Review

Does the use of consumer health information technology improve outcomes in the patient self-management of diabetes? A meta-analysis and narrative review of randomized controlled trials

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ARTICLE INFO

ABSTRACT

Purpose: To assess whether the use of consumer health information technologies (CHITs) improves outcomes in the patient self-management of diabetes.

Method: The evidence from randomized controlled trials (RCTs) on the effects of CHITs on patient outcomes was analyzed using either meta-analysis or a narrative synthesis approach. A systematic search of seven electronic databases was conducted to identify relevant reports of RCTs for the analysis. In the meta-analyses, standardized mean differences in patient outcomes were calculated and random-effects models were applied in cases where the heterogeneity of the results was moderate or high, otherwise fixed-effects models were used.

Results: Sixty-two studies, representing 67 RCTs, met the inclusion criteria. The results of the meta-analyses showed that the use of CHITs was associated with significant reductions in HbA1c, blood pressure, total cholesterol, and triglycerides levels when compared with the usual care. The findings from the narrative synthesis indicated that only a small proportion of the trials reported positive effects of CHITs on patient outcomes.

Conclusions: The use of CHITs in supporting diabetes self-management appears to have potential benefits for patients' self-management of diabetes. However, the effectiveness of the technologies in improving patient outcomes still awaits confirmation in future studies.

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1. Introduction

Diabetes is a major public health problem owing to its high prevalence, induced complications, and escalating health care cost [1–3]. It is estimated that diabetes affected 285 million adults worldwide and accounted for a global health care expenditure of USD376 billion in 2010; and the figures are projected to increase to 439 million adults and USD490 billion by 2030 [2,3]. The growing challenge of diabetes management calls for innovative approaches to improve patient outcomes and to relieve the economic burden on health care systems.

Research has shown that self-management interventions can be beneficial for diabetic patients [4–6]. With the general advancements in information technology, consumer health information technologies (CHITs) are emerging as promising tools for facilitating the self-management of diabetes. CHITs refer to "patient-focused interactive web- or technology-mediated applications that are designed to improve information access and exchange, enhance decision making, provide social and emotional support, and facilitate behaviour changes that promote health and well being" [7]. The evidence also suggests that these technologies have the potential to release patients from high hospital care costs, improve health care convenience, promote communication between clinicians and patients, and enhance the accessibility of health care resources for patients [8,9]. In addition, it is believed that these technologies can empower patients to gain more control of their disease care [10].

While the results of previous review studies on the use of CHITs in diabetes care are promising, the evidence is unclear [11–14]. As a result of the growing interest in information technologies, a number of randomized controlled trials (RCTs) have recently been conducted to examine the effects of CHITs on patient outcomes. However, these studies have yet to be reviewed. Given the incidence and severity of diabetes, it is important to understand whether the use of CHITs in the self-management of diabetes can improve patient outcomes. The present study aims to systematically review and assess the current state of the evidence concerning the effects of the use of CHITs on diabetic patients' outcomes.

2. Methods

2.1. Literature search and study selection

A literature search was conducted using the MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, Academic Search Premier, CINAHL Plus, PsycARTICLES, and PsycINFO databases up to January 2013. The search strategy included terms for technology (Web* or Internet or computer* or telemonitor* or telemedic* or phone* or technolog* or system* or device*), disease management (glucose monitor* or self monitor* or self care or self manag* or disease manag* or case management), evaluation (evaluat* or assess* or compar* or effect* or impact* or outcome* or benefit*), and disease (diabetes or diabetic*). The titles and abstracts of the citations identified in the search were first screened to determine their relevance. The full texts of the potentially relevant studies were further reviewed for final inclusion. The reference lists of the included studies were also examined to catch any missed articles. The two authors independently assessed the studies in all the stages of the review. Any discrepancies in regard to the inclusion of studies or data extraction were resolved through discussion and consensus.

2.2. Inclusion and exclusion criteria

Studies were included in the review if they: (1) were RCTs, (2) focused on patient use of CHITs for diabetes self-management, (3) examined the effects of CHITs on patient outcomes, (4) were published in peer-reviewed journals, and (5) were written in English. We excluded review papers, studies that only assessed the feasibility of the technologies, and