

## Chapter 4.7

# Ubiquitous Healthcare: Radio Frequency Identification (RFID) in Hospitals

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### **ABSTRACT**

Ubiquitous healthcare has become possible with rapid advances in information and communication technologies. Ubiquitous healthcare will bring about an increased accessibility to healthcare providers, more efficient tasks and processes, and a higher quality of healthcare services. radio frequency identification (RFID) is a key technology of ubiquitous healthcare and enables a fully automated solution for information delivery, thus reducing the potential for human error. This chapter provides an overview of ubiquitous healthcare and RFID applications. In this chapter, the background of ubiquitous computing and RFID technologies, current RFID applications in hospitals, and the future trends and privacy implications of RFID in hospitals are discussed.

### **IINTRODUCTION**

Advances in wireless networking, the Internet, and embedded systems move us toward ubiquitous computing. Ubiquitous computing refers to the creation and deployment of computing technology in such a way that it is embedded in our natural movements and interaction with our environments (Lyytinen and Yoo, 2002). Ubiquitous computing enhances computer use by making computers available throughout the physical environment, while making them effectively invisible to the user (Weiser, 1993).

With rapid advances in information and communication technologies, ubiquitous healthcare has become possible. Ubiquitous, or pervasive, healthcare refers to healthcare to anyone, any-time, and anywhere by removing location, time and other restraints while increasing both the

coverage and quality of healthcare (Varshney, 2005). radio frequency identification (RFID) is a key technology of ubiquitous healthcare. RFID is a technology used to identify, track, and trace a person or an object without using a human to read and record data and enables the automated collection of important business information (Asif and Mandviwalla, 2005). In hospitals, RFID enables a fully automated solution for information delivery at the patient's bedside, thus reducing the potential for human error and increased efficiency (ITU, 2005).

The use of RFID technology in the healthcare market is on rise. A recent study reports that the global market for RFID tags and systems in the healthcare industry will increase steadily from \$90 million in 2006 to \$2.1 billion by 2016 (Harrop and Das, 2006). The purpose of this chapter is to present an overview of ubiquitous healthcare and RFID in hospitals. Specifically, the chapter introduces the background of ubiquitous computing and RFID technologies, current RFID applications in the healthcare industry, the future trends and privacy implications of RFID, and the impact of RFID use on the healthcare industry.

## **HEALTHCARE INDUSTRY AND INFORMATION TECHNOLOGY**

Healthcare is one of the world's largest industries. In the United States, for example, it accounts for 14 percent of GDP (Janz *et al.*, 2005). Healthcare is also arguably the most complex and regulated industry, regularly facing change brought on by federal, state, and local regulation, changing competitive landscapes, mergers and acquisitions, and the pressures of cost control (Finch, 1999). The healthcare industry historically has lagged behind other industries in the adoption of information and communication technologies partially due to healthcare managers and executives struggling to cope with environmental challenges in the healthcare industry (Menon *et*

*al.*, 2000). Zukerman (2000) pointed out that it is the dynamic nature of the healthcare industry that leads organizations to struggle to survive in turbulent conditions.

While the healthcare industry historically has lagged behind other industries in the adoption of information and communication technologies, this is changing at a faster rate (Finch, 1999). Healthcare industry leaders and decision makers have begun to realize the supporting role of technology in their effort to maintain a focus on quality care while meeting the pressures from regulatory bodies, competition, and achieving business and performance goals.

The mobile workstation, which can be used for medical records, diagnostics, charting, pharmacy, admissions, and billing, is an example of recently adopted technologies in hospitals. With mobile workstations, physicians can write prescriptions at the point of care, from their offices or from home computers (Coonan, 2002). While inputting orders, physicians can be prompted about drug interactions, potential alternatives, formulary restrictions and patient limitations. As a result, generally illegible handwriting is not an issue and the electronic support systems at the bedside can deter errors.

## **UBIQUITOUS COMPUTING AND RFID**

Rapidly progressing information and communication technologies have brought about increasingly connected computing devices which are so naturalized within the physical environment that users are not able to view the computers. The computing devices are embedded in the environment, track real-time information on current locations anywhere and anytime, and transmit and receive relevant data regarding the users and the context in which they are being used.

Ubiquitous computing places considerable requirements on both hardware and software

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