Effect of mobile phone intervention for diabetes on glycaemic control: a meta-analysis


CRD summary
The review concluded there was strong evidence that mobile phone intervention led to significant improvements in glycaemic control and self-management in diabetes care, especially for type 2 diabetes patients. Limited reporting, both of comparator treatments and of variation between studies, means the authors’ conclusions should be interpreted with caution.

Authors' objectives
To assess the effect of mobile phone intervention on glycaemic control in diabetes self-management.

Searching
PubMed, EMBASE and The Cochrane Library were searched for articles published in English between January 1990 and February 2010; search terms were reported. Reference lists of retrieved publications were examined to identify further studies. Experts in the field were contacted.

Study selection
Studies that evaluated use of mobile phones for diabetes self-management in non-pregnant patients and reported mean values of pre- and post-intervention glycosylated haemoglobin (HbA1c) for each group or mean difference in HbA1c between groups were eligible. Randomised controlled trials (RCTs), quasi-randomised trials, controlled before-and-after trials and controlled crossover trials were all eligible.

Participants had a mean age of 44 years and a median diabetes duration of 6.4 years. Around half of the studies were of patients with type 1 diabetes and the rest studied patients with type 2 diabetes; a few studied both populations or did not specify the type of patient. Most studies were conducted in outpatient clinics or in a tertiary care setting. Intervention details varied, although most studies used a SMS text message to deliver blood glucose test results and self-management information; mobile phones in more than half the studies also used internet technology.

Two reviewers independently selected studies for inclusion, with disagreements resolved by a third reviewer.

Assessment of study quality
Study quality was evaluated using the Jadad scale of randomisation, blinding and withdrawals/drop-outs. The authors stated that since it was not applicable in mobile phone intervention studies, blinding would be replaced by assessing whether there was an indication of the power of the sample size and an indication of the inclusion criteria used. The maximum possible score was 5 points.

Data extraction
Two reviewers independently extracted per-protocol data on HbA1c levels, along with standard deviations (estimated where not reported) in order to calculate standardised mean differences (SMD) in HbA1c with 95% confidence intervals (CI).

Methods of synthesis
Meta-analyses (random effects model) were performed to calculate pooled standardised mean differences with 95% CIs. Heterogeneity was assessed using the $I^2$ statistic. Subgroup analyses investigated the treatment effect by type of diabetes, baseline HbA1c values, follow-up duration, study design, study quality, intervention contents, technologies, frequency, age group, body mass index and sample size. It appeared that an assessment of publication bias was made, but no further details were reported.

Results of the review
Twenty-two trials were included (1,657 participants, range 10 to 274): 11 RCTs, two quasi-randomised trials, two randomised crossover trials and seven controlled before-after trials. Jadad scores ranged from 1 (three studies) to 5.
(five studies). Median follow-up was six months (range three to 12 months).

Mobile phone interventions reduced HbA1c values (SMD 0.51%, 95% CI 0.33 to 0.69%; 22 studies, $I^2=73\%$) compared with control groups. In a subgroup analysis, the reduction was found to be significantly greater among patients with type 2 diabetes ($p=0.02$) compared to type 1 diabetes. No significant differences were found for any of the other subgroup analyses.

Cost information
The cost:benefit ratio of mobile phone intervention was calculated in five studies, which reported that home monitoring would be cost-effective.

Authors' conclusions
There was strong evidence that mobile phone intervention led to statistically significant improvements in glycaemic control and self-management in diabetes care, especially for type 2 diabetes patients.

CRD commentary
The review addressed a clear question and was supported by appropriate inclusion criteria. Attempts to identify studies in English were undertaken by searching electronic databases and checking references; the possibility of publication and/or language bias affecting the results could not be ruled out. Suitable methods were employed to reduce risks of reviewer error and bias for the processes of study selection and data extraction; the authors did not report on whether such methods were used to assess study quality. A modified Jadad scale was used to assess study quality and a subgroup analysis was used to investigate the effect of study quality on results.

Sufficient study details were provided except that for many studies no details were provided on comparator treatments, which made interpretation of results very difficult. Appropriate methods were used to pool data and assess heterogeneity; the authors pooled studies with different designs, but this was investigated using a subgroup analysis. Significant heterogeneity was found in the main analyses reported. Levels of heterogeneity for the subgroup analyses were not reported and this made it difficult to evaluate the generalisability of the results. It should be borne in mind that only data for participants who completed the studies were used in the meta-analyses.

The limited reporting of comparator treatment details and heterogeneity results mean that the authors' conclusions should be interpreted with caution.

Implications of the review for practice and research
Practice: The authors stated that patient-specific communication by a mobile phone SMS, or SMS combined with internet, was a viable, safe and convenient option to support diabetes self-management. They added that the intervention may not be suitable for all patients with diabetes.

Research: The authors stated that further well-designed trials with large sample sizes were needed to further demonstrate how mobile phone interventions could enhance diabetes self-management support. Studies should examine cost-effectiveness.

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