Patient referral by telemedicine: effectiveness and cost analysis of an intranet system
Harno K, Paavola T, Carlson C, Viikinkoski P

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
The cost-effectiveness of telemedicine in improving the referral process from primary to secondary care.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study looked at patient referrals in two Finnish districts.

Setting
The study setting was hospital and primary care. The economic analysis was carried out in Finland.

Dates to which data relate
Effectiveness, resource use, and cost data were collected during an eight-month period in 1998 with one-year follow-up. The price year was 1998.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
207 patients were referred to the hospital with the teleconsultation system and 85 patients were referred to the traditional outpatient clinic. No power calculations or exclusion criteria were reported.

Study design
The study took the form of a prospective cohort study carried out in two centres. Patients were followed up for one year. No patients were lost to follow-up.

Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. The primary health outcomes included diagnostic and therapeutic effectiveness measures. The authors did not report whether groups were shown to be comparable in terms of demographic characteristics at analysis.

**Effectiveness results**

The effectiveness results were as follows:

The population-based number of referrals to the outpatient clinic with teleconsultation (7.5/1000) was twice that to the traditional outpatient clinic (3.8/1000).

37% of referrals to the outpatient clinic with teleconsultation included requests from general practitioners for on-line medical advice.

43% of the total number of intranet referrals resulted in outpatient visits at the outpatient clinic with teleconsultation, compared with 79% in the traditional outpatient clinic.

Specialists rated the feasibility of the interactive referral system as excellent or good in 67% of cases.

Only 18% of patients receiving a teleconsultation ended up in the outpatient clinic with teleconsultation within one year. These visits were mainly due to progression of chronic disease.

No deaths or missed diagnoses could be attributed to telemedicine, but one diagnosis was delayed.

80% of patients treated by intranet email consultations wished they could make their next visit to the outpatient clinic in a similar way.

Specialists in the outpatient clinic with teleconsultation took, on average, 13 minutes for teleconsultations.

**Clinical conclusions**

The wide interactive use of the intranet referral system between secondary and primary care improved clinical effectiveness.

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

Measures of diagnostic and therapeutic effectiveness were used in the analysis. The analysis was therefore of cost-consequences design.

**Direct costs**

Direct costs were not discounted due to the short time horizon of the study (less than 1 year). Quantities and costs were reported separately. Direct costs related to personnel costs, internal and external service charges, material expenses and rental, travel costs, other health care costs, and the cost of arranging home help. The quantity/cost boundary adopted was that of society. The estimation of quantities and costs was based on actual data. Estimates of costs and quantities were based on patient questionnaires, time keeping processes in the hospitals, and by using a resource management programme. The price year was 1998.

**Statistical analysis of costs**

No statistical analysis of costs was reported.

**Indirect Costs**

Indirect costs were not included.
Currency
EU with EU 1.00 = $0.9.

Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
See effectiveness results above.

Cost results
The cost results were as follows:

The cost for an outpatient clinic visit was EU211 compared to EU32 for an email consultation.

A cost minimisation analysis of the alternative interventions showed a benefit of EU7,876 in favour of teleconsultation.

The cost difference between giving on-line medical advice for the 108 cases and a visit to the outpatient clinic for the other 88 was less costly (by EU4,140) than investigating the 124 patients whose original clinic referrals to the outpatient clinic with teleconsultation were not declined.

Synthesis of costs and benefits
Cost and effectiveness measures were not combined into a cost-effectiveness ratio.

Authors’ conclusions
The wide interactive use of the intranet referral system between secondary and primary care improved clinical effectiveness, lowered direct costs, increased productivity, and was cost-effective.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used, namely traditional outpatient clinic. You, as a user of the database, should decide if this health technology is relevant to your setting.

Validity of estimate of measure of effectiveness
The analysis was based on a cohort study, which was appropriate for the study question. The study sample was representative of the study population. The authors did not report, however, if patient groups were comparable at analysis. The analysis of effectiveness was handled credibly.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The analysis was therefore of cost-consequences design.

Validity of estimate of costs
Some good features of the cost analysis were that all relevant direct cost categories were included, quantities and costs were reported separately, and the price year was reported. However, no sensitivity or statistical analyses were reported on quantities or costs. Some charges were used to proxy prices. These latter features tend to limit the generalisability of the cost results, although the magnitude of difference has to be borne in mind with regard to this point.
Other issues
The authors did make appropriate comparisons of their findings with those from other studies but did not address the issue of generalisability to other settings. The authors did not present their results selectively. The study considered patients who were referred to secondary care, and this was reflected in the authors' conclusions.

Implications of the study
Experience from the telemedicine-assisted outpatient clinic supports expectations of better management of demand and operating costs. The authors sought to address the issue of proper evaluation of clinical outcomes inherent in telemedicine studies.

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