Reducing the cost of diagnosis of breast carcinoma: impact of ultrasound and imaging-guided biopsies on a clinical breast practice


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 ultrasound and imaging-guided percutaneous biopsy procedures in the diagnosis of breast carcinoma. The biopsy procedures included 14-gauge core biopsy, fine-needle biopsy and vacuum-assisted core biopsy device.

Type of intervention
Secondary prevention: diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women with mammograms deemed to be sufficiently suspicious to warrant biopsy.

Setting
The setting was tertiary care. The economic study was carried out in Birmingham (AL), USA.

Dates to which data relate
The effectiveness and resource utilisation data were collected from July 1984 to March 1998. The price year was 1998.

Source of effectiveness data
The effectiveness data were gathered from a single retrospective study.

Link between effectiveness and cost data
The costing was carried out on the same sample group as that used in the effectiveness study.

Study sample
Power calculations were not used to determine the sample size. Five historical cohorts of 100 women were compared. Each period described the history of approach to biopsy in the authors' setting. Between July 1984 and April 1986, patients with mammograms deemed suspicious enough for biopsy underwent needle-localised open biopsy (NLB) (era 1). Between April 1986 and December 1991, ultrasound was introduced (era 2). Between January 1992 and February 1994, 14-gauge core biopsy was introduced (era 3). Between March 1994 and May 1997, fine-needle biopsy was introduced (era 4). From June 1997 to March 1998, a vacuum-assisted core biopsy device was acquired (era 5). The decision on whether to perform percutaneous biopsy, and which biopsy method to use, were at the radiologist's and patient's discretion. Four radiologists were involved in interpreting all breast imaging. They were responsible for 80% of the interpretations during the study period.
**Study design**
This was a retrospective observational study (audit) that was carried out in a single centre. The duration of follow-up was 14 years.

**Analysis of effectiveness**
The analysis used all those patients for whom the data were available (from hospital database records). The primary health outcomes used in the analysis were the rates of NLB positive for breast cancer over the 14-year period. A comparison of the risk factor distribution in 100 consecutive NLB for 1984 to 1986 (era 1) and 1997 to 1998 (era 5) was reported.

**Effectiveness results**
The overall breast carcinoma yield for NLB of nonpalpable lesions increased from 21% in 1984 to 68% in 1998, (p<0.0001).

The breast carcinoma detection rate for masses increased from 211 per 1,000 in 1984 to 868 per 1,000 in 1998, (p<0.0001). Changes in risk factors did not account for the changes in the detection rates.

**Clinical conclusions**
Selective use of ultrasound alone and percutaneous fine- and large-core needle biopsy resulted in a substantial reduction in benign open surgical biopsies.

**Measure of benefits used in the economic analysis**
The measure of benefit in the economic analysis was the number of cancers discovered.

**Direct costs**
The costs were measured using an average insurer payment rate (Medicare for 43% of the patients and another payer for the remaining patients). The cost estimates were determined from 1984 to 1998 by tabulating the numbers of biopsy procedures. The direct costs were for screening mammography and the biopsy procedures. The costs and the quantities were not reported separately. The price year was 1998. The costs were measured by applying the payment schedule of the last year in the series to the earlier years.

**Statistical analysis of costs**
No statistical analysis of the costs was carried out.

**Indirect Costs**
No indirect costs were included in the analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was carried out.

**Estimated benefits used in the economic analysis**
The number of cancers found was 21 in era 1 (screening mammography and NLB), 176 in era 2 (ultrasound), 95 in era 3 (14-gauge core biopsy), 188 in era 4 (fine-needle biopsy) and 65 in era 5 (vacuum-assisted core biopsy device).

Cost results
The total expense was $409,555 in era 1, $3,305,177 in era 2, $1,626,734 in era 3, $2,866,268 in era 4, and $941,864 in era 5.

Synthesis of costs and benefits
The average cost or expense per cancer found was $19,503 in era 1, $18,779 in era 2, $17,124 in era 3, $15,246 in era 4, and $14,490 in era 5.

The incremental cost of era 2, compared with era 1, was $18,618 per cancer found.

The authors incorrectly calculated the incremental cost for each era compared with the previous era. For example, the authors calculated an incremental cost of $20,722 for era 3 compared with era 2. In fact, the incremental cost of $20,722 represented the additional cost in era 2 to detect one additional cancer in comparison with era 3. This same incorrect calculation occurred when the authors calculated the incremental cost of era 5 compared with era 4.

Authors’ conclusions
The selective use of ultrasound and imaging-guided percutaneous biopsies resulted in substantial savings, by reducing the number of benign open surgical biopsies, and without decreasing the sensitivity for detecting small potentially curable lesions.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator was clear. The comparator was chosen because it represented the routine breast screening procedure for women in the authors’ setting 16 years ago. You should consider whether this is a widely used technology in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness data were derived from observational data obtained for various time periods associated with the introduction of the new technologies. Although this was appropriate for addressing the study question, a randomised controlled trial would have been a more valid design to adopt. However, confounding or risk factors were tested for in the analysis. Historical cohorts were not compared according to age, which may introduce the potential for confounding.

Validity of estimate of measure of benefit
The estimation of the benefits was obtained directly from the effectiveness analysis and was justified. The authors noted that the life-years saved or quality-adjusted life-years gained would have been heavily influenced by changes in cancer survival rates outside the control of their departments.

Validity of estimate of costs
The authors acknowledged that some relevant costs were omitted from the analysis. For example, the patients’ co-payments, and the net institutional profit or loss for breast carcinoma detection. These costs, however, were likely to be small and were therefore unlikely to have affected the authors’ conclusions. Few details of the cost items were given. The costs and the quantities were not reported separately. The costs were not discounted since they were measured by applying the payment schedule of the last year in the series to the earlier years. No statistical analysis of the quantities and prices was performed. This may limit the interpretation and generalisability of the study findings.
Other issues
The authors made appropriate comparisons of their findings with those from other studies. The issue of generalisability to other settings was addressed. The authors did not present their results selectively. The cost-effectiveness analysis included some methodologically incorrect calculations in terms of the incremental cost per additional cancer discovered. Further, the authors’ conclusions were, perhaps, too optimistic in that the findings did not show that ultrasound and imaging-guided percutaneous biopsies were cost-saving procedures.

Implications of the study
The findings suggest that similar, if not more valid results could be achieved in more conventional screening settings.

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None stated.

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Other publications of related interest


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