Home telemonitoring for congestive heart failure: a systematic review and meta-analysis

CRD summary
The authors concluded that home telemonitoring was generally effective for patients with chronic heart failure. No adverse events were reported in the selected studies. Evidence about use of health services was more limited. The authors' conclusions appeared to reflect the evidence, but study limitations, small sample sizes and differences between studies should be taken into account when interpreting the findings.

Authors' objectives
To compare home telemonitoring to usual care in patients with chronic heart failure.

The paper was based on a Health Technology Assessment of home telemonitoring in patients with various chronic diseases (see Other Publications of Related Interest).

Searching
PubMed, MEDLINE Daily Update, MEDLINE In-Process and Other Non-Indexed Citations, BIOSIS Previews, EMBASE, CINAHL, PsycINFO, The Cochrane Library and DARE were searched for studies published between 1998 and 2008. Search terms were reported. No language restrictions were applied.

Study selection
Randomised controlled trials (RCTs) and observational studies of adult and paediatric patients with chronic heart failure were eligible if they compared home telemonitoring to usual care. Outcomes of interest were mortality, quality of life (QoL) and use of health care resources. Studies that evaluated telephone support were excluded.

In all studies, patients had a mean age greater than 52 years. Most studies were of patients with a mean New York Heart Association functional classification between 2 and 4. Most studies excluded patients with previous mental illness, cognitive impairment, life expectancy of less than one year, language barrier and other chronic diseases. Most of the studies were conducted in USA. Studies used different tools to measure quality of life. One study compared home telemonitoring plus usual care with usual care alone.

Two reviewers independently selected studies and resolved disagreements on inclusions by consensus.

Assessment of study quality
Validity was assessed using a modification of the tool described by Hailey et al. The score was used to classify studies from A (high quality) to E (poor quality). Items assessed were based on study design, sample size, randomisation, blinding, patient selection, description of intervention, type of analysis, withdrawals and outcomes reported.

Two reviewers independently assessed validity and resolved disagreements by consensus.

Data extraction
Numbers of events per patients were extracted or calculated from mean numbers.

Two reviewers independently extracted data onto a structured form and resolved disagreements by consensus.

Methods of synthesis
Heterogeneity was assessed using the $I^2$ statistic. In the absence of substantial statistical heterogeneity ($I^2 \geq 50\%$), RCTs and prospective cohort studies graded C (fair to good) or higher for quality were combined using a random-effects meta-analysis. Continuous data were summarised using rate ratios to measure the number of events per patient and risk ratios.
for dichotomous data; 95% confidence intervals (CI) were calculated. RCTs and observational studies were also analysed separately.

Where substantial heterogeneity was present, attempts were made to identify reasons by grouping studies by study design and home telemonitoring intervention. Where heterogeneity was unexplained, studies were combined in a narrative synthesis.

**Results of the review**

Twenty-one studies were included (3,082 patients): 11 RCTs and 10 observational studies. Sample size ranged from 18 to 690.

Seventeen studies compared telemonitoring with usual care. Of these, three studies were rated A (high quality), four were rated B, four rated C and six rated D or E.

Four studies had three intervention arms; only data from the home telemonitoring versus usual care arms were used. Three of these were rated B (good quality) and one was rated D. Follow-up ranged from 30 days to one year.

Compared to usual care, home telemonitoring was associated with a statistically significant reduction in the number of patients hospitalised for any reason (RR 0.77, 95% CI 0.65 to 0.90; three RCTs and one observational study) and all-cause mortality (RR 0.64, 95% CI 0.48 to 0.85; five RCTs and one observational study). No substantial heterogeneity was found for either analysis. When only RCTs were analysed, results were similar for number of patients hospitalised (three RCTs) and mortality (five RCTs).

Substantial heterogeneity was found for other outcomes. Studies reported that telemonitoring interventions were associated with reductions in the number of hospitalisations (eight of 11 studies), lower numbers of all-cause emergency department visits per patient (six or seven out of eight studies; number unclear), lower mean all-cause bed days of care (four of five studies) and lower numbers of home care or outpatients visits (two of four studies).

Thirteen studies considered quality of life. Seven studies reported no significant differences between groups and five studies reported higher QoL or satisfaction or adherence to drug treatment in telemonitoring groups. Results did not appear to be reported for the remaining study.

**Authors' conclusions**

Home telemonitoring was generally effective for patients with chronic heart failure and no adverse events were reported in the selected studies. Evidence about use of health services was more limited.

**CRD commentary**

The review question was clearly stated and inclusion criteria were appropriately defined. Several relevant sources were searched. Attempts were made to minimise language bias, but no attempts were made to minimise publication bias. Validity was assessed and aggregate scores were reported; only studies that met a minimal quality score were included in meta-analyses. Methods were used to minimise reviewer errors and bias in the review process.

The authors acknowledged that there was clinical and methodological heterogeneity among studies. Statistical heterogeneity was assessed and only homogeneous studies were combined using meta-analysis. For the main meta-analyses, RCTs and observational studies were combined and this was not appropriate. However, RCTs were also analysed separately. The authors appropriately highlighted the potentially limited generalisability of review findings due to patient exclusions and the small numbers of studies that reported some outcomes.

The authors’ conclusions appeared to reflect the evidence, but limitations of the evidence, small sample sizes and differences between studies should be taken into account when interpreting the findings.

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

**Practice:** The authors did not state any implications for practice.
Research: The authors stated that higher quality longer-term studies (such as multicentre RCTs) were required to evaluate the clinical effects of home telemonitoring for patients with chronic heart failure. Studies should recruit more diverse patient populations.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.