**Positron emission tomography in Quebec**
*Dussault F P, Van H Nguyen, Rachet F*

**Authors' objectives**
To gather hard data on the clinical use of positive emission tomography (PET) in different fields, in particular, oncology, neurology and cardiology. In addition, to make recommendations (based on cost- and clinical-effectiveness data) concerning the possible deployment of PET in Quebec, Canada.

**Searching**
MEDLINE (via PubMed), the Cochrane Library, EMBASE and Cancerlit were searched from 1966 to February 2001 using a variety of search terms, which were detailed in an appendix of the review. Language was not an exclusion factor, but only articles with an English or French abstract were included automatically. Articles in Spanish or German were selected for future consideration, if warranted. Additional relevant publications were obtained with assistance from advisory committee members, and by scanning the Internet and reports of committees evaluating PET technology.

**Study selection**
Study designs of evaluations included in the review
The studies had to include 10 or more participants and include all consecutive eligible patients based on the inclusion criteria.

Specific interventions included in the review
The inclusion criteria for the interventions specified studies of PET using the radiopharmaceutical 2-[18F]fluoro-2-D-glucose (FDG). The methods of performing the test had to be described in sufficient detail to permit replication.

Reference standard test against which the new test was compared
No inclusion criteria relating to the reference standard were specified. Studies were included if independent, blinded comparisons with a reference standard were conducted. Other methods of scanning (e.g. CT, MET, MRI, SPECT), with or without laboratory testing, served as the reference standards for the review. The authors state that studies were included if the PET scan results had no influence on the decision to perform or not perform the reference standard test.

Participants included in the review
The inclusion criteria specified participants with the disease of interest (cardiac, oncology or neurology patients). Patient criteria in the included studies had to be clearly stated.

Outcomes assessed in the review
The inclusion criteria for the outcomes were not specified a priori.

How were decisions on the relevance of primary studies made?
A team of five reviewers selected the papers for the review.

**Assessment of study quality**
The authors assessed the validity of the included studies using two hierarchies of evidence developed by Flynn and Adams (see Other Publications of Related Interest). The authors do not state how many of the reviewers performed the validity assessment.

**Data extraction**
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.
Methods of synthesis
How were the studies combined?
The studies were grouped in a narrative synthesis according to the different uses of PET: diagnostic (staging, spread, recurrence), therapeutic impact (choice of treatment and therapeutic monitoring), patient outcomes and cost-effectiveness.

How were differences between studies investigated?
The authors do not state a method for assessing any differences between the studies.

Results of the review
Eighty-four studies were included in the review: 53 oncologic, 16 neurology and 15 radiology. An additional 9 studies were identified on miscellaneous uses of PET not covered by this report. The study designs were not listed.

Oncology.
Lung cancer (n=17): in non-small-cell cancer, the clinical utility of PET is recognised for characterising the solitary pulmonary nodule and initial staging when a diagnosis of non-small-cell lung cancer is made. PET has potential for monitoring response to therapy and detecting recurrent or residual tumours.

Colorectal cancer (n=5): the clinical utility of PET is recognised for (1) detecting pre-operatively hepatic and extra-hepatic metastases in patients in whom a localised recurrence is detected; (2) determining the location of recurrent tumours in the presence of clinical symptoms or abnormal paraclinical findings; and (3) differentiating between recurrence and post-operative scar in the context of diagnostic imaging that shows abnormalities. PET has potential for monitoring response to therapy and is not recognised for diagnosing the primary lesion.

Melanoma (n=9): the clinical utility of PET is recognised for detecting extranodal metastases during initial staging or in the context of a post-operative follow-up, and evaluating a potentially treatable recurrence. PET is not recognised for diagnosing the primary lesion or detecting lymph node metastases.

Head and neck cancer (n=9): the clinical utility of PET is recognised for (1) identifying an unknown primary tumour in the presence of cervical node metastases; (2) staging cervical lymph nodes when there are negative findings on conventional imaging; and (3) detecting recurrent disease or residual tumour and differentiating post-operative scar. PET is not recognised for monitoring response to therapy.

Lymphoma (n=6): in Hodgkin’s and non-Hodgkin’s lymphoma, the clinical utility of PET is recognised for initial staging when restaging could affect the choice of treatment, and evaluating residual disease after treatment. PET has potential for evaluating response to therapy. Breast cancer (n=6): the clinical utility of PET is not clearly recognised. However, PET has potential for staging primary and recurrent tumours; detecting axillary and internal mammary lymph node metastases; detecting the primary tumour in the context of an equivocal complete evaluation; and monitoring response to therapy.

