

Chapter 18

Effective Use of RFID in Medicine and General Healthcare

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ABSTRACT

RFID have been used for decades. There are a variety of systems and several standards for RFID tags. RFID systems have long been utilized in industry, but their use in hospitals is not widespread. RFID tag systems with specific applications to hospital needs have the potential for great benefit, both clinically and economically. In the first part of this chapter, typical uses of RFID in hospitals are shown, after which practical RFID systems are introduced, including the use of newly developed active RFID tags. Finally, possible future medical uses of RFID tags and tag systems are discussed.

INTRODUCTION

The utility of Radio Frequency Identification (RFID) systems is well documented, and a variety of types of tags and their related technologies have been developed. Although RFID tags have long been widely used for commercial and industrial purposes, only fairly recently have they been adopted for medical purposes in the clinical and healthcare field. The installation of

RFID tag systems in hospitals has the potential for great benefit, both clinically and economically. Herein, the strengths and weaknesses of RFID are defined and how they can contribute to “safety first” is shown. Examples will then be given of the application of RFID tags to hospital needs and information necessary for the successful implementation of an RFID system is presented. Finally, how RFID tags and tag systems might be used in the future is discussed.

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Background

RFID tags have been put to practical use for several decades. Spekman and Sweeney did an excellent review of the implementation of RFID in 2006. The main target of this review was the logistics of distribution systems. In recent years, experimental systems using RFID tags have been tested in hospitals. For medical and healthcare purposes, the systems have been mainly used for inventory control or for searching for the location of a person or material to which an RFID tag is attached. Yao et al., Wamba, and Chien et al. have done reviews of hospital applications of RFID in which they focused mainly on systems used for inventory control and for locating personnel or materials to which a passive RFID tag was attached. Many other reports of systems in which RFID tags are attached to medical devices or to staff members have been published, for example by Fry in 2005, Kannry in 2007, Macario in 2006, Meyer in 2006, Ohashi in 2008, and Reicher in 2007.

An example of RFID use is shown in Figure 1. It looks like a standard wristband used to identify a patient. On the surface, the barcode of the ID and the sex and name of the patient are printed, as on the usual patient wristband. However, a waterproof RFID tag sealed in vinyl is embedded on the reverse side, which enables the staff to obtain patient data without physical contact or to locate a patient from a remote location.

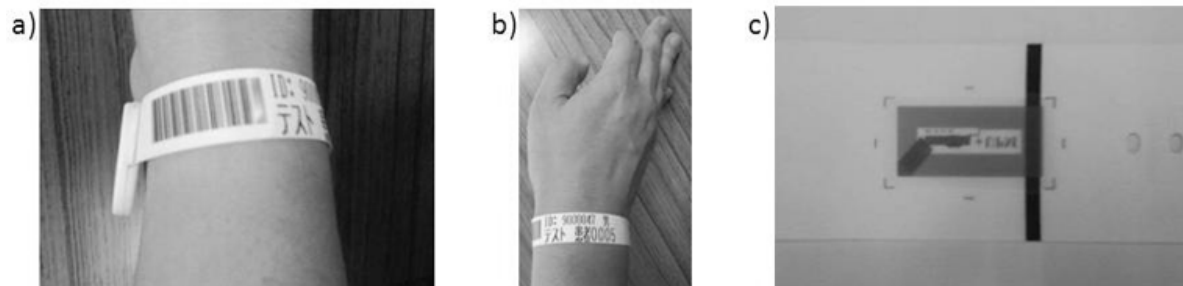
This type of wristband has been used in Akita University Hospital, Japan for several years. At this hospital, RFID tags are also attached to blood bags to confirm that the bag is used only for the patient with the corresponding tag. RFID use in hospitals and in general healthcare has made great progress over the past few years.

RFID Tag Systems

A typical RFID system consists of RFID tags, a tag reader, a tag writer, and a server. The basic tag itself consists of an electronic circuit that includes an antenna and memory, with some having a battery. Inventory tracking and control and monitoring the location of hospital staff are currently the main purposes of RFID systems. Commonly called “IC tags”, they come in various shapes, such as microchips, tablets, plates, and needles. Passive tags are thin and small enough to be embedded in a resin card.

Two methods are used for communication between a reader and an RFID tag; contact and non-contact. A contact type RFID system uses electrodes that make contact with the reader/writer. Such systems emit only a very small electromagnetic field. Non-contact RFID tag systems use wireless communication or magnetic resonance. When installing a non-contact RFID tag system in a hospital, it is necessary to establish the electromagnetic compatibility (EMC) with medical

Figure 1. An RFID tag equipped wristband for patient identification; a) Bar code printed on the wristband, b) Wristband, c) A waterproofed RFID tag



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