Authors' objectives
To assess telemedicine services that substitute for face-to-face medical diagnosis and treatment, and that may apply to the Medicare population.

Searching
MEDLINE, CINAHL and HealthSTAR were searched for relevant publications to December 2000; the search terms were given in the report. In addition, the authors conducted handsearches of leading telemedicine journals and identified key papers from the reference lists of selected journal articles.

Study selection
Study designs of evaluations included in the review
The authors did not state any inclusion criteria relating to study design. A wide range of study designs were selected for inclusion, from randomised controlled trials (RCTs) to descriptive studies/case reports.

Specific interventions included in the review
Studies that focused on telemedicine services that would substitute for face-to-face medical diagnosis and treatment, including store-and-forward, home-based self-monitoring/testing or clinician-interactive services, were included in the review. Studies of services not requiring face-to-face encounters were excluded, as were telephone or e-mail care programmes. A wide range of telemedicine interventions were evaluated in a range of settings: store-and-forward telemedicine was evaluated in ophthalmology, neonatology, paediatrics and dentistry; self-monitoring/testing interventions were evaluated in obstetrics, home care and paediatrics; clinician-interactive services were evaluated in cardiology, child psychiatry, emergency medicine, paediatrics, obstetrics and neonatology.

Participants included in the review
Studies including pregnant women or children appear to have been eligible for inclusion in the review. The interventions were evaluated in a wide range of populations: home-based self-monitoring/testing was evaluated for diabetes hypertension, pulmonary disease, acquired immune deficiency syndrome and Alzheimer's disease.

Outcomes assessed in the review
Studies reporting the comparability of diagnostic decisions and recommendations for clinical management, health outcomes, access to care, patient and/or clinician satisfaction, and costs or cost-effectiveness were eligible for inclusion. The outcomes reported in the included studies were relevant to their particular setting.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies for inclusion in the review, with any disagreements resolved through consultation with a third reviewer.

Assessment of study quality
Studies that examined clinical outcomes, patient satisfaction or access to care were classified according to their level of evidence. The authors also determined the potential for bias in estimates of diagnostic test performance and assessed the quality of economic evaluations. The authors did not state how many reviewers performed the validity assessment.

Data extraction
One reviewer performed the data extraction. Data on key study characteristics and outcomes were extracted.
Methods of synthesis
How were the studies combined?
The studies were combined in a narrative.

How were differences between studies investigated?
Studies were presented in the narrative synthesis according to the type of telemedicine intervention being evaluated (store-and-forward, home-based self-monitoring/testing, clinician-interactive services) and the type of outcomes reported (diagnosis/management, health outcomes, access to care, patient/clinician satisfaction and costs/cost-effectiveness). Further differences between the studies were apparent from the tables and were discussed to some extent in the text.

Results of the review
A total of 28 studies (number of participants unclear) were included in the review.

Store-and-forward telemedicine (4 studies).

There was some evidence that comparable diagnosis and management decisions were made using store-and-forward telemedicine from the areas of paediatric dental screening, paediatric ophthalmology, and neonatology. No studies addressed health outcomes, patient/clinician satisfaction or costs.

Self-monitoring/testing telemedicine (21 studies).

In the areas of paediatrics, obstetrics and clinician-indirect home telemedicine, there was evidence that access to care could be improved when patients and families had the opportunity to receive telehealth care at home rather than in-person care in a clinic or hospital. Access was enhanced when the telehealth system enabled timely communication between patients or families and care providers, allowing self-management and necessary adjustments that may prevent hospitalisation. There was some evidence that this form of telemedicine improved health outcomes, but the study sample sizes were usually small, and/or the treatment effects were small. No studies addressed diagnosis and management or costs.

Clinician-interactive telemedicine (21 studies).

Some studies provided evidence of efficacy but did not clearly define which technologies provided benefit or cost-efficiency. Where reported, studies suggested this form of telemedicine improved access to care. No studies were RCTs, though they provided some evidence of access improvement over prior conditions.

Cost information
Three cost studies published on clinician-interactive telemedicine did not adequately demonstrate that telemedicine reduced the costs of care. No study addressed cost-effectiveness.

Authors' conclusions
While the use of telemedicine is small but growing, the evidence for its efficacy is incomplete. Many of the studies were small and/or methodologically limited, so it could not be determined whether telemedicine was efficacious.

CRD commentary
This review was based on a question that was broadly defined in terms of the participants, interventions and outcomes. A search of three electronic databases was supplemented by checks of reference lists from relevant primary studies and handsearches of key journals. However, no attempts were made to identify unpublished studies, and it was not clear whether the search was restricted by language. For these reasons, the possibility that relevant studies might have been overlooked cannot be excluded. The validity of the included studies was assessed by a variety of means. However, though multiple reviewers selected studies for inclusion, similar attempts to minimise the potential for errors and bias did not appear to have been made at other stages of the review. Given the heterogeneity of the included studies, the use...
of a narrative synthesis was suitable and the authors' conclusions were appropriately cautious. However, these conclusions should be interpreted in light of the caveats mentioned.

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

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that future studies should focus on the use of telemedicine in conditions where burden of illness and/or barriers to access for care are significant. They added that use of recent innovations in the design of RCTs for emerging technologies would lead to higher quality studies, and that journals publishing telemedicine evaluation studies must set high standards for methodological quality.

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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.