Economic consequences of diagnostic imaging for vocal cord paralysis

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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
Two diagnostic techniques for the assessment of suspected vocal cord paralysis, magnetic resonance imaging (MRI) and computed tomography (CT), were examined.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised unselected patients suspected of having vocal cord paralysis.

Setting
The setting was a tertiary care hospital. The economic study was carried out at the Department of Otorhinolaryngology, Head, and Neck Surgery, University of Pennsylvania Medical Centre, Philadelphia, USA.

Dates to which data relate
The effectiveness and resource use data were gathered from January 1992 to 1997. The price year was 1997.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

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

Study sample
Power calculations to determine the sample size were not performed. A sample of 49 consecutive patients, out of 96 potentially eligible patients, were referred to the ear, nose and throat (ENT) clinic and were included in the analysis. Of these, 30 patients underwent MRI and 19 underwent CT. The demographics of the patients were not reported. The patients were also divided into high- and low-suspicion groups on the basis of the presence or absence of a clinically detected abnormality, such as a known history of head and neck cancer or other forms of cancer. In the high-suspicion group, 14 patients underwent MRI and 6 underwent CT. In the low-suspicion group, 16 patients underwent MRI and 13 patients underwent CT.
Study design
This was a retrospective case-control study carried out in a single centre (Department of Otorhinolaryngology, Head, and Neck Surgery, University of Pennsylvania Medical Centre). The patients were not followed after the diagnostic imaging and consecutive work-up. Board-certified neuroradiologists conducted the assessments.

Analysis of effectiveness
All patients included in the study were accounted for in the analysis. The primary health outcomes were the number of true-positive, true-negative, false-positive, and false-negative cases. These were classified on the basis of the presence of radiological abnormalities that suggested a mass as the underlying cause of the impaired vocal cord mobility. The final classification of positive or negative cases was obtained by means of biopsies, direct laryngoscopy, electromyography, or follow-up radiological or clinical examinations. The overall effectiveness was assessed through the sensitivity and specificity of the diagnostic techniques. The comparability of the groups was not reported.

Effectiveness results
In the high-suspicion group, there were 9 (45%) true positive, 4 (20%) false-positive, 7 (35%) true-negative, and no false-negative cases.

Further work-up was performed in 7 (78%) of the true-positive, 3 (75%) of the false-positive, and 1 (14%) of the true-negative cases.

In the low-suspicion group, there were 2 (7%) true-positive, 9 (31%) false-positives, 18 (62%) true-negative (62%), and no false-negative cases.

Further work-up was performed in all (100%) of the true-positive, 4 (44%) of the false-positive, and 2 (11%) of the true-negative cases.

In the high-suspicion group, the sensitivity was 100% for both MRI and CT. The specificity was 57% for MRI and 75% for CT.

In the low-suspicion group, the sensitivity was 100% for MRI but was not measurable for CT since there were no true-positive or false-negative CT findings. The specificity was 43% for MRI and 92% for CT.

Overall, 9 patients (18%) were found with a malignant neoplasm causing the vocal cord paralysis.

Clinical conclusions
Diagnostic imaging with CT and MRI represented a useful technique for better evaluation of vocal cord paralysis. However, it appears to have been crucial to use a selective approach to stratify patients on the basis of a predisposing history as a cause of vocal cord paralysis.

Measure of benefits used in the economic analysis
The benefit measure used in the economic analysis was the number of patients found with a malignant neoplasm causing the vocal cord paralysis. This was derived directly from the effectiveness analysis.

Direct costs
Discounting was irrelevant due to the short time horizon of the study. The unit costs and the quantities of resources were not reported. The cost/quantity boundary adopted was presumably that of the hospital. The cost items included in the analysis were CT, MRI, operating room time, anaesthesia, and all the procedures eventually carried out in the work-up (such as laryngoscopy, stroboscopy, biopsy and electromyography). The professional fees were not included due to the high variability between the institutions. The costs were estimated using reimbursement rates that were derived from the Medicare Resource-based Relative Value Scale. These reflect actual costs as the percentage of hospital
charges. The operating room time and anaesthesia costs were derived directly from the authors’ institution. The quantities were estimated from a review of the patients’ charts. The quantities of resources used were gathered from January 1992 to 1997. The price year was 1997.

**Statistical analysis of costs**
No statistical analysis of the costs was conducted.

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were not carried out.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
In the high-suspicion group, the total and mean costs of immediate diagnostic work-up (MRI or CT plus care of patients suspected of having vocal cord paralysis) were $20,737 and $1,037, respectively.

The total induced cost (work-up costs induced by a false-positive CT or MRI) was $9,127.

In the low-suspicion group, the total and mean costs of immediate diagnostic work-up were $21,698 and $748, respectively.

The total induced cost was $6,502.

**Synthesis of costs and benefits**
The costs and the benefits were combined by an average cost-effectiveness analysis. At a total cost of $42,435, the average cost per cancer discovered with CT or MRI was $4,715. The cost of a true-positive case was $2,304 in the high-suspicion group and $10,849 in the low-suspicion group.

**Authors' conclusions**
Both the diagnostic techniques were useful for evaluating vocal cord paralysis. The authors stated that "the average cost of finding space-occupying lesions as a cause of vocal cord paralysis is more than 4.5 times higher in patients without suspicious antecedent clinical findings ($10,849) than in those who do not have such a history ($2,304)".

**CRD COMMENTARY - Selection of comparators**
The rationale for the choice of the comparators was clear. Both the diagnostic techniques were currently used at the authors' institutions. You should assess whether MRI and CT are widely used in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis of effectiveness was conducted retrospectively on the basis of a case-control study. This appears to have been appropriate for the study question. However, the sample size was small and power calculations were not performed. In addition, although the patients in the sample were unselected, the authors' institution represents a tertiary care centre to which the patients were referred. Therefore, the prevalence rates should be lower in the general population, resulting in a greater number of true-negative examinations.

**Validity of estimate of measure of benefit**
The benefit measure was derived directly from the effectiveness analysis. It would have been interesting to have seen a benefit measure reflecting the patients' preferences for the diagnostic techniques.

**Validity of estimate of costs**
The perspective adopted in the study was presumably that of the institution. Given that perspective, it appears that all the relevant categories of costs have been included in the analysis. Only professional fees were not included, because of the high variability between the institutions. Statistical analyses of the costs were not conducted. The unit costs and the quantities of resources were not reported.

**Other issues**
The authors did not compare their findings with those from other studies. The issue of the generalisability of the study's results to other settings was not addressed. Sensitivity analyses were not conducted. The authors pointed out some limitations of their analysis.

**Implications of the study**
The authors propose an alternative pathway with stratification of the patients in low- and high-suspicion groups. They also state that the present study was not designed as a cost-effectiveness analysis but as a form of cost-identification study, aimed at providing the basis for a future cost-effectiveness analysis.

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