A systematic review of IT for diabetes self-management: are we there yet?

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CRD summary
This review concluded that IT could have positive impacts on self-management of chronic illness. The uncertain quality of the included studies and pooling of diverse studies means that the authors' conclusions may not be reliable.

Authors' objectives
To determine the effectiveness of information technology (IT) for the improvement of self-management for adults with Type 1 and Type 2 diabetes.

Searching
PubMed, Web of Science, Institute of Electrical and Electronics Engineers (IEEE), ABI/INFORM and ACM were searched from 1970 to August 2012; search terms were reported. In addition, a related article search was conducted in PubMed and the citation map of Web of Science was used to identify other relevant studies. The reference lists of eligible studies were also searched.

Study selection
Primary studies that used some form of IT to support one or more tasks involved in the self-management of diabetes were eligible for inclusion. Self-management tasks were to be performed by the patient, with or without the intervention of a healthcare provider. Whilst the outcome of interest was not explicitly stated, it was clear that it was the improvement of self-management of diabetes.

Where stated, most studies included patients with Type 2 diabetes; other studies included patients with Type 1 diabetes, a combination of Type 1 and Type 2, or gestational diabetes. Most studies were in adults, where stated, but some were in children aged from 12 years old. The studies used the Internet (for example, visualising physiological and medical data), mobile phone (integrating glucometer with mobile device for automatic glucose level upload), decision support (providing real-time feedback for the physiological data entered) and telemedicine (video conferencing with clinicians) as their primary technology for the self-management of diabetes; some studies used a combination of these technologies. Most interventions involved two-way communication.

The authors independently assessed a random sample of 50 records identified from PubMed and 50 records identified from Web of Science and assessed the Joint Probability of Agreement, disagreements were resolved by discussion. The remaining articles were assessed by one of the authors.

Assessment of study quality
The authors did not appear to have assessed the quality of included studies.

Data extraction
Data were extracted from each study on whether or not there was an improvement in the self-management of diabetes. The authors did not state how many reviewers undertook data extraction.

Methods of synthesis
The number of studies in which there was an improvement in self-management of diabetes, no improvement or no difference were presented for each type of intervention; Internet, phone, decision support and telemedicine. Further narrative results were presented for some studies.

Results of the review
A total of 104 studies were included in the review; 60 randomised controlled trials (RCTs), two cluster RCTs and 42 studies with other research designs (primarily observational). The sample size ranged from six to 2,924 participants.

Seventy-seven of 104 studies showed some type of benefit of using an IT diabetes self-management intervention, 13 showed no benefit and 14 studies did not explicitly evaluate the efficacy of the intervention. Thirty-four of forty studies
that assessed the impact of an Internet based technology on self-management of diabetes showed some form of benefit. Twenty-six of thirty studies that assessed the impact of mobile phones/devices on self-management of diabetes showed some form of benefit. Six of eight studies that assessed the impact of a decision support technology on self-management of diabetes showed some form of benefit. Eleven of twelve studies that assessed the impact of telemedicine based technology on self-management of diabetes showed some form of benefit. The benefit was in the form of an improvement in clinical outcome (such as glycated haemoglobin level), adoption of healthy behaviour, reduced disease management cost and/or improved patient satisfaction.

Additional results from some of the studies were reported.

Authors’ conclusions
The results of the review support the evidence that IT could have positive impacts on self-management of chronic illness.

CRD commentary
The review question was clear. The search strategy appeared to have been adequate, although it was not stated whether any language or publication status restrictions were applied. Some attempt was made to minimise reviewer error and bias during study selection, although not all studies were selected by more than one reviewer independently. It was not clear whether adequate attempts were made to minimise reviewer error or bias during data extraction. The authors did not appear to have assessed the quality of the included studies. Heterogeneity between studies was not formally assessed and the results of studies (in terms of whether there was a benefit associated with the intervention) were grouped together despite differences in study design, participant characteristics, intervention characteristics and outcomes assessed.

The uncertain quality of the included studies and pooling of diverse studies means that the authors’ conclusions may not be reliable.

Implications of the review for practice and research
Practice: The authors stated that there was a distinct need for more comprehensive interventions, in which several technologies were integrated to be able to manage chronic conditions such as diabetes. Such IT interventions should be theoretically founded and rely on principles of user-centred and socio-technical design in their planning, design and implementation.

Research: The authors stated that the effectiveness of self-management systems should be assessed along multiple dimensions: motivation for self-management, long-term adherence, cost, adoption, satisfaction and outcomes as a final result.

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