Telehealth interventions for primary prevention of cardiovascular disease: a systematic review and meta-analysis

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CRD summary
This review concluded that there was insufficient evidence to determine the effectiveness of telehealth interventions in reducing cardiovascular disease risk. The substantial diversity in the interventions considered and the outcomes reported suggest that this conclusion is appropriate.

Authors’ objectives
To assess the effectiveness of telehealth interventions in the primary prevention of cardiovascular disease.

Searching
Nine databases (including MEDLINE, EMBASE and The Cochrane Library) were searched to June 2013. Registers of clinical trials and reference lists of included papers were searched. Only studies published in English were considered. Search terms were presented.

Study selection
Randomised clinical trials of real-time or asynchronous telehealth interventions designed to reduce overall cardiovascular risk or modify cardiovascular risk factors were included. Non-randomised and observational studies were excluded. Participants had to be community-based adults (aged 18 or over) with no history of cardiovascular disease.

The trials were conducted in USA, Canada, Europe and Japan. Types of participant varied and included people with diabetes or chronic disease, war veterans and employees of specific organisations. Participants had a mean age of 55 years and 41% of them were male. Interventions varied and included personalised or group counselling, self-assessment tools, online tools and telehealth devices. About half of the studies compared telehealth to usual care (not defined in the paper). Outcomes included various assessments of 10-year cardiovascular risk and measurements of blood pressure, cholesterol, obesity and other cardiovascular risk factors.

Two reviewers assessed papers for inclusion; disagreements were resolved by consensus.

Assessment of study quality
The Cochrane risk of bias tool was used to assess risk of bias for quality of sequence generation, allocation concealment, blinding of participants and outcome assessors, completeness of data and selective reporting. How many reviewers performed the assessment was not stated.

Data extraction
Data were extracted on changes in overall cardiovascular disease risk or changes in individual cardiovascular risk factors. Results were converted into standard units where necessary. For continuous outcomes the intervention and comparator were compared in terms of the mean difference between arms; odds ratios were calculated for dichotomous outcomes. Authors were contacted to supply data that were not reported in the paper.

Two reviewers performed the data extraction; it was not clear whether this was done in duplicate.

Methods of synthesis
Trials were pooled in meta-analyses, reporting standardised mean differences (SMD) for continuous outcomes and summary odds ratios (OR) for dichotomous outcomes, each with 95% confidence intervals (CI). Heterogeneity was assessed using Cochran’s Q test and Higgins’ I² statistic. Heterogeneity was considered high where I²>70%, in which case a random-effects meta-analysis was used. Fixed-effect meta-analysis was used where there was low heterogeneity. Meta-analyses were performed only for risk factors generally included in cardiovascular risk calculations.
Results of the review

Thirteen trials with 10,057 participants (range 146 to 3,382) were included. Follow-up times ranged from three to 96 months; only three trials had follow-up that exceeded 12 months. Trial quality varied. Most trials were considered to be of moderate quality (three to five domains at low risk of bias). The main potential sources of bias were lack of blinding of participants and incomplete outcome data.

For the three studies that reported reduction in Framingham 10-year risk score there was no evidence that telehealth interventions reduced cardiovascular risk (SMD -0.35, 95% CI -1.97 to 1.27; I²=82%). Eight trials reported systolic blood pressure lowering, with no statistically significant evidence of a benefit of telehealth (SMD -1.22 mmHg, 95% CI -2.80 to 0.35; I²=61%).

Six studies reported total cholesterol reduction with no statistically significant benefit of telehealth (SMD -0.07 mmol/L, 95% CI -0.19 to 0.06; I²=45%). Four trials reported high-density lipoprotein (HDL) cholesterol reduction, again with no evidence of a benefit of telehealth (SMD -0.01 mmol/L, 95% CI -0.03 to 0.02; I²=49%). Four trials reported reduction in smoking, with no evidence of a benefit of telehealth (OR 1.09, 95% CI 0.82 to 1.44; I²=0).

Meta-analyses for other outcomes were not performed because of a lack of suitable data. Some results from specific trials were presented.

Authors' conclusions

There was insufficient evidence to determine the effectiveness of telehealth interventions in reducing cardiovascular disease risk.

CRD commentary

This review addressed a relevant research question and used appropriate, but broad, inclusion criteria. A thorough search was performed but unpublished studies or those not published in English were excluded so some relevant trials may have been missed. Some action was taken to avoid reviewer error and bias; it was unclear whether this was done for quality assessment and data extraction. Risk of bias was assessed and trials were generally found to be at moderate risk of bias. Many trials were not blinded or had incomplete outcome data, which increased the risk of biased results. The authors noted that follow-up times may have been too short to identify benefits of the interventions.

Results were pooled in meta-analyses but these analyses were limited by the diversity of outcomes reported. In general the trials were very diverse and considered a wide range of populations, telehealth interventions, comparator interventions and outcomes. Follow-up times varied substantially from three months to three years. Substantial heterogeneity was observed in most meta-analyses. Combining such diverse trial in meta-analyses may not give useful results and the findings may not generalise to all kinds of telehealth interventions. For all these reasons the results of the analyses may not be reliable and therefore the authors’ conclusions are appropriate.

Implications of the review for practice and research

Practice: The authors made no recommendations for practice.

Research: The authors suggested that comparisons of telehealth interventions and cost-effectiveness analyses were needed. They also suggested that a standardised overall cardiovascular risk tool should be used in future trials of telehealth interventions.

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Bibliographic details


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This is a systematic review that meets the criteria for inclusion on DARE.