Chapter 1
Data Accuracy Considerations with mHealth

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ABSTRACT

With the plethora of mHealth solutions developed being digital, this necessitates the need for accurate data and information integrity. Lack of data accuracy and information integrity in mHealth can cause serious harm to patients and limit the benefits of such promising technology. Thus, this exploratory study investigates data accuracy and information integrity in mHealth by examining a mobile health solution for diabetes, with the aim of incorporating Machine Learning to detect sources of inaccurate data and deliver quality information.

INTRODUCTION

Reports from the World Health Organization (WHO) indicate that noncommunicable diseases are the leading cause of deaths worldwide, where the number of deaths from 2012 are projected to increase from 38 million to 52 million by 2030 (WHO, 2015). Noncommunicable diseases according to WHO, are chronic diseases such as cardiovascular diseases, cancers, respiratory diseases and diabetes. Chronic diseases along with change in demographics, increasing cost of medical services, ongoing quality and safety issues in healthcare, are all major challenges to the delivery of healthcare services (Armstrong et al., 2007).

A new and innovative way of dealing with these healthcare challenges is through the adoption of mobile health (mHealth) technology. mHealth is the use of portable devices such as smartphones and tablets to improve health (Hamel et al., 2014). This innovative technology has enabled people to play an active role in managing their health rather than being the passive object when seeking treatment during traditional methods (Niilo, Ilkka, & Elina, 2006). The advances in sensor technology such has heart

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rate, respiratory and blood pressure sensors, along with mobile phone devices, have allowed patients to self-monitor their health before conditions deteriorate and risk re-admission to hospital (Tarassenko & Clifton, 2011).

For mHealth to be effective in delivering safe and high quality health services, the technology must be free of errors. Errors in the medical field are defined as a preventable adverse outcome that results from improper medical management (a mistake of commission) rather than from the progression of an illness caused by lack of care (a mistake of omission) (Van Den Bos et al., 2011). Medical errors belong to a number of domains such as development and use of technologies, ergonomics, administration, management, politics and economics (Vincent, 2010). However, medical errors have progressed from human to technological errors. Jenicek (2010) defines technological errors in medicine as errors that relate to data and information recording, processing, and retrieval caused by information technology and its uses (Information technology inadequacy and failure). The use of mobile phone technology for managing health has its own set of challenges and complexities, such as accuracy, integrity, privacy, security and confidentiality.

Since the collected data in mHealth is in digital format, an information systems technique such as Machine Learning can be introduced to learn and detect medical errors by learning about the data. This study explores how Machine Learning can be used to address data inaccuracy in mHealth as opposed to the other studies where Machine Learning algorithms were used to detect diseases and classify them based on the training the algorithms have completed. This study is conducted using a qualitative approach whereby secondary de-identified medical data is extracted from a secondary database of a chronic disease for study. The expected outcome is a framework that covers accuracy aspects of health data in mHealth and a Machine Learning Algorithm that can best detect data inaccuracy.

BACKGROUND

This section explores mHealth technology and its role in connecting people to healthcare services. As well as what defines accurate data, effect of data inaccuracy on Information Integrity and the emergence of Machine Learning in the development of healthcare solutions and how it can be used to detect medical errors to enhance quality of mHealth.

mHealth

Smartphones are becoming both a necessity and an essential technology for people (Konschak & Jarell, 2010). This is reflected in the number of mobile phone subscriptions, where it is estimated to be 7 billion worldwide (International Telecommunication Union, 2015). The portability of smartphone devices and their ability in accessing the internet make them ideal for the collection and transfer of data (Medhanyie et al., 2015). Half of smartphone owners frequently browse for health information online and monitor their health using mobile health applications (Fox & Duggan, 2012). This has allowed for healthcare services to be developed and deployed on smartphones to deliver mHealth services. mHealth is a great opportunity and convenient way of tackling diseases and illness from both children to chronic diseases (Curioso & Mechael, 2010). Few examples that demonstrate the applicability of mHealth in treating diseases range from psychiatric assessments (Ben-Zeev et al., 2015) to more serious and life threaten-