Assessing short-term effects and costs at an early stage of innovation: the use of positron emission tomography on radiotherapy treatment decision making

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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.

CRD summary
This study examined the impact of using positron emission tomography (PET) as an adjunct to conventional computed tomography prior to radiotherapy treatment for patients with unresectable non-small-cell lung cancer or Hodgkin’s disease. The study demonstrated that PET was more valuable for patients with lung cancer than those with Hodgkin’s disease in terms of costs and changes in patient management. The authors’ conclusions should be considered with a degree of caution given that the study had some limitations, especially on the clinical side.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The primary objective of the study was to examine the impact of using positron emission tomography (PET) as an adjunct to conventional computed tomography (CT), compared with CT alone, as the imaging approach for patients with unresectable non-small-cell lung cancer (NSCLC) or Hodgkin’s disease considered for radiotherapy.

Interventions
The two diagnostic approaches under examination were CT plus PET versus CT alone. Both strategies were used prior to performing radiotherapy in the two groups of patients with unresectable disease.

Location/setting
France/hospital.

Methods
Analytical approach:
This economic evaluation was based on a single study. A short-term time horizon was considered as the analysis was restricted to the time span corresponding to the diagnostic work-up. The authors stated that a societal perspective was adopted in the study.

Effectiveness data:
The clinical data were derived from a sample of 209 patients (112 NSCLC patients and 97 Hodgkin’s disease patients) enrolled in 8 centres over the period January 2004 to December 2005. NSCLC patients in Stage IV and patients with Hodgkin’s disease Stage III and IV were excluded. This prospective study used patients as their own controls and determined the potential changes in patient management (i.e. the definition of radiotherapy treatment) as a consequence of the results of the imaging strategies. Changes in the decision could imply modifications of the dose and/or the volume and/or the radiotherapy technique, or postponement or even cancellation of treatment.

Monetary benefit and utility valuations:
None.

Measure of benefit:
No summary benefit measure was used in the economic analysis. The primary end point of the clinical study was the percentage of patients with a change in their management as a consequence of the PET results.
Cost data:
The economic analysis focused on the costs incurred or saved by using PET for radiotherapy decision-making. Costs common to both strategies (i.e. initial treatment planning) were excluded from the analysis. The three main categories of costs considered were the PET scan itself, the additional tests intended for the interpretation of the PET scan, and the costs incurred or saved by changes in radiation treatment as a result of the PET scan. The resource quantities were assessed using a micro-costing approach based on both hospital- and patient-questionnaires. The cost items included were staff hours (operators and nuclear medicine doctors), equipment (PET scan, nuclear medicine equipment, and administration of $\text{[18F]}$fluoro-2-deoxy-D-glucose), additional tests and patient transportation. The costs were derived from average salary costs, the hospital accounting system and reimbursement rates. Equipment depreciation was considered by applying a 3% discount rate. The costs were in euros (EUR). The price year was 2005.

Analysis of uncertainty:
The issue of uncertainty was not addressed.

Results
Changes in radiotherapy treatment decisions with the use of PET in comparison with CT alone: the rate of therapy cancellation was 3.3% (6.2% in NSCLC and 0% in Hodgkin's disease), the rate of radiotherapy postponement was 1.9% (0% and 4.1%), the rate of changes in dose and volume and/or technique was 8.1% (12.5% and 3.1%), and the rate of change in volume only was 12.9% (21.4% and 3.1%). Overall, changes occurred in 40.1% of patients with NSCLC and in 10.3% of patients with Hodgkin's disease.

The additional cost of PET equipment amounted to EUR 889.2 per patient. For those with Hodgkin's disease there was an additional cost of EUR 29 for tests and EUR 12.9 for changes in decisions. For patients with NSCLC there was an additional cost of EUR 56.9 for tests, but there were savings of EUR 520.6 due to changes in decisions.

Overall, the total additional costs of the PET plus CT strategy over the CT alone option were EUR 425.5 in NSCLC patients and EUR 931.1 in Hodgkin's disease patients. Only in NSCLC patients did the changes in radiotherapy treatment as a result of PET lead to substantial cost-savings, while there was a small increase in resource consumption in Hodgkin's disease patients.

Authors' conclusions
The authors concluded that the use of PET as an adjunct to CT prior to radiotherapy treatment was more valuable for patients with lung cancer than for those with Hodgkin's disease in terms of costs and changes in patient management.

CRD commentary
Interventions:
The selection of the comparators under examination was justified and appears relevant to several health systems.

Effectiveness/benefits:
The clinical study was based on prospective data derived from a single sample of patients who served as their own controls. In effect, a separate comparison group was not used. Consequently, some of the clinical results of the analysis were based on hypothetical management rather than on real observation. The analysis considered outcome measures that were not directly related to the patients' health but which could be considered as a surrogate for clinical end points. In addition a very short-term horizon was used and no sensitivity analysis was performed. These issues might affect the robustness of the study, as the authors acknowledged.

Costs:
The analysis of the costs represented the key aspect of the study. The authors provided extensive details on the types of costs included, the approaches used to derive estimates of resource consumption, the use of discounting to take into account equipment depreciation, and the price year. However, the unit costs and the resource quantities were not presented separately. This piece of information would have made the whole analysis more transparent. Furthermore, the authors stated that the cost of some items might change over time, thus affecting their conclusions.

Analysis and results:
The analysis focused on the consumption of resources and treatment patterns. Thus, the clinical side of the study was not considered. The authors justified this aspect of the analysis on the grounds of the very limited time horizon of the study, which precluded the investigation of the real impact of these diagnostic approaches on patient health. As a result, a cost-consequences analysis was performed. The authors did not address the issue of uncertainty, given that the analysis relied on real-world data that might be considered valid in their own setting.

Concluding remarks:
The authors' conclusions should be treated with some degree of caution given that there were some limitations of the study, especially on the clinical side.

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Bibliographic details

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
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