Multicentre randomised control trial comparing real time teledermatology with conventional outpatient dermatological care: societal cost-benefit analysis

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Real time teledermatology in general practice patients requiring referral to dermatology services. Standard commercial videoconferencing units (VC7000, BT) connected by basic rate ISDN lines at 120 kbit/s were installed at each of the participating sites. An additional video camera was connected to the videoconferencing unit at each health centre to enable the general practitioner to transmit close up images to the dermatologist.

Type of intervention
Diagnosis; Telemedicine

Economic study type
Cost-effectiveness analysis.

Study population
General practice patients requiring referral to dermatology services.

Setting
Hospital and primary care. The economic analysis was carried out in Belfast, Northern Ireland.

Dates to which data relate
The study was performed over a 12-month period, but the dates were not specified. The price year was 1995.

Source of effectiveness data
The evidence for the final outcomes was based on a single study.

Link between effectiveness and cost data
Costing was conducted prospectively on a sub-sample of the patient sample used in the effectiveness analysis.

Study sample
Sample size calculations showed that a sample size of 200 had a power of 80% to detect a standardised difference of 0.4 at the 0.05 significance level. Of 204 patients who participated in the trial, 102 were randomised to teledermatology and 102 to conventional hospital consultation. Ages ranged from 4 months to 89 years with a mean of 38.6 (SD 23.8) years.

Study design
This was a multicentre randomised, controlled trial, carried out in four health centres (two urban, two rural) and two regional hospitals. The minimum duration of the follow-up was 3 months. The effectiveness study appears to have had no loss to follow-up. Sealed envelopes containing a referral form and consent form were distributed at each health centre. The referral form contained details of the randomisation group. Prior randomisation of the referral forms had taken place by means of a table of random numbers. All patients received an accelerated referral and were seen within 10 days. Patient reattendance at general practice or hospital and the clinical outcome of the initial consultation were ascertained from a follow up review of patient records.

**Analysis of effectiveness**

The principle used in the analysis of effectiveness appears to have been intention to treat. The clinical outcomes were the number (percentage) of patients who required at least one further hospital appointment, required general practice review, required no follow-up visits, and the proportion of patients who attended subsequent hospital appointments. The baseline comparability of the two patient groups was not discussed.

**Effectiveness results**

No major differences were found in the reported clinical outcomes of teledermatology and conventional dermatology. Of those patients randomised to teledermatology 55 (54%) were managed within primary care and 47 (46%) required at least one hospital appointment. Of patients randomised to the conventional hospital outpatient consultation 46 (45%) required at least one further hospital appointment, 15 (15%) required general practice review, and 40 (39%) required no follow-up visits. Clinical records showed that 42 (41%) patients seen by teledermatology attended subsequent hospital appointments compared with 41 (40%) patients seen conventionally. No statistical tests of significance were reported.

**Clinical conclusions**

There were no major differences in clinical outcome between teledermatology and conventional outpatient dermatology care. Almost half of those who were recommended to return (by telemedicine) for a general practice follow-up visit failed to do so. The authors believed this implied that the videolink management advice was effective and that a return visit was deemed unnecessary by the patient. The review of patient records showed that the teledermatology patients had a lower level of reattendance to both their general practitioner and the dermatology outpatient department compared with patients seen conventionally.

**Measure of benefits used in the economic analysis**

No summary benefit measure was identified in the economic analysis, and only separate clinical outcomes were reported. As the two procedures were similar in terms of the clinical outcomes, the economic study was reduced to a cost-minimisation analysis.

**Direct costs**

Costs were not discounted due to the short time frame of the cost analysis. Some resource use quantities were reported separately from the costs and cost items were reported separately. The cost analysis covered the variable costs (including consultant time, general practitioner time, and patient travel), fixed costs (capital, depreciation, telecommunications), and costs of equivalent training and cost savings due to non-referrals owing to an improvement in the general practitioners' knowledge of dermatological problems.

The perspective adopted in the cost analysis was that of society. Patients were asked to complete an anonymous economic questionnaire assessing the time spent and costs incurred by them immediately after their initial consultation and after the first return visit to hospital. The response rate was 59% (62% in the teledermatology group and 57% in the conventional group). The sources of the average cost data were MedEconomics, or national institutions. The medical staff in the study were subsequently interviewed by an economic consultancy firm to obtain quantitative data on the costs of teledermatology. The price year was 1995. The cost analysis did not consider the costs of the return visits, equipment maintenance and repair, or of training staff to use equipment.
Statistical analysis of costs
95% confidence intervals were reported only for some resource use and no cost data.

