

Mobile Health in Emergency Care



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INTRODUCTION

This chapter describes the role of mobile health (mHealth) in healthcare, specifically in the field of emergency care. The World Health Organization (WHO) defines mHealth as, “An area of electronic health (eHealth) that provides health services and information via mobile technologies such as mobile phones and PDAs” (Källander *et al.*, 2014). We consider mHealth to be generally defined as the technology and tools that provide mobility to patients and providers. We also consider mHealth as a critical component of telehealth and its subset telemedicine. The American Telemedicine Association (ATA) defines telemedicine as, “the use of medical information exchanged from one site to another via electronic communications to improve a patient’s clinical health status. Telemedicine includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools, and other forms of telecommunications technology.” There are references to telemedicine since the 1920s, but mHealth became more broadly recognized in the early 1960s with space exploration and the need to monitor vital signs and other physiological measurements while in space. Since then, many telemedicine research projects explored providing healthcare to remote or rural areas (Bashshur *et al.*, 1975).

In the United States, the Patient Protection and Affordable Care Act (2010), was designed to curb healthcare costs and improve access to care. The

ACA is changing the healthcare landscape as payment models move away from traditional fee-for-service arrangements to placing risk on providers for population health (Kaiser Family Foundation KFF, 2014). For example, Accountable Care Organizations (ACO) made up of physicians, hospitals, and insurers are incentivized to provide high quality care at a lower cost. The financial risk placed on providers for their population’s healthcare costs should serve as the impetus for implementing technology interventions to improve the management of chronic disease and enhance preventive care and wellness (KFF, 2013).

EMERGENCY MEDICINE AND MHEALTH OVERVIEW

Emergency care is generally considered to be a medical concern for which a prudent layperson would seek immediate evaluation (American College of Emergency Physicians, 2009). Most emergency care is delivered in Emergency Departments (ED). According to the Center for Disease Control and Prevention (CDC), there were over 129 million ED visits in the United States in 2010 (CDC, 2014). Some of the most common reasons patients visit the ED is for abdominal pain, chest pain, fever, headache and back pain (CDC, 2010). Providers in the ED utilize electronic medical records, rapid blood testing, and diagnostic procedures to determine if a patient needs inpatient

or outpatient care. Other tools included telemetry, bedside sonography, point of care tests, and clinical decision aids. The emergency physician's new technologies may allow more patients to receive the care at home that was once only available in hospital (Demiris *et al.*, 2008).

Since patients presenting to the ED have multiple comorbid disease processes or chronic diseases, the evaluation of acute exacerbation of these complicated patients can be complex and expensive (Gonzalez Morganti *et al.*, 2013). Patients face many other challenges such as specialty physician access, inequalities in care depending on whether they live in rural or urban setting, social support systems, and ED overcrowding. While technology will not solve all of these challenges, it is a tool to help providers and patients. Currently, telemedicine and mHealth are commonly utilized in the following areas: (1) neurological emergencies, (2) emergency radiology, (3) psychiatric emergencies, (4) wound care, burns, and dermatological emergencies, and (5) EMS and pre-hospital care.

NEUROLOGICAL EMERGENCIES

Today, the standard of care for acute ischemic stroke presenting within 4 hours of onset is the administration of tissue plasminogen activator (TPA) to dissolve the clot (Levine *et al.*, 1999). This treatment was approved by the FDA in 1996 and the term telestroke was coined in 1999 (Hess & Audebert, 2013). While this treatment has become standard, emergency physicians recognize that the treatment bears significant risk of converting an ischemic stroke to a hemorrhagic stroke. Selection of the appropriate patient is very important and is best done in collaboration with a vascular neurologist. Since not all hospitals have vascular neurologist available 24/7, telemedicine technologies have helped to bridge the gap, making stroke neurologist more widely available. The use of telestroke helps patients, hospitals, and providers.

Patients get the earliest possible access to skilled neurologists and lifesaving drugs. Hospitals can transfer appropriate patients to comprehensive stroke centers and retain patients who can receive quality care at their facility. Reducing inappropriate transfers (1) reduces overall cost of care, (2) improves revenue recovery for the treating hospital, and (3) helps to keep patients in their own community for acute care and rehabilitation (Levine, 1997). In fact, this technology has also helped neurologists increase their experience and improve their management skill by increasing their experience from typically only small number of TPA cases a month in their primary hospital to significantly when combining the experience from the multiple hospital they are providing telemedicine to at one time (Edlow, 2013; Levine, 1997). The hub and spoke model listed below (Figure 1) illustrates this relationship.

EMERGENCY RADIOLOGY

Emergency radiology is an area in which telemedicine has become instrumental in improving patient outcomes, reducing cost, and increasing specialty provider availability. Since many of the emergency conditions requires some form of imaging modality (Sonogram, CT scans, X-rays) to get the correct diagnosis and to start the treatment, radiology plays a crucial role in diagnosis and treatment. Although the general practitioner or the emergency physician have a baseline experience in interpreting radiological images, the use of an expert radiologist is frequently required. Since most hospitals do not have 24/7 in-house experienced radiologists, hospitals have utilized tele-radiology to overcome this obstacle for years via digital Picture Archiving and Communication System (PACS) that can be accessed from home (Choplin, 1992). There has been many studies in recent years to evaluate the utility of mobile devices such as mobile phones, iPads, and PDAs to try to increase mobility and ease of access (Blaivas,

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