Economic analysis of the use of limited coronal computed tomography scans in the management of sinusitis

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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 modalities of computed tomography (CT) scanning, full CT and limited-cut CT scan, were compared for the diagnosis of sinusitis. The full CT scan was defined as a standard contiguous CT scan of the paranasal sinuses without contrast at a 3-mm slice thickness and including both coronal and axial cuts. The limited scan consisted of four non-contiguous slices (5 mm each), one through the frontal sinus, one through the anterior ethmoid and maxillary sinuses, one through the posterior ethmoid and maxillary sinuses, and one through the sphenoid sinus. Those testing positive using the limited scan were then referred for full CT scanning.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of 100 patients with sinus complaints, who were willing to undergo endoscopic surgery and who had been previously treated with appropriate antibiotic therapy.

Setting
The study setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
Effectiveness studies were sought from studies published between 1966 to August 2002. The price year was 2002.

Source of effectiveness data
The effectiveness data were derived from a review and synthesis of published studies, supplemented with authors’ assumptions.

Modelling
A decision tree was used to compare the two diagnostic arms.

Outcomes assessed in the review
The outcomes assessed were the prevalence of abnormal CT scan findings, and the sensitivity and specificity of the limited CT scan.
Study designs and other criteria for inclusion in the review
Only articles limited to studies in humans and reported in the English language were included in the review. Studies that investigated the sensitivity and specificity of either limited, non-consecutive cut CT scans, the prevalence of abnormal CT scans, and recommendations on the use of limited scans for operative management were further examined.

Sources searched to identify primary studies
MEDLINE and PubMed were searched for published medical literature.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Three primary studies were included in the review.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The prevalence of abnormal CT scans was 75%.

The sensitivity of limited CT scans was 93% and the specificity was 89%.

Methods used to derive estimates of effectiveness
The authors supplemented the results derived from the literature with their own assumptions.

Estimates of effectiveness and key assumptions
The authors assumed that full-contiguous CT scan was 100% sensitive and specific, and that an endoscopic sinus surgeon would not operate from a limited CT scan. Hence, if the results from the limited CT scan were positive, the patient would be referred for a full CT scan.

Measure of benefits used in the economic analysis
The measure of benefits used was the number of correct diagnoses of sinusitis.

Direct costs
The direct costs to the third-party payer were included in the analysis. These comprised the total of all the hospital charges and radiologist’s fees. The authors did not report which cost components were covered under hospital charges. They did, however, report that costs relating to office visit to the doctor were not included as they would be similar for both groups. The costs were derived from the Department of Radiology at the University of Mississippi Medical
Centre. As the costs were incurred during a short time period, discounting was unnecessary and was appropriately not performed. The study reported the total costs. The price year was 2002.

**Statistical analysis of costs**
The costs were treated as point estimates, that is, the data were deterministic.

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

**Currency**
US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was conducted to evaluate the effect of six variables or assumptions on the baseline scenario. The sensitivity and specificity of the limited CT scan varied from 70 to 99%, and the prevalence of abnormal CT scan findings varied from 50 to 100%. The cost of the full CT scan varied from $600 to $1,000, while the cost of the limited CT scan varied from $150 to $450. The number of surgeons who would not operate from a limited CT scan ranged from 50 to 100%.

**Estimated benefits used in the economic analysis**
A total of 100 (100%) individuals were appropriately diagnosed with the full CT scan, compared with 92 (92%) with the limited CT scan.

**Cost results**
The total cost was $79,100 for the full CT scan and $92,747.50 for the limited CT scan.

**Synthesis of costs and benefits**
The authors combined the cost and benefits using an average cost-effectiveness ratio and an incremental cost-effectiveness ratio. The average cost-effectiveness ratio was $791 per correct diagnosis for the full CT scan, compared with $1,008.13 per correct diagnosis for the limited CT scan. Although the costs and benefits were combined using an incremental cost-effectiveness analysis (i.e. the additional cost per additional patient correctly diagnosed), this was not relevant because the use of the full CT scan was both more effective and less costly than the use of the limited CT scan.

The authors reported that there were two scenarios where the limited CT scan became cost-effective, both of which involved values on the minimum side of the spectrum. In the first scenario, when the percentage of surgeons who would not operate without a full CT scan dropped to less than 65%, the limited scan became cost-effective, and the minimum case at 50% cost $95.44 less per correct diagnosis than the full-contiguous CT scan.

In the second scenario, when the total cost of the limited CT scan dropped below $154, it became cost-effective compared with the full-contiguous CT scan. Using the minimum case of $150, it cost $4.61 less per correct diagnosis.

**Authors’ conclusions**
The use of limited computed tomography (CT) scans was economically unsound as a method to reduce costs in a defined population.

**CRD COMMENTARY - Selection of comparators**
A justification was given for using full CT as the comparator. It was considered the ‘gold’ standard test in the authors' settings. You should decide if this intervention represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
It was unclear whether a full systematic review of the literature was undertaken to identify relevant research and minimise biases. The authors provided some information on the methodology of the review undertaken. For instance, the databases where searches were carried out, some of the inclusion criteria, and the keywords used in the search strategy. They did not, however, provide many details on the studies finally included in the review. The authors made several assumptions to supplement the results of the review of the literature, amongst them the assumption that full CT scans were 100% sensitive and specific. This assumption was not appropriately tested in a sensitivity analysis.

**Validity of estimate of measure of benefit**
The estimation of benefits was modelled using data from the literature and the authors’ own assumptions.

**Validity of estimate of costs**
All the categories of cost relevant to the perspective adopted were included in the analysis. However, the authors did not specify the costs covered under hospital charges, making it difficult to determine if certain relevant costs were excluded from the analysis. This limits the generalisability of the authors’ results. The authors undertook appropriate one-way sensitivity analyses of the costs by varying the total costs of full and limited CT scans, based on UMC Department of Radiology figures. Discounting was not relevant, as all the costs were incurred during a short time period, and was therefore not performed. The price year was reported, which will aid any possible inflation exercises.

**Other issues**
The authors did not compare their findings with those from other studies. The issue of generalisability to other settings was not addressed. The fact that the authors assumed that full CT was both 100% specific and sensitive, without undertaking appropriate sensitivity analyses, limits the internal and external validity of the authors’ results as this parameter appears to have been one of the key drivers in determining the cost-effectiveness. The authors reported a number of further limitations to their study. For example, the estimates of the sensitivity and specificity of limited CT scans were derived from retrospective studies. Also, the precision of the cost-effectiveness analyses was limited by assumptions in the analysis, data uncertainties, potential biases and best guesses.

**Implications of the study**
The authors reported that although limited CT scanning could play a role in a primary care setting if the prevalence of sinusitis was lower than 50%, its use is not cost-effective in the population sub-set of patients that would be evaluated in the otolaryngologist’s office.

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None stated.

**Bibliographic details**

**PubMedID**
15586806

**Other publications of related interest**
Sonkens JW, Harnsberger HR, Blanch GM, et al. The impact of screening sinus CT on the planning of functional...


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Subject indexing assigned by NLM

**MeSH**
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