Evaluation of an independent, radiographer-led community diagnostic ultrasound service provided to general practitioners
Pallan M, Linnane J, Ramaiah S

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 use of an independent, radiographer-led, primary case-based, mobile diagnostic ultrasound service was compared with an open access National Health Service (NHS) Trust-provided service.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who underwent diagnostic ultrasound scans, such as abdominal, pelvic transvaginal, renal and prostate scans, after being referred by their general practitioner (GP). The patients included in the study were older than 18 years old. No further inclusion or exclusion criteria were reported.

Setting
The setting was primary care and secondary care. The economic study was carried out in the West Midlands, UK.

Dates to which data relate
The effectiveness data were collected from April 2001 until March 2002. The dates of the cost data were not reported. The price year was also not reported.

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

Link between effectiveness and cost data
It would appear that the costing was carried out retrospectively on the same sample of patients as that used in the effectiveness analysis, although this was not explicitly reported.

Study sample
Sample size calculations were conducted using a 2-sample t-test. Power calculations demonstrated that a sample size of 200 in each study group would allow a difference in mean waiting time of 2.7 days between the two groups to be identified with 80% power at 5% statistical significance. Patients who underwent diagnostic ultrasound after referral by their GP for the community- or hospital-based service were included in the study. The community-based group comprised 783 patients and the hospital-based group 353. The authors formed random samples of 200 patients within
each group. Seven patients aged less than 18 years were excluded from the hospital-based random sample. A third study group comprised 36 GP principals located in the West Midlands area.

**Study design**
The analysis was based on a multi-centre (36 GP principals and NHS Trust), retrospective, comparative cohort study. The data were collected for one year, from April 2001 until March 2002. Patients and GPs were followed up through postal surveys. It was reported that the response rate reached 52.9% (100 out of 189) for the community service patient survey. Of the 89 nonrespondents, 11 patients had died or moved address; no reasons were provided for the rest of the patients. The response rate reached 44.6% (82 out of 184) for the hospital service patient survey. Of the nonrespondents 9 patients had died or moved address; no reasons were provided for the rest of the patients. The response rate reached 80.6% among GPs, but no reasons were provided for nonresponse. Additional data (e.g. on access to ultrasound services) were retrieved from medical records. Such data were retrieved for just 88.5% of the community service sample and 96.9% of the hospital service sample, owing to unavailable or incomplete patient records.

**Analysis of effectiveness**
The outcomes assessed were patient and GP access to the two services, patient and GP satisfaction with the services, and further aspects of service quality. These were assessed through postal surveys piloted and sent to the two patient groups and the GP principals.

Patient satisfaction was evaluated on a scale of 1 ("very dissatisfied") to 5 ("very satisfied").

The patients' access to secondary care services after an abnormal diagnostic ultrasound scan was evaluated by mapping a small number of patients who were referred to secondary care using their hospital medical records.

Clinical quality of the two services was evaluated by taking a random sample of 20 abdominal ultrasound scan images for each service group (stratified into 10 normal and 10 abnormal scans). Consultant radiologists assessed the images and compared them with equivalent reports. In addition, the structure and the organisation of the two services were assessed through interviews with the NHS Trust Director of Imaging and the radiographer who administered the service in the community.

It was reported that the patient groups were comparable in terms of their demographic characteristics. Of the 29 GPs who replied to the survey, all used the hospital service and 23 used the community service.

**Effectiveness results**
The results for access to ultrasound services were as follows.

The mean waiting time for an ultrasound scan appointment was 17.44 days (95% Confidence interval, CI: 15.86 to 19.02) for the community service and 44.53 days (95% CI: 38.83 to 50.23) for the hospital service.

Eighteen of the 23 GPs (78.3%) who used community as well as hospital ultrasound services took waiting times for the services into consideration when deciding on which service to refer a patient to.

Ninety-three per cent of community service patients and 95.1% of hospital service patients reported that the location of their ultrasound appointment was convenient

The time of the appointment was reported as suitable by 95 (95%) community service patients and 76 (92.7%) hospital service patients.

The time difference between the programmed appointment time and actual appointment time was estimated to be less than 10 minutes by 43% of patients in the community service group and by 33% of patients in the hospital service group. When the pathways of three pairs of patients were referred to secondary care after abnormal scans, the biggest differences were observed in the time interval between initial ultrasound screening and referral to secondary care (Range: 1 to 168 days). No systematic differences in other time intervals were observed between the two groups.
In terms of patient satisfaction with the services, 86% of patients in the community group and 76% in the hospital group rated their satisfaction as 4 or 5.

