

Health Technologies for Monitoring and Managing Diabetes: A Systematic Review

Elizabeth Russell-Minda, M.A.,¹ Jeffrey Jutai, Ph.D., C.Psych.,² Mark Speechley, Ph.D.,³
Kaitlin Bradley, B.H.Sc.,³ Anna Chudyk, M.Sc.,¹ and Robert Petrella, M.D., Ph.D.¹

Abstract

Background:

The primary objective of this review was to determine the strength of evidence for the effectiveness of self-monitoring devices and technologies for individuals with type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM) based on specific health-related outcome measures. Self-monitoring devices included those that assist patients with managing diabetes and preventing cardiovascular complications (CVCs). A secondary objective was to explore issues of feasibility, usability, and compliance among patients and providers.

Methods:

Study criteria included individuals ≥ 14 years and youth (7–14 years) with T1DM or T2DM, intervention with a self-monitoring device, assessment of clinical outcomes with the device, literature in English, and ≥ 10 participants. Relevant published literature was searched from 1985 to 2008. Randomized controlled trials and observational studies were included. Data were extracted for clinical outcomes, feasibility and compliance methods, and results. Selected studies were independently evaluated with a validated instrument for assessing methodological quality.

Results:

Eighteen trials were selected. Predominant types of device interventions included self-monitoring of blood glucose, pedometers, and cell phone or wireless technologies. Feasibility and compliance were measured in the majority of studies.

Conclusions:

Self-monitoring of blood glucose continues to be an effective tool for the management of diabetes. Wireless technologies can improve diabetes self-care, and pedometers are effective lifestyle modification tools. The results of this review indicate a need for additional controlled trial research on existing and novel technologies for diabetes self-monitoring, on health outcomes associated with diabetes and CVCs, and device feasibility and compliance.

J Diabetes Sci Technol 2009;3(6):1460-1471

Author Affiliations: ¹Aging, Rehabilitation, and Geriatric Care Research Centre, Lawson Health Research Institute, London, Ontario, Canada; ²Faculty of Health Sciences, University of Ottawa, Ottawa, Ontario, Canada; and ³Department of Epidemiology and Biostatistics, University of Western Ontario, London, Ontario, Canada

Abbreviations: (CVC) cardiovascular complication, (BMI) body mass index, (HbA1c) hemoglobin A1c, (HDL) high-density lipoprotein, (LDL) low-density lipoprotein, (PDA) personal digital assistant, (RCT) randomized controlled trial, (SMBG) self-monitoring of blood glucose, (SMS) short message service, (T1DM) type 1 diabetes mellitus, (T2DM) type 2 diabetes mellitus

Keywords: diabetes mellitus, health technologies, monitoring, systematic review

Corresponding Author: Robert Petrella, M.D., Ph.D., Aging, Rehabilitation, and Geriatric Care Research Centre, Lawson Health Research Institute, 801 Commissioners Road East, B-3002, London, Ontario N6C 5J1, Canada; email address petrella@uwo.ca