healthcare is a very different business due to various reasons. Patients are not typical consumers, they do not always make the decision as to when, and where they will seek which type of care and

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at what cost. Healthcare providers are not as autonomous as any other typical business could be. Various stakeholders, such as legislators, regulators, and payers often affect both clinical and business decisions of caregivers. For healthcare providers, efficiency is not merely good fiscal practice. It must be a critical component of their mission (Fosso Wamba, Anand, & Carter, 2013; Lefebvre, Castro, & Lefebvre, 2011a).

Healthcare sector today provides strong institutional powers and policies for an effective use of information technology (IT). Healthcare sector considers adoption and effective use of IT a critical goal of modern healthcare system to enable better support service delivery (Menachemi & Brooks, 2006; Payton et al., 2011). IT offer many opportunities for healthcare transformation through business process reengineering. Effective use of IT could provide minimized data-entry errors, real-time access to patient data, improved clinical trials, streamlined processes, increased transparency, reduced administrative overhead, creation of new high-tech healthcare markets and jobs and improved overall healthcare management of individuals (PCAST, 2010; Burkhard et al., 2010). The estimated potential safety savings from adoption and use of interoperable electronic medical records systems in USA was approximately US$142–371 billion (Sherer, 2010). RFID technology is considered the next IT innovation expected to expand healthcare transformation (Fosso Wamba et al., 2008; Ngai et al., 2009a, 2009b; Oztekin et al., 2010a, 2010b; Fosso Wamba & Bgai, 2011). In order maximize efficiency and reduce waste, healthcare providers need to answer some tough questions such as what they have, where they have it, and where it needs to go. In order successfully track equipment and people, healthcare providers need a flexible and scalable system that provides automatic tracking with no dependency on clinical staff. One such system is RFID-bases system. All the capabilities enabled by RFID technology have the potential to facilitate new value creation in healthcare service innovation (Dominguez-Péry et al., 2011). At the moment, many healthcare providers use a manual system for patient care and inventory management. RFID supported by the knowledge reasoning for decision support (KRDS) system can be used to identify, record and ensure an efficient, effective and smooth transition at all stages of patient care (Alharbe, Atkins, & Khalil, 2016).

In short, RFID-enabled healthcare transformation projects, such as smart hospitals, could lead to tremendous benefits. These benefits include improved patient care, improved patient security, and safety, and improved organizational performance (Reyes et al., 2011). Use of RFID in healthcare can enable "new work practices to develop higher order capabilities for improving cost management, enhancing patient safety, and enabling regulatory compliance in hospital settings" (Lewis et al., 2009, p. 8). The high operational and strategic potential of the RFID technology is effective in the healthcare market. The value of the RFID market rose from about $ 5.63 billion in 2010 to almost $ 5.84 billion in 2011(Das & Harrop, 2011). The global market turnover for RFID readers and RFID tags alone was expected to reach $8.9 billion by 2015 (MarketResearch.com, 2011). In 2011, almost 150 million RFID tags were in use in the healthcare supply chain (Pleshek, 2011). The sale of RFID tags and systems was expected to reach almost $ 1.43 billion in 2019, an increase of 51% from 2009. Such an increase is due to the widespread of RFID-enabled healthcare applications, including the item-level tagging of drugs and various medical disposables, real-time locating systems for healthcare staff, patients and assets for improved efficiency and reduced losses, the compliance with safety requirements, and the availability of assets (Harrop et al., 2009). According to a latest study, the global RFID market was valued at US$ 1.9 billion in 2013 and is expected to grow at a CAGR of 13.9% from 2014 to 2040, to reach an estimated value of USD 5.3 billion in 2020. In 2014, North America held largest market share of nearly 51%. The various reasons contributing to this large market share included sophisticated healthcare infrastructure and increasing number of collaborations between medical device industry, regulatory authorities and nonprofit research organizations. It was expected that the increased research spending in the healthcare industry would further drive the RFID market in the years to come. With a CAGR of above 30%, Asia Pacific was one of the most important RFID market. Improved healthcare infrastructure and high economic growth in the countries of Asia Pacific regions were expected to boost the RFID market in the years to come. Furthermore, rising concern