Chapter 4.9
A Prehospital Database System for Emergency Medical Services

Nada Hashmi
10Blade, Inc., USA

Mark Gaynor
Boston University School of Management, USA

Marissa Pepe
Boston University School of Management, USA

Matt Welsh
Harvard University, USA

William W. Tollefsen
Boston University School of Medicine, USA

Steven Moulton
Boston University School of Medicine, USA

Dan Myung
10Blade, Inc., USA

ABSTRACT

Emergency Medical Services (EMS) are not only responsible for providing prompt and efficient medical care to many different types emergencies, but also for fully documenting each and every event. Unfortunately, the vast majority of EMS events are still documented by hand. The documents are then further processed and entered manually into various billing, research, and other databases. Hence, such a process is expensive, labor intensive, and error prone. There is a dire need for more research in this area and for faster, efficient solutions. We present a solution for this

problem: Prehospital Patient Care Record (PCR) for emergency medical field usage with a system called iRevive that functions as a mobile database application. iRevive is a mobile database application that is designed to facilitate the collection and management of prehospital data. It allows point-of-care data capture in an electronic format and is equipped with individual patient sensors to automatically capture vital sign data. Patient information from the field is wirelessly transmitted to a back-end server, which uses Web service standards to promote interoperability with disparate hospital information systems, various billing agencies, and a wide variety of research applications. In this chapter, we describe the current state of EMS, the iRevive application, a mini-trial deploying iRevive in real scenarios, the results, and a future direction for our solution.

INTRODUCTION

There are times when an individual's life may depend on the quick reaction and competent care of emergency medical technicians (EMTs). These highly trained, prehospital healthcare providers are dispatched by 911 operators to incidents as varied as motor vehicle crashes, heart attacks, near-drowning events, childbirth, and gunshot wounds. Their first priority is to stabilize a patient's cardiopulmonary status. They must then determine the nature and severity of the patient's condition and whether the patient has any preexisting medical problems. EMTs follow strict rules and guidelines in their provision of emergency care and often use special equipment such as backboards, defibrillators, airway adjuncts, and various medications before placing patients on stretchers and securing them in an ambulance for transport. At a medical facility, EMTs transfer the care of their patients to emergency department personnel by reporting their observations and actions to staff.

Equally important is EMS personnel documenting the care they provide. They do so in the form of a prehospital record, which must be completed for each patient who is treated or transported by them. The prehospital record is a medical and legal document used by emergency medical technicians to record a variety of data concerning a patient's current illness or injury, past medical history, treatment rendered, and subsequent improvement or worsening of the patient's condition (Mann, 2002). This type of prehospital documentation is used to support the actions of the crew, the transfer of care, and to justify reimbursement from various insurance companies; it is also used for quality improvement programs and research. Unfortunately, the vast majority of EMS events are still documented manually by hand on paper. This leads to an extensive amount of manual data processing as the often illegible handwritten data must sometimes be deciphered, then manually entered into various billing, research, and other databases. The whole process is expensive, labor intensive, and error prone.

The rest of this chapter is sectioned as follows: first, an overview of the current state of EMS workflow, documentation methods, and research is provided. This section emphasizes the National Highway Traffic Safety Association's goals for EMS in the future, including the call for a national EMS database and improved information systems, so that prehospital information can be linked with the hospital record. The next section is a description of one solution called iRevive, a mobile database for EMS professionals that streamlines data capture, communication, reimbursement processing, quality assurance, and research. It takes advantage of tiny wireless sensors to automatically record vital sign data. It permits multilevel decision support; the local EMT over his/her patient, the regional commander over a selected vicinity, and the central level of control over all the events occurring at a particu-