The cost-effective use of 18F-FDG PET in the presurgical evaluation of medically refractory focal epilepsy

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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
The authors evaluated the therapeutic and health impacts of various strategies which involved fluorine-18 (18F)-fluorodeoxyglucose (FDG) positron emission tomography (PET) in the pre-surgical evaluation for medically refractory focal epilepsy. They concluded that 18F-FDG PET provided important prognostic and cost-effective information, particularly for patients for whom the MRI or the VEM gave non-localising or non-concordant results. There were a few limitations so the authors’ conclusions should be considered with a degree of caution.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The aim was to evaluate the therapeutic and health impacts of various strategies that involved fluorine-18 (18F)-fluorodeoxyglucose (FDG) positron emission tomography (PET) for the pre-surgical evaluation for medically refractory focal epilepsy.

Interventions
Three imaging strategies were compared with a baseline strategy of medical therapy for all patients.

The three strategies were video-electroencephalography monitoring (VEM) with magnetic resonance imaging (MRI); VEM+MRI with ictal (during seizure) single photon emission computed tomography (SPECT) for those patients with indeterminate VEM+MRI; and VEM+MRI plus interictal (between seizures) 18F-FDG PET for those patients with indeterminate VEM+MRI.

Location/setting
Australia/hospital.

Methods
Analytical approach:
A decision tree model with a 39-month median time horizon was used. The authors stated that the perspective was that of an Australian purchaser.

Effectiveness data:
The effectiveness data were mostly based on a cross-sectional sample of 176 patients, who underwent 18F-FDG PET as part of their pre-surgical evaluation, although some data were derived from other studies. The "gold standard of lesion localisation" was derived through consensus by a group of experts, who were presented with all of the test information. The main outcomes were localisation rates, patient's status defined using a modified Engel scale to assign a post-surgical outcome of good (class I or II) or poor (class III or IV), and the characteristics and concordance of the tests.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The measure of benefit was the achievement of a class I or II outcome.

Cost data:
The direct costs were those of both the investigation (the tests) and the surgery. These were based on the Medicare schedule and Australian hospital diagnosis related group classifications. Testing costs and surgery costs were presented separately. The direct lifetime savings of a class I or II outcome were based on an assumption made by the authors. The currency was Australian dollars (AUD).

Analysis of uncertainty:
A series of one-way sensitivity analyses, which included outcomes, prevalences, and characteristics of tests, as well as lifetime savings in direct medical costs from a class I or II outcome, were performed. The ranges of values tested were adequately described.

Results
The potential class I or II outcomes were 47.6% with VEM+MRI alone, 85.8% with SPECT, and 97.8% with PET. The costs of investigation and surgery were AUD 10,632 with VEM+MRI, AUD 21,248 with SPECT, and AUD 21,982 with PET. The cost per class I or II outcome for each strategy was also reported.

The incremental cost-effectiveness ratio (ICER, the increased cost per additional positive outcome) of SPECT over VEM+MRI was AUD 104,078, and the ICER for PET over VEM+MRI was AUD 84,703.

The sensitivity analysis showed that the results were generally robust. The only conditions under which SPECT would produce a lower cost per class I or II outcome, were when the SPECT sensitivity was at the upper confidence limit and either the PET sensitivity or specificity were at the lower limit.

When including lifetime costs, all the strategies were cost saving and the savings were higher for PET and SPECT than for VEM+MRI (these results were shown in a figure only). Further results were presented in supplemental tables.

Authors’ conclusions
The authors concluded that 18F-FDG PET provided important prognostic and cost-effective information for the pre-surgical evaluation of medically refractory focal epilepsy, particularly for patients for whom the MRI or the VEM gave non-localising or non-concordant results.

CRD commentary
Interventions:
The interventions were described in detail and were justified. They appeared to be relevant interventions for the population and setting.

Effectiveness/benefits:
The authors described in detail how the effectiveness and benefit measures were derived. The study and baseline patient characteristics were presented. The gold standard was determined by the consensus of an expert panel on the basis of all the available clinical and investigation information. The authors justified using this consensus method over independently and blindly assessing the results.

Costs:
The costing section was brief. The authors included only the cost categories of the investigation (tests) and surgery. It is not clear, from the details reported, what these two cost categories contained. For example, it is not possible to determine whether the staff costs were included. Future lifetime costs saved were roughly assumed and, although these were subjected to sensitivity analysis, it is difficult to determine whether the range and baseline estimate were appropriate. No discounting appears to have been carried out despite the long time horizon and the price year was not reported, which will hinder reflation exercises.

Analysis and results:
An incremental analysis was conducted, but the comparators were not ranked and compared to the next most effective
one, instead each comparator was compared with VEM and MRI alone. Whilst the majority of the results were presented, it is not clear that all of the data required to calculate the ICERs was presented. The reader was referred to online supplemental tables for some results. The authors noted limitations, which included the lack of outcome data in non-operated patients, and the non-universal performance of PET for all patients. Overall, the reporting was fairly transparent and the lack of some information may have been due to space limits, but the cost analysis was fairly weak.

Concluding remarks:
There were a few limitations so the authors’ conclusions should be considered with a degree of caution.

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