Systematic review and evaluation of web-accessible tools for management of diabetes and related cardiovascular risk factors by patients and healthcare providers

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CRD summary
This review found that web-based tools for diabetes management may improve health outcomes and healthcare delivery, but knowledge of their effectiveness was limited. The diversity in the types of tools considered and the outcomes measured, and the poor quality of many of the studies means these cautious conclusions are appropriate as the evidence cannot be considered to be reliable.

Authors' objectives
To evaluate the effectiveness, usefulness, sustainability and usability of web-accessible tools for the management of diabetes and cardiovascular-related risk factors.

Searching
MEDLINE, EMBASE, CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to June 2011, for publications in English or French. Search strategies were presented. Reference lists of identified studies, discussion with experts and a Google web search were used to identify further studies.

Study selection
Studies were eligible if they evaluated a web-compatible diabetes-related care tool, specifically an audiovisual tool for patients, care givers or healthcare providers which addressed diabetes or pre-diabetes management. Studies had to evaluate at least one psychological, behavioural or clinical outcome. Observational and experimental study designs were included. Studies were excluded if they had no stand-alone tool, were not readily available to the average user or required an operator.

Patient outcomes included knowledge and skill development, behaviour changes and psychological and clinical outcomes. Types of tools included static and interactive websites, decision aids, games and email feedback programmes. Five tools targeted patients with diabetes; the others did not specifically target people with diabetes. Ten tools targeted healthcare providers (six physicians, three nurses and one public health professionals).

Two reviewers independently performed the study selection, referring to a third reviewer in case of disagreement.

Assessment of study quality
Study quality was assessed in terms of study design, treatment allocation, blinding, allocation of care across groups, follow-up and use of intention-to-treat analyses. How many reviewers performed the quality assessment was not stated.

Data extraction
Where possible, estimates of effect were extracted and converted into standardised measures of effect (Hedges G) with 95% confidence intervals. Otherwise, results and conclusions of studies were extracted as presented. Two reviewers independently performed the data extraction.

Methods of synthesis
A narrative synthesis was used to present the overall results of studies according to the type of tool evaluated. The standardised estimates of effect that were available were pooled in a meta-analysis, with meta-regression used to investigate the effect of clinical usefulness and usability. Heterogeneity was measured.

Results of the review
A total of 57 studies with 92 tools were included. Of these, 40 studies were experimental (25 randomised controlled trial, one controlled trial, 14 before and after studies), and 17 used observational designs (Nine cohort studies, seven cross-sectional, one case–control). Quality was variable with loss to follow-up described in half the studies and randomisation and allocation concealment in few studies.
The meta-analysis (12 studies, 2,731 participants) found that the tools had a statistically significant benefit on outcomes (Hedges G 0.64, 95% CI 0.15 to 1.13), neither clinical usefulness nor usability moderated this effect.

Two studies evaluated a self-management tool for patients with poorly controlled diabetes. One found it reduced blood pressure and cholesterol; but the other found no differences in clinical outcomes. Seven studies evaluated nutrition and physical activity websites, generally finding a reduction in measures of obesity. Eight studies evaluated online smoking prevention and cessation tools. Results were mixed, with some studies showing a benefit and others no change in smoking rates. There was some evidence across tools that the more interactive tools resulted in greater clinical improvements.

**Authors’ conclusions**
Web-based tools have the potential to improve health outcomes and healthcare delivery, but knowledge of their effectiveness was limited. Few tools met the authors’ criteria for effectiveness, usefulness, sustainability or usability.

**CRD commentary**
This review considered a rather broad research question with equally broad inclusion criteria. A suitable search was conducted, but it was limited to publications in English and French; some effort was made to identify unpublished studies. Action was taken to reduce reviewer error and bias in the study selection and data extraction processes. Study quality was assessed and was generally poor as many studies were not randomised or controlled.

A narrative synthesis was performed because of the considerable diversity in the types of web-based tools included and the outcomes assessed. A meta-analysis was performed on some studies. The authors acknowledged the considerable limitations in the review due to the diversity of studies and low study quality, and that most tools did not meet their criteria for effectiveness, usefulness, sustainability or usability.

Their conclusions were suitably cautious, and, for all these reasons, the evidence in this review cannot be considered reliable.

**Implications of the review for practice and research**

**Practice:** The authors suggested that web-based tool developers must seek to improve usability and interactivity of the tools.

**Research:** The authors suggested that transparent systems to assess the effectiveness, usefulness, sustainability and usability of these tools were needed.

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