Chapter 13
RFID in E-Health: Technology, Implementation, and Security Issues

Peter J. Hawrylak
The University of Tulsa, USA

Nakeisha Schimke
The University of Tulsa, USA

John Hale
The University of Tulsa, USA

Mauricio Papa
The University of Tulsa, USA

ABSTRACT

Electronic healthcare or E-Health promises to offer better care at lower cost. This is critical as the cost of healthcare continues to increase and as the population ages. Radio Frequency Identification (RFID) technology is one form of wireless technology that will be part of the E-Health environment. RFID provides the ability to identify, track, and monitor patients and staff members. This enables better resource allocation, reduction of medical errors, and increased independence for patients. One part of E-Health is the Electronic Medical Record (EMR). New developments in RFID technology now enable the storage of all or part of the EMR on an RFID tag that remains with the patient. This chapter investigates the use of RFID in E-Health, how RFID can be used to store the EMR, and the security and privacy risks associated with using RFID to store the EMR.

INTRODUCTION

This chapter focuses on the use of Radio Frequency Identification (RFID) technology in E-Health applications and on the privacy issues related to this. RFID is a wireless technology that can be used not only to identify a patient, but also to store information about that patient. This information can be incorporated into many hospital activities to improve performance and quality of care. Most RFID systems provide both write and re-write

DOI: 10.4018/978-1-4666-0888-7.ch013

capability. This is ideal for storing and updating a key parts of a patient's medical information. RFID tags are often included in patient wristbands and this enables their medical information to travel with them.

The first part of this chapter provides a brief overview of RFID describing the differences between general classes of RFID systems and a brief explanation of the physics behind passive RFID technology. Next, example cases of applications using RFID in the medical environment to monitor patents and medical staff are presented. These example cases focus on using RFID in applications beyond simply identifying the patient. The third part describes on how RFID can be used to store patient information such as the Electronic Medical Record (EMR). The EMR allows the development of systems to monitor patient activities remotely enabling the patient to be more independent while maintaining constant monitoring by medical personnel. Methods for storing this information are presented along with which classes of RFID technology are best suited to each method. However, significant security and privacy risks associated with this type of a system exist. The fourth part of the chapter presents security requirements for these systems to ensure that the patient's privacy is protected.

BACKGROUND

RFID has been around for a long time, with initial applications being in the areas of automatic toll collection and airline baggage handling systems (Landt, 2001; Landt, 2005). Hawrylak, Mickle, and Cain present the background and history of the technological development of RFID (Hawrylak, Cain, & Mickle, 2008). RFID is composed of three components: RFID tags, RFID readers, and middleware/backend software. RFID tags are attached to an asset or person. The RFID tag identifies the asset or person and provides a medium to store additional data about the asset or person. This memory is commonly referred to as *user memory*. The RFID reader serves as the link between the middleware/backend software and the RFID tag. The RFID reader is responsible for communicating with the RFID tag and transferring information between the middleware/backend software and the RFID tag. The middleware/backend software represents two software components that are sometimes merged together. The middleware provides the glue logic, similar to a device driver, to connect the RFID reader to the backend system responsible for process control. Some advanced middleware platforms incorporate filtering and data processing capabilities to reduce the amount of data and requests sent to the backend software. The middleware connects to the backend software. In some RFID systems the middleware component is built into the RFID reader. The backend software provides the process control for the larger system. An Enterprise Resource Planning (ERP) system is one example of a backend system. Figure 1 illustrates the four major components in an RFID system.

RFID enhances a traditional ERP system by providing better visibility and insight in the real-time operation of the system or process being managed. In the medical environment RFID can provide better inventory management, inventory locating capability, improve patient throughput, and improve patient safety.

RFID Readers and Tags

RFID readers and tags provide the *last mile* connectivity between the backend system and the asset or person. RFID provides a wireless means to identify, track, and monitor the asset or person.

A barcode based identification system requires a line of sight between the barcode and the barcode scanner. While this is acceptable for supermarket and retail applications, the need for a line of sight causes problems in a number of environments including hospitals. Another drawback of barcodes is related to the fact that they are read using an