Prostate cancer (n=1): FDG-PET has potential clinical utility for detecting recurrence or residual tumours, although there are currently no data to demonstrate its efficacy.

Miscellaneous uses (not examined and reported in this review): nine studies are listed in the data extraction tables without further summary.

Neurology.
Alzheimer’s disease (n=2): the clinical utility of PET is not recognised.

Refractory epilepsy (n=14): the clinical utility of PET is recognised for localising epileptogenic foci in patients with refractory epilepsy who are being considered for surgery and where inconclusive localising information is provided by a standard assessment, including seizure semiology, electroencephalography and magnetic resonance imaging.
Brain tumours (n not stated): the clinical utility of PET is recognised for evaluating residual lesions after treatment of a recurrent glioma and differentiating between radionecrosis and recurrence in patients treated with radiation therapy who have abnormalities on diagnostic imaging. PET has potential for the initial staging of patients suspected of having a primary brain tumour, in order to guide biopsy to the highest area of activity; evaluating the progression of a low-grade glioma to malignancy; the pre-operative work-up; grading tumours; the choice of treatment; determining the prognosis; and detecting metastases.

Other clinical uses in neurology and psychiatry (n not stated): not examined in detail in this study.

Cardiology.

Myocardial viability (n=15): in cardiology, the clinical utility of PET is recognised for studying myocardial perfusion for the purpose of diagnosing and managing coronary artery disease; and studying myocardial viability. PET has potential for monitoring heart transplant patients and monitoring the effect of treatments and the response to therapy in coronary artery disease.

Miscellaneous cardiology: functional reversibility of segmental wall motion (n=28) was not evaluated further in the review.

Cost information
The authors state that models have mainly concerned non-small-cell lung cancer and solitary pulmonary nodules, and that there is little information on the evolution of patients following PET scanning. Given that there are no direct measurements of the impact of PET on quality of life and survival, the economic evaluations are based on intermediate evaluation measures of the patients' clinical evolution. Nevertheless, the data tend to suggest that PET could generate savings if the upper limit of cost-effectiveness is set at $50,000 per life-year saved.

Authors' conclusions
This review confirms the clinical utility of PET in many oncological, neurological and cardiological applications. Depending on the type of cancer, PET is used for diagnostic purposes, for detecting metastases, and for monitoring response to therapy. In neurology, PET is recognised to be effective in certain uses in epilepsy and brain tumours. In cardiology, its utility is recognised in certain applications, such as myocardial viability and myocardial perfusion studies. Lastly, PET has promising potential for other uses in these area of practice. There are few cost-effectiveness data on the efficiency of PET.

CRD commentary
This review is more of a narrative overview than a full systematic review. However, it does meet the inclusion criteria for this database of reviews. The authors have stated the research question, but the scope of the inclusion and exclusion criteria was limited. The literature search was fairly thorough, was not restricted to English language publications, and did attempt to find unpublished or grey literature. There were no tests for publication bias.

The quality of the included studies was assessed using diagnostic-oriented hierarchies of evidence, and the authors have reported how the articles were selected, but not who performed the validity assessment and data extraction. The authors have used quality issues inherent in diagnostic studies as a basis for including or excluding studies, thus enhancing the quality of the studies included in this review.

The data extraction was reported in depth in tables in the appendices, and was briefly discussed in the text of the review. It was not possible or appropriate to perform a statistical meta-analysis of the included studies, so the authors have summarised the studies in a narrative overview. There was no discussion of heterogeneity. The authors' summaries appear to follow from the data in the studies, but should be viewed with much caution because of limitations in the quality of the review process.

Implications of the review for practice and research
Practice: The authors make several recommendations for the deployment of PET in Quebec, mainly concerning the promotion of PET and increasing the availability of PET scanning.

Research: The authors state that further research is needed for both clinical and cost-effectiveness data.

Funding
AETMIS.

Bibliographic details
Dussault F P, Van H Nguyen, Rachet F. Positron emission tomography in Quebec. Montreal, PQ, Canada: Agence d'Evaluation des Technologies et des Modes d'Intervention en Sante (AETMIS). AETMIS; 01-3 RE. 2002

Original Paper URL

Other publications of related interest

Indexing Status
Subject indexing assigned by CRD

MeSH
Brain Diseases /diagnosis; Coronary Disease /radionuclide imaging; Epilepsy /diagnosis; Heart Diseases /radionuclide imaging; Neoplasms /radionuclide imaging; Tomography, Emission-Computed

AccessionNumber
12002008524

Date bibliographic record published
30/09/2003

Date abstract record published
30/09/2003

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.