Effect of computed tomography of the appendix on treatment of patients and use of hospital resources

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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
Routine computed tomography (CT) scanning in the diagnosis and treatment of patients with clinically suspected appendicitis.

Type of intervention
Diagnosis; Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Hospitalized patients with clinically suspected appendicitis. Ages ranged from 6 to 75 years and 57% were women. Pregnant women and patients with any contraindication to the instillation of contrast material into the colon were ineligible.

Setting
Hospital. The study was carried out in Boston, Massachusetts, USA.

Dates to which data relate
The dates of the clinical study were not reported. The cost and resource use data were based on the records of patients who attended the hospital between October 1993 and June 1997. The price year was not reported.

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

Link between effectiveness and cost data
The costing was undertaken retrospectively based on a different patient sample from that used in the effectiveness analysis.

Study sample
No power calculations were reported. A total of 100 consecutive patients with suspected acute appendicitis, who presented to the emergency department directly or with physician referral, were offered participation in the study. All those offered participation accepted it.
Study design
Case series. The study was conducted at a single centre. The clinical outcomes were followed up for 2 months after CT scanning. No losses to follow-up occurred.

Analysis of effectiveness
All the original participants were included in the analysis. The primary clinical outcomes used in the analysis were specificity, sensitivity, overall accuracy of the appendiceal CT, and change in patient management as a result of the CT scanning. The final outcomes were determined at surgery and by pathological examination in 59% of the cases and by clinical follow-up (by telephone or at the clinic) in patients who did not undergo surgery (41%).

Effectiveness results
The sensitivity, specificity, positive predictive values, negative predictive value, and overall accuracy were 98% each. The corresponding figures for the comparator were obtained according to the referring surgeon's judgement before CT scanning. CT findings resulted in 63 changes in this initial treatment strategy for 59 patients.

Measure of benefits used in the economic analysis
The measure of benefits was the number of unnecessary appendectomies avoided and number of avoided observation periods (1 day in hospital) before necessary appendectomies, before necessary treatment for CT-diagnosed alternative conditions, and before discharge with normal appendix.

Direct costs
Some quantities of resource use were reported separately from the costs. The costs measured were operating costs at hospital. The details of the methods used to calculate the cost per unnecessary appendectomy avoided and the cost per appendiceal CT scan were not reported. The cost per CT scan was determined from data for all patients undergoing pelvic CT in 1996, whereas the cost of unnecessary appendectomy was derived from data for a sample of 61 consecutive patients with normal findings after appendectomy. The cost per day of observation at hospital was determined from a sample of 350 patient-days using the lowest level of severity of illness for nursing resource use plus the cost of hospital room, according to the scales of the study hospital. Final costs were estimated on the basis of the actual data from the clinical study. The price year was not reported. The cost associated with the initial evaluations before CT (as well as the costs associated with cases whose treatment plan did not change as a result of CT) were assumed to be common and were excluded from the analysis.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
Cases of unnecessary appendectomy: 13.
Avoided observation periods (1 day in hospital) before necessary appendectomies: 21.
Avoided observation periods before necessary treatment for CT-diagnosed alternative conditions: 11.
Avoided observation periods before discharge with normal appendix: 13.
Cost results
Overall, the intervention resulted in net savings (negative incremental costs) of $44,731, relative to the comparator. The cost savings per patient was $447.30.

Synthesis of costs and benefits
Since the intervention was the dominant strategy, the costs and benefits were not combined.

Authors' conclusions
Routine appendiceal CT performed in patients who present with suspected appendicitis improves patient care and reduces the use of hospital resources.

CRD COMMENTARY - Selection of comparators
A justification for the comparators used was given. The comparator was diagnosis, and subsequent patient management, of those admitted to hospital with suspected appendicitis based on clinical findings alone (clinical history, physical examination, and laboratory results). The referring surgeon would judge the probability of appendicitis and then prescribe either observation in hospital (assumed to last one day), or urgent appendectomy. This was reported as the strategy used in 'many emergency departments'. The alternative strategy was to carry out both the clinical evaluation and the CT scan, and base the treatment plan on this combined information. You, as a user of this database, should consider whether these are appropriate alternatives in your setting.

Validity of estimate of measure of benefit
Potential observation bias may be inherent due to the study design if the physician who did the initial judgement, based on clinical evaluation only, was aware of the ongoing study. Adequate details of the study design were not provided. An additional source of observation bias is represented by the 41 patients (41%) whose final diagnoses were established by clinical follow-up via telephone at two months. All the outcome measures used in the economic evaluation, however, indicated consistent and remarkable improvement in treatment of patients, and this lends more confidence to the results.

Validity of estimate of costs
The cost analysis was undertaken retrospectively, lacked some details about individual items involved in the calculation, and reported few relevant quantities of resource use separately from costs. The price year was not reported. The cost calculation was based only on the cases whose treatment would change as a result of incorporating the CT findings in the treatment decision, and hence assumed many cost components as common for both alternatives.

Other issues
The authors' conclusions seem to be justified. The comparison with previous studies yielded similar results for the diagnostic accuracy of appendiceal CT. The authors noted that the study population involved only patients who met the clinical criteria for hospitalisation due to suspected appendicitis, and therefore the savings are likely to be somewhat less for patients with low suspicion of appendicitis. The net savings were, however, remarkable when compared to the cost of CT scanning, and conservative estimates were used in calculating the costs of unnecessary operations and hospitalisation avoided as a result of CT scan. It should be noted that the costs represent experiences from the study hospital and may not be generalisable to other hospitals in the USA or, more especially, to other countries. The results were not presented selectively.

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