# Using Radio Frequency Identification (RFID) Tags to Store Medical Information Needed by First Responders:
## Data Format, Privacy, and Security

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## ABSTRACT

*In the event of an accident or emergency, a victim's medical information such as blood type, prescribed drugs, and other pertinent medical history is critical to Emergency Medical Technicians (EMTs) so that the correct treatment can be provided to the victim as quickly as possible. Victims of car accidents, heart attacks, etc., are not always able to answer simple but crucial medical questions. Treatment time is critical in an emergency situation and the EMT must quickly obtain correct medical information to provide treatment until the victim is stabilized or admitted to the hospital. With an unconscious patient, the EMT must perform a number of tests to obtain these details. A Radio Frequency Identification (RFID) tag encoded with this information could provide this information quickly and correctly, while saving the time and expense of the tests to answer these questions. The ability of the RFID tag to communicate through objects can minimize the movement of the victim to obtain the necessary information. This paper presents a standardized format for encoding (storing) this information in the RFID tag for use in the United States. The use of data compression techniques are explored to maximize the amount of information able to be stored in the RFID tag. Privacy and security issues with this application are discussed and a potential solution is presented.*

*Keywords:* *Electronic Health Record (EHR), Electronic Medical Record, Privacy, Radio Frequency Identification, Security*

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## INTRODUCTION

Over the past decade a push has been made to store medical records in a way that medical personnel would have easy access to records of incoming patients. This ability allows doctors and Emergency Medical Technicians (EMTs) to more effectively perform their job without missing information that could lead to medical complications for the patient. This is important for patients that have recently had surgery, have extreme allergy issues, or are taking medication. Without this knowledge, medical personnel could unknowingly put a patient's life at risk.

Due to information privacy concerns and issues, there has been resistance to creating digital medical records. The disclosure of financial data and personal information resulting from hacking raise concerns with storing digital information, especially when accessible through the Internet. However, disclosure of private information is not limited to electronic data, but also occurs with paper files. Information privacy is a valid concern to patients who participate in medical programs and must be addressed to prevent confidential data from being stolen or compromised. Information leaks can damage a patient, preventing them from being employed, cause them to be fired, or used against them publicly. For these reasons, the data stored must have adequate protection to prevent disclosure or unauthorized access.

Another challenge is the method for storing the data. Storing data online while being practical in most cases, can be an issue in areas without Internet coverage and situations where information is needed quickly. The current method generally used is to store this information in hospitals or on simple paper forms that are filled out in advance and kept on the patient's person. There are disadvantages to this method, the patient may forget the form, not have the form with them when they need emergency care, or after a period of inactivity have been destroyed to free up space. Digital storage is not without its problems. Storing digital data can be expensive and difficult to secure.

The electronic medical record (EMR), also referred to as an electronic health record (EHR), promises to solve many of these problems. Current EMR implementations are typically proprietary and it is still difficult to share information between providers using different health information infrastructures. The three major issues that EMRs face are interoperability (sharing), data security, and data privacy.

This paper presents a system for storing portions of a patient's EMR in a radio frequency identification (RFID) tag that is retrieved by first responders, specifically EMTs. The goal of this system is to provide the EMT with the critical information about the patient correctly and quickly. The primary requirements of the proposed system are: (i) to provide a means to store emergency medical information in a format that is accessible to EMTs anywhere within the United States; (ii) to minimize the movement of the patient required to obtain this information; and (iii) to provide simple and clear, yet complete information to the EMT. This information will be stored directly in the RFID tag carried by the patient. Thus, the information is available at any place and at any time. This is in contrast to methods such as placing forms with medical information on one's refrigerator, which are only effective if the patient is in their home. Not requiring access to the Internet to retrieve patient information is another key factor because Internet and cellular access is limited many rural areas. The most common form factor for the RFID tag in this application would be a credit card size tag, similar to an employee ID badge or public transit card. Because RFID does not require a line-of-sight to be read (Hawrylak, Cain, & Mickle, 2008; Finkenzeller, 2010) the data stored in the RFID tag may be retrieved while still in the patient's pocket or wallet. This is beneficial because it reduces the amount of movement of the patient by the EMT to obtain this information, minimizing further risk of injury. A solution based around a line-of-sight technology, such as a bar-code, requires the EMT to first find and then remove the ID card before being able to read the necessary information.