Indirect Costs
Costs were not discounted due to the short time frame of the cost analysis. Quantities were reported. The indirect costs covered the costs of patient time based on the average annual income as reported by the 130 patients who completed the relevant section of the economic questionnaire. The perspective adopted in the cost analysis was that of society. The price year was 1995. The cost savings arising from reduced length of time off work were not considered in the analysis.

Currency
UK pounds sterling (€).

Sensitivity analysis
A set of sensitivity analyses was performed on parameters affecting the comparative costs of teledermatology. Threshold values were identified.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
The average total variable plus fixed costs of telemedicine were 201.88 versus 48.72 for the conventional procedure. The cost savings arising from a reduction in referral cases and cost of equivalent training was 69.78. General practitioners estimated that dermatology referrals could be reduced by an average of 20% (range: 10 - 25%). The net societal cost for the teledermatology was 132.10 compared to 48.72 for the conventional consultation. Sensitivity analysis revealed that if each health centre had allocated one morning session a week to teledermatology and the average round trip to hospital had been 78 km instead of 26 km, the costs of the two methods of care would have been equal.

Synthesis of costs and benefits
A synthesis of costs and benefits was not conducted as the economic study was reduced to a cost-minimisation analysis.

Authors’ conclusions
Real time teledermatology was clinically feasible but not cost-effective compared with conventional dermatological outpatient care. However, if the equipment were purchased at current prices and the travelling distances were greater, teledermatology would be a cost-effective alternative to conventional care.

CRD COMMENTARY - Selection of comparators
A justification was given for the choice of the comparator. It was the conventional approach in the context in question. You, as a database user, should consider whether this is a widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The randomised nature of the study design was appropriate for the study question. Furthermore, power calculations were performed to ensure 80% power, and the analysis appears to have been based on intention to treat. However, the effectiveness data do not appear to have been collected fully prospectively as follow-up data were based on the review of the records. The degree to which the study sample was representative of the study population cannot be objectively assessed due to the lack of adequate information regarding the inclusion/exclusion criteria adopted in the study. Further details about the baseline characteristics of the two groups of patients, including their comparability, would have been
helpful. No statistical tests were reported on the observed differences in the effectiveness results between the groups.

**Validity of estimate of measure of benefit**
The analysis of benefits was based on the therapeutic equivalence of treatment alternatives. The economic analysis therefore included only costs.

**Validity of estimate of costs**
The following aspects of the cost analysis may have contributed to its validity. Most resource use quantities were reported separately from the costs, adequate details of methods of cost estimation were given and the price year and perspective adopted in the cost analysis were specified. Moreover, the effects of alternative procedures on indirect costs were addressed and the robustness of the cost results was investigated through sensitivity/threshold analysis. Further details of the sensitivity analysis were provided on the web site of the [journal](http://www.bmj.com/content/320/7244/1252/DC1). However, the following aspects may have adversely affected the validity. The costing was based on a sub-sample of the study sample used in the effectiveness analysis, no statistical analyses were performed on the cost data, and, as the authors noted, the cost analysis was not comprehensive as some cost elements were not included in the analysis.

**Other issues**
The authors' conclusions appear to be justified given the sensitivity analysis conducted. The issue of generalisability to other settings was not directly addressed. Some comparisons were made with other studies. The authors reported factors that they had omitted from the analysis and also opportunities to reduce the costs of telemedicine locally. The authors classified their study as a cost-benefit analysis, while it was in fact a cost-effectiveness analysis, because health benefits were not measured in monetary terms. Given the importance of the perceptions of patients and staff, a cost-utility approach may have been a more appropriate framework to incorporate the subjective assessment of the alternative approaches. The degree to which the study sample was representative of the study population was not discussed in the authors' comments.

**Implications of the study**
The authors suggest that although real time teledermatology is both clinically effective and economic in the appropriate circumstances, it is not likely to be useful in large cities, except possibly for secondary-to-tertiary consulting or for educational use. Its place in the overall management of dermatology patients from primary care, and indeed the place of pre-recorded teledermatology ("store-and-forward") remains to be established in future trials.

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