Chapter 71
RFID Applications in Healthcare–State-of-the-Art and Future Trends

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ABSTRACT

Implementation of RFID technology-based healthcare services is on the rise. The purpose of this chapter is a thorough, systematic review of the existing literature to provide a discussion of current trends and future directions in this domain. Findings indicate that tracking is the key RFID enabling function. Automatic data collection and transfer is an RFID function also frequently used in relation to assets, staff, and patients. Finally, RFID is employed for sensing, most often in relation to patients, but also to assets. The chapter concludes by highlighting future research directions where the deployment of RFID technology is likely to transform the healthcare sector.

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

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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 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, 2011). 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,b; Oztekin et al., 2010a,b; Fosso Wamba, 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).

In short, RFID-enabled healthcare transformation projects 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).

The objective of this chapter is to provide an overview of RFID applications in healthcare. This overview would serve as a foundation for healthcare professionals with limited knowledge of information and communication technologies (ICT) to determine further directions of how RFID can be employed to solve their problems.

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