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Interactive telemedicine: effects on professional practice and health care outcomes (Review)

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[Intervention Review]

Interactive telemedicine: effects on professional practice and health care outcomes

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ABSTRACT

Background

Telemedicine (TM) is the use of telecommunication systems to deliver health care at a distance. It has the potential to improve patient health outcomes, access to health care and reduce healthcare costs. As TM applications continue to evolve it is important to understand the impact TM might have on patients, healthcare professionals and the organisation of care.

Objectives

To assess the effectiveness, acceptability and costs of interactive TM as an alternative to, or in addition to, usual care (i.e. face-to-face care, or telephone consultation).

Search methods

We searched the Effective Practice and Organisation of Care (EPOC) Group's specialised register, CENTRAL, MEDLINE, EMBASE, five other databases and two trials registers to June 2013, together with reference checking, citation searching, handsearching and contact with study authors to identify additional studies.

Selection criteria

We considered randomised controlled trials of interactive TM that involved direct patient-provider interaction and was delivered in addition to, or substituting for, usual care compared with usual care alone, to participants with any clinical condition. We excluded telephone only interventions and wholly automatic self-management TM interventions.

Data collection and analysis

For each condition, we pooled outcome data that were sufficiently homogenous using fixed effect meta-analysis. We reported risk ratios (RR) and 95% confidence intervals (CI) for dichotomous outcomes, and mean differences (MD) for continuous outcomes.

Main results

We included 93 eligible trials (N = 22,047 participants), which evaluated the effectiveness of interactive TM delivered in addition to (32% of studies), as an alternative to (57% of studies), or partly substituted for usual care (11%) as compared to usual care alone.

The included studies recruited patients with the following clinical conditions: cardiovascular disease (36), diabetes (21), respiratory conditions (9), mental health or substance abuse conditions (7), conditions requiring a specialist consultation (6), co morbidities (3), urogenital conditions (3), neurological injuries and conditions (2), gastrointestinal conditions (2), neonatal conditions requiring specialist care (2), solid organ transplantation (1), and cancer (1).

Telemedicine provided remote monitoring (55 studies), or real-time video-conferencing (38 studies), which was used either alone or in combination. The main TM function varied depending on clinical condition, but fell typically into one of the following six categories, with some overlap: i) monitoring of a chronic condition to detect early signs of deterioration and prompt treatment and advice, (41); ii) provision of treatment or rehabilitation (12), for example the delivery of cognitive behavioural therapy, or incontinence training; iii) education and advice for self-management (23), for example nurses delivering education to patients with diabetes or providing support to parents of very low birth weight infants or to patients with home parenteral nutrition; iv) specialist consultations for diagnosis and treatment decisions (8), v) real-time assessment of clinical status, for example post-operative assessment after minor operation or follow-up after solid organ transplantation (8) vi), screening, for angina (1).

The type of data transmitted by the patient, the frequency of data transfer, (e.g. telephone, e-mail, SMS) and frequency of interactions between patient and healthcare provider varied across studies, as did the type of healthcare provider/s and healthcare system involved in delivering the intervention.

We found no difference between groups for all-cause mortality for patients with heart failure (16 studies; N = 5239; RR:0.89, 95% CI 0.76 to 1.03, P = 0.12; I² = 44%) (moderate to high certainty of evidence) at a median of six months follow-up. Admissions to hospital (11 studies; N = 4529) ranged from a decrease of 64% to an increase of 60% at median eight months follow-up (moderate certainty of evidence). We found some evidence of improved quality of life (five studies; N = 482; MD:-4.39, 95% CI -7.94 to -0.83; P < 0.02; I² = 0%) (moderate certainty of evidence) for those allocated to TM as compared with usual care at a median three months follow-up. In studies recruiting participants with diabetes (16 studies; N = 2768) we found lower glycosylated haemoglobin (HbA1c %) levels in those allocated to TM than in controls (MD -0.31, 95% CI -0.37 to -0.24; P < 0.00001; I² = 42%, P = 0.04) (high certainty of evidence) at a median of nine months follow-up. We found some evidence for a decrease in LDL (four studies, N = 1692; MD -12.45, 95% CI -14.23 to -10.68; P < 0.00001; I² = 0%) (moderate certainty of evidence), and blood pressure (four studies, N = 1770: MD: SBP:-4.33, 95% CI -5.30 to -3.35, P < 0.00001; I² = 17%; DBP: -2.75 95% CI -3.28 to -2.22, P < 0.00001; I² = 45% (moderate certainty evidence), in TM as compared with usual care.

