Chapter 7
Wearable Technologies for Glucose Monitoring:
A Systematic Mapping Study of Publication Trends

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ABSTRACT

With the increasing prevalence of diabetes mellitus, it has become of utmost importance for wearable technologies for glucose monitoring to be introduced in different contexts. While there is a high number of research on noninvasive techniques for glucose monitoring of diabetes mellitus, there is a shortage of studies discussing the publication trend of wearable technologies that support glucose monitoring. The primary purpose of this chapter was to conduct a Systematic Mapping Study of publication trends relating to wearable technologies for glucose monitoring. This study adopted a Systematic Mapping Study approach in identifying relevant papers for analysis. Articles were identified from relevant databases including IEEE Xplore, ACM Digital Library, ScienceDirect and Scopus. A total of 29 papers met the inclusion criteria. The findings of this study are expected to inform health informatics experts and academics on the current research and publication trends in wearable technologies for glucose monitoring.

INTRODUCTION

Diabetes mellitus is an ailment that causes an upsurge in glucose levels (Riaz, 2009). According to Aninaw and Seyoum (2017), the estimated number of people living with diabetes mellitus by 2025 will be approximately 300 million. Furthermore, the effects of diabetes mellitus could lead to further complications such as blindness and other health-related problems (Bruen et al., 2017), hence, the increase in technologies to support diabetes mellitus.

Before the use of noninvasive mechanisms for monitoring patients with diabetes mellitus, the finger pricking approach was applied in observing the glucose level of diabetic patients (Nentwich and Ulbig, 2015). This process produces a bit of discomfort to the patient (Bruen et al., 2017), as Heinemann (2008, p. 920) clearly states, the result of repeatedly pricking the finger could lead to "development of massive scarring/callous formation and loss of sensibility/ perception hindrance". Recently, there has been an interest in the use of noninvasive technologies to support patients with diabetes mellitus to facilitate a continuous process of monitoring the glucose level of these patients (Bruen et al., 2017; Nentwich and Ulbig, 2015; Heinemann, 2008; Lin et al., 2018; Pfutzner et al., 2018). There is also an abundance of research elaborating on new advances in noninvasive technologies such as GlucoTrack (Lin et al., 2018), and TensorTip Combo Glucometer (CoG) (Pfutzner et al., 2018). These types of technologies focus on using noninvasive methods to determine the glucose level rather than invasively pricking the finger to draw blood from the patient (Nentwich and Ulbig, 2015).

Recently, there is a rise in the use of noninvasive technologies for glucose monitoring, with systematic literature reviews conducted on wearable technologies (Cappon et al., 2017; Ray, 2018) and studies highlighting wearable and sensor technologies as components of digital health relevant for improving the outcome of healthcare (Iyawa et al., 2016a; Iyawa et al., 2016b). However, there is limited research focusing on the publication trends and technologies on wearable technologies for glucose monitoring. The purpose of this chapter was to provide a Systematic Mapping Study to identify the publication channels that are the main targets for publishing research on wearable technologies for glucose monitoring and identify the publication trends of research focusing on the use of wearable technologies for glucose monitoring. The chapter also identified and examined the different wearable technologies used for glucose monitoring. To the best of the researchers' knowledge, this is the first time a Systematic Mapping Study has been conducted on publication trends of studies on wearable technologies for glucose monitoring. This study, therefore, contributes to the existing body of knowledge on wearable technologies for glucose monitoring. This chapter is structured as follows: Research Methodology, Results, Discussion, and Conclusions.

RESEARCH METHODOLOGY

The review method adopted in this paper is the Systematic Mapping Study. Grant and Booth (2009, p. 94) explain that the purpose of a Systematic Mapping Study is to "map out and categorise existing literature from which to commission further reviews and primary research by identifying gaps in research literature". The above discussion is in line with the scope of this study which is to identify the publication trends of studies on wearable technologies for monitoring diabetes mellitus. Systematic Mapping Study approach has been adopted in a wide range of studies in different fields including enterprise architecture

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