Outcomes and costs of positron emission tomography: comparison of intravenous adenosine and intravenous dipyridamole

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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
Positron emission tomography (PET) with intravenous adenosine in patients referred for PET imaging to evaluate coronary artery disease (CAD).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Patients referred for PET imaging to evaluate CAD (myocardial infarction, coronary revascularization, or both).

Setting
Hospital. The economic study was carried out in Omaha, Nebraska, USA.

Dates to which data relate
The effectiveness and resource use data corresponded to patients referred for PET imaging from January 1993 to March 1996. The price date was not reported.

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

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

Study sample
No power calculations were reported. A total of 108 patients was included in the study. 72 patients with an average (SD) age of 58.9 (10.9) years underwent adenosine PET, and 36 patients with an average age of 59.3 (12.2) years underwent dipyridamole PET. An experienced cardiologist blinded to the results of the PET studies interpreted the coronary arteriograms.

Study design
This was a retrospective cohort study. The study was carried in a single centre. The duration of follow-up was for a
minimum of 5 minutes and until stabilisation in terms of blood pressure, heart rate, ST segments or side effects. No loss to follow-up was reported.

**Analysis of effectiveness**
The principle (intention to treat or treatment completers only) used in the analysis of effectiveness was not explicitly specified. The primary health outcomes used in the analysis were side-effects, sensitivity, specificity, and predictive accuracy for identification of coronary stenosis. The groups were matched in a 2:1 ratio for the intervention and the comparator, in terms of age, body weight, sex, previous myocardial infarction, coronary anatomy, and previous coronary revascularization.

**Effectiveness results**
The proportion of patients in the dipyridamole group who experienced at least one side-effect was 67% versus 82% in the adenosine group, (p=0.047). The percentage of patients experiencing side-effects requiring medical intervention was 6% in the adenosine group versus 53% in the dipyridamole group, (p<0.0001). The overall sensitivity, specificity and predictive accuracy values associated with adenosine PET were 88%, 93%, and 90%, respectively. For dipyridamole PET, the corresponding values were 87%, 89%, and 87%.

**Clinical conclusions**
Although adenosine was associated with a greater frequency of side effects, dipyridamole was associated with a statistically significant increase in delayed and prolonged side effects requiring medical intervention.

**Measure of benefits used in the economic analysis**
The measure of benefits used in the economic analysis was predictive accuracy, defined as number of true-positive results + number of true negative results all divided by total number of tests (multiplied by 100).

**Direct costs**
Costs were not required to be discounted due to the short time frame of the study. The quantities of resources were not fully reported separately from the prices. The costs measured were operating, overhead, supplies, and those associated with side-effects. The boundary adopted was the hospital. The estimation of costs was based on actual data from the study institution. The data corresponded to patients referred to PET imaging from January 1993 to March 1996. The price date was not reported.

**Statistical analysis of costs**
Mann-Whitney U-test was used to compare the study groups in terms of the costs.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was conducted.

**Estimated benefits used in the economic analysis**
The overall predictive accuracy for adenosine PET (intervention) was 90%, and for dipyridamole PET (comparator) was 87%.

Cost results
The total (median) intervention cost was $577.0 (+/- 122.8) and the total (median) comparator cost was $727.6 (+/- 233.6), (p<0.001).

Synthesis of costs and benefits
The total median cost per correctly diagnosed patient was used as the outcome measure to synthesise the costs and benefits associated with each strategy. The price date was not reported. The total median cost per correctly diagnosed patient was $672 for the intervention, and $928 for the comparator, (p<0.001).

Authors' conclusions
Adenosine may be the drug of choice for pharmacologic vasodilation for PET.

CRD COMMENTARY - Selection of comparators
A justification was given for the choice of the comparator. It was the approved pharmacologic alternative in the context in question at the time of the study in the USA.

Validity of estimate of measure of benefit
The internal validity of the estimate of effectiveness cannot be guaranteed due to the retrospective study design adopted, which may have introduced potential biases.

Validity of estimate of costs
The resource quantities were not systematically reported separately from the prices. Adequate details of cost estimation were given, except for the price date used in the analysis. No relevant cost items appear to have been omitted.

Other issues
A sensitivity analysis would have been desirable, in the context discussed. More importantly, according to the authors, the study findings do not apply to institutions where aminophylline is routinely administered, as prophylaxis, after dipyridamole but before imaging.

Source of funding
None stated.

Bibliographic details

PubMedID
9220220

Indexing Status
Subject indexing assigned by NLM
MeSH
Adenosine /adverse effects /economics /pharmacology; Cardiac Catheterization; Case-Control Studies; Coronary Disease /radionuclide imaging; Cost-Benefit Analysis; Dipyridamole /adverse effects /economics /pharmacology; Economics, Pharmaceutical; Electrocardiography; Female; Hemodynamics /drug effects; Humans; Male; Middle Aged; Retrospective Studies; Tomography, Emission-Computed /economics; Vasodilator Agents /adverse effects /economics /pharmacology

AccessionNumber
21997008224

Date bibliographic record published
31/03/2000

Date abstract record published
31/03/2000