In terms of GP satisfaction with the services, 17 (74%) GPs who used the community service rated their satisfaction as 5, while only 1 (3%) of the 29 GPs who used the hospital rated their satisfaction as 5. Seventeen GPs (59%) assigned a rating of 1 or 2 for the hospital service, mainly because of the long waiting time required for the patients’ appointments.

In terms of complaints GPs received for the ultrasound services, one GP received a complaint for the community service while 14 GPs received complaints for the hospital service. Again, these mainly referred to long waiting times.

The aspects of quality evaluated referred to structure, process and outcome indicators (i.e. quality of stored images, demonstration of normal and abnormal anatomy, and quality of ultrasound reports). No systematic differences were found between the two services in terms of the quality indicators.

**Clinical conclusions**
The authors concluded that, compared with the NHS Trust service, the community diagnostic ultrasound service reduces the patients' waiting time, achieves comparable quality, and raises both patient and GP satisfaction.

**Measure of benefits used in the economic analysis**
The authors used number of abnormalities detected as the measure of benefit in the economic analysis. This was derived from the scans report.

**Direct costs**
The health care costs included in the analysis were the unit cost per ultrasound scan in the community service (all types of scans including domiciliary), and the unit cost per scan in the hospital service (abdomen scan, lower abdomen scan, upper abdomen scan, aorta scan, pelvis scan and transvaginal scan). Overhead costs were excluded from the analysis since no estimations were available for the community service. The costs and the quantities were reported separately. The resource quantities were obtained from medical records, whereas the source of the costs and the price year were not reported. Since the costs were incurred during a short time, discounting was not relevant and was not conducted.

**Statistical analysis of costs**
The unit costs were treated deterministically.

**Indirect costs**
The indirect costs were not included in the analysis.

**Currency**
UK pounds sterling ().
In the community service group, 280 ultrasound scans were performed and the total costs reached 8,400.00.

In the hospital service group, 200 scans were performed and the total costs were 4,718.40.

**Synthesis of costs and benefits**
The average cost per abnormality detected was 107.69 (95% CI: 90.61 to 132.71) in the community ultrasound service group and 77.35 (95% CI: 63.76 to 98.30) in the hospital ultrasound service.

**Authors’ conclusions**
The difference in the average cost per abnormality detected was not statistically significant between the two groups. Therefore, the authors concluded "the benefits afforded by greatly reduced waiting times and high levels of patient and general practitioner (GP) satisfaction could justify the higher costs for the community service”.

**CRD COMMENTARY - Selection of comparators**
The selection of the comparators was explicitly justified. You should decide if they represent a valid health technology in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a retrospective comparative study. The retrospective nature of the study represents a limitation to its internal validity. For example, (as the authors reported), it can be associated with patients’ recall bias, in addition to bias and confounding. However, no statistical analysis was undertaken to take such potential confounding factors and biases into consideration. The study sample appears to have been representative of the study population and the patient groups were shown to have comparable baseline characteristics. In addition, power calculations were reported and an appropriate sample size was used. A prospective randomised controlled trial would have dealt better with the issues of bias and confounding and, therefore, would have enhanced the results obtained.

**Validity of estimate of measure of benefit**
The measure of benefit used in the economic analysis was the number of abnormalities detected. This was derived from medical records. Cases detected represent a common outcome for diagnostic studies. However, a quality of life measure would better facilitate comparisons with other technologies.

**Validity of estimate of costs**
The perspective adopted in the economic analysis was not reported, but it was unlikely to have been societal as the indirect costs were not included in the analysis. Due to unavailable overhead costs in the community service, overhead costs were excluded from both groups. However, it is unclear whether their omission has affected the authors’ conclusions. The costs and the quantities were reported separately, thus enhancing the reproducibility of the results to other settings. The costs were treated deterministically and no sensitivity analysis was carried out to assess the robustness of the cost estimates used, which may limit the interpretation of the study findings. In addition, dates relating to the costs and the price year were not reported, which may limit any future reflation exercises. Overall, the reporting of the costing was poor.

**Other issues**
The authors compared their findings with those from published studies on community-based outreach services, reporting consistency in their findings. The issue of generalisability of the results was not directly addressed. The authors do not appear to have presented their results selectively. The authors reported a number of limitations to the study. For example, the low patient response rate to the questionnaire, the methods used to review ultrasound images in order to assess quality, and the fact that the reviewers were not blinded (which might have introduced observer bias).
**Implications of the study**
The authors stated "the findings of this study are that independently provided community services may provide a legitimate choice for PCOs (Primary Care Organisations) when commissioning enhanced services under the GMS2 contract". They also suggested that these conclusions may be extrapolated not only to diagnostic services but also to various health care services, and are being provided in community-based settings. The authors did not recommend any areas for future research. However, their discussion highlighted areas where more information is needed.

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