Seven studies that recruited participants with different mental health and substance abuse problems, reported no differences in the effect of therapy delivered over video-conferencing, as compared to face-to-face delivery. Findings from the other studies were inconsistent; there was some evidence that monitoring via TM improved blood pressure control in participants with hypertension, and a few studies reported improved symptom scores for those with a respiratory condition. Studies recruiting participants requiring mental health services and those requiring specialist consultation for a dermatological condition reported no differences between groups.

Authors' conclusions

The findings in our review indicate that the use of TM in the management of heart failure appears to lead to similar health outcomes as face-to-face or telephone delivery of care; there is evidence that TM can improve the control of blood glucose in those with diabetes. The cost to a health service, and acceptability by patients and healthcare professionals, is not clear due to limited data reported for these outcomes. The effectiveness of TM may depend on a number of different factors, including those related to the study population e.g. the severity of the condition and the disease trajectory of the participants, the function of the intervention e.g., if it is used for monitoring a chronic condition, or to provide access to diagnostic services, as well as the healthcare provider and healthcare system involved in delivering the intervention.

PLAIN LANGUAGE SUMMARY

Interactive telemedicine: effects on professional practice and healthcare outcomes

Background

Telemedicine uses telecommunication systems to deliver health care at a distance. This method of delivering health care may improve patient health outcomes, access to health care and reduce costs. It is important to understand the impact that care at a distance via telemedicine might have on patients, healthcare professionals and the organisation of care.

Review question

We assessed the effectiveness, acceptability, and costs of interactive telemedicine, delivered in addition to, or as an alternative to, usual care as compared to usual care alone.

Study characteristics

Researchers in The Cochrane Collaboration searched the literature up to June 2013 and found 93 eligible randomised controlled trials (N = 22,047 participants). The studies recruited participants with a number of clinical conditions: cardiovascular disease (36 studies), diabetes (21 studies), respiratory conditions (nine studies), mental health problems or substance abuse (seven studies), conditions requiring a

specialist consultation (six studies), complex co morbidities (three studies), urogenital conditions (three studies), neurological injuries and conditions (two studies), gastrointestinal conditions (two studies), neonatal conditions requiring specialist care (two studies), patients recovering after solid organ transplantation (one study) and cancer (one study).

Telemedicine provided remote monitoring (55 studies), or real-time video-conferencing (38 studies), which was used either alone or in combination. The main telemedicine function varied depending on clinical condition, but fell typically into one of the following six categories, with some overlap: i) monitoring of a chronic condition to detect early signs of deterioration and prompt treatment and advice; ii) provision of treatment or rehabilitation, for example stroke rehabilitation; iii) education and advice for self-management; iv) specialist consultations; v) real-time assessment of clinical status, for example post-operative assessment after minor operation vi); screening for depression or angina.

Key results

We found no difference in mortality between participants with heart failure receiving care through telemedicine, compared to those receiving health care without telemedicine. The results of the studies differed for admissions to hospital, from a relative decrease of 64% to an increase of 60%. Disease-specific quality of life was slightly improved for heart failure participants receiving telemedicine as compared to those receiving usual care only.

We found that telemedicine may improve glucose control in people with diabetes (mean difference (MD) 0.30 percentage points), but that the effect varied across studies: from a MD of -0.72 to 0.20 percentage points at a median nine months follow-up. We found some evidence for a decrease in LDL cholesterol, which is considered the 'bad' cholesterol, in participants allocated to telemedicine as compared to those allocated to usual care (MD -12.45 mg/dL). We also found a greater decrease in blood pressure in those allocated to telemedicine compared to those that were allocated to usual care.

Seven studies that recruited participants with different mental health and substance abuse problems reported no differences in the effect of therapy delivered over video-conferencing, as compared to face-to-face delivery. Findings from the other studies varied; there was some evidence that monitoring via telemedicine improved blood pressure control in participants with hypertension, and a few studies reported improvement for those with a respiratory condition. Studies recruiting participants requiring specialist consultation for a dermatological condition reported no differences between groups.

Certainty of the evidence

We were able to summarise data from 16 studies recruiting people with heart failure (high to moderate certainty of evidence) and from 21 studies recruiting people with diabetes (high to low certainty of evidence). The results from these studies provide a good indication of the likely effect of using telemedicine to deliver health care to people with these conditions on health outcomes. The findings from the other studies are less certain, due to a relatively small number of studies recruiting participants with other clinical conditions.