Cost-effectiveness analysis of somatostatin receptor scintigraphy
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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
Somatostatin receptor scintigraphy (octreotide scintigraphy) in detecting neuroendocrine tumours.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Patients having, or suspected of having, one of five types of neuroendocrine tumours.

Setting
Hospital outpatient departments in Rotterdam, The Netherlands.

Dates to which data relate
1993 prices were used for equipment costs. Dates for the study, prices and resources were not given.

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

Link between effectiveness and cost data
Costing was undertaken retrospectively on the same patient sample as that used in the effectiveness study.

Study sample
One hundred and fifty patients having, or suspected of having, one of five types of neuroendocrine tumours were included in the study:

33 patients in the carcinoids group;
21 patients with medullary thyroid carcinoma (MTC);
34 patients having, or suspected of having, paragangliomas;
36 patients with endocrine pancreatic tumours (12 gastrinomas and 24 insulinomas);
and 26 patients with small-cell lung carcinoma (SCLC).
It is not known whether power calculations were used to determine sample size. Details of the method of sample selection were not stated. Patients in each diagnostic group were scanned by conventional and octreotide techniques, but not all patients were scanned by all techniques.

The study results were presented for the five categories of tumours. Confidence intervals and p-values were not given.

Carcinoids: Four combinations of imaging techniques were applied to carcinoid patients. Conventional imaging alone detected 49% of tumours. Somatostatin receptor scintigraphy, in combination with chest radiograph and ultrasound of the upper abdomen, detected all 69 of the tumours found by any technique.

Medullary Thyroid Carcinoma: Six imaging techniques were applied to this category of patients. The use of somatostatin receptor scintigraphy, alone or in combination with other techniques, did not result in a significant increase in the number of lesions detected.

Paragangliomas: In this group, five imaging techniques were used. Conventional imaging alone detected 71% of all lesions visualised by any technique. Somatostatin receptor scintigraphy detected an additional 25% of lesions.

Endocrine Pancreatic Tumours: Patients with this type of tumour were sub-divided into two groups. Four imaging techniques were applied to patients with gastrinomas. Somatostatin receptor scintigraphy, in combination with CT scanning of the upper abdomen, detected tumours in 75% of patients. Conventional imaging detected tumours in 50% of patients. Five imaging techniques were applied to patients with insulinomas. Whereas conventional imaging failed to localise tumours in 46% of patients, in combination with somatostatin receptor scintigraphy, more lesions were visualised. Applied alone, somatostatin receptor scintigraphy demonstrated tumours in 42% patients.

Small-Cell Lung Carcinoma: Five combinations of imaging schemes were investigated. Somatostatin receptor scintigraphy revealed all the primary tumours detected by any technique and its inclusion in the staging protocol of patients led to 36% of patients being upgraded from Limited Disease (LD) to Extensive Disease (ED). In addition, when somatostatin receptor scintigraphy was applied to all patients, 19% were shown to have unexpected brain metastases.

**Study design**
The study was a prospective case series study.

**Analysis of effectiveness**
The analysis of the clinical study was based on intention to treat. The primary outcomes used were the number of lesions detected. The issue of the comparability of groups was not addressed in the analysis.

**Clinical conclusions**
Somatostatin receptor scintigraphy supplied additional information on tumour locality for all types of neuroendocrine tumours, with the exception of medullary thyroid carcinomas. In patients with SCLC, the use of somatostatin receptor scintigraphy can lead to a change of grading; it may also be used for early detection of cerebral metastases, possibly resulting in an improved quality of life.

**Measure of benefits used in the economic analysis**
Benefits were measured directly from the study in terms of the number of lesions detected. This was a primary outcome measure, rather than a measure of health benefit. The authors discussed the importance of locating tumours in making clinical decisions. For some SCLC patients, they also considered the possible effect of this information on quality of life. However, a relationship between tumour detection and life expectancy or quality of life of the study patients was not formally identified.

**Direct costs**
The figures supplied related to hospital costs. Labour, materials, equipment and housing, and overhead costs were included in the analysis. The average working hours per year were found for physicians, interns, radiology and nuclear medicine workers and administrative personnel. An hourly operating cost was found for equipment, using a discount rate of 8%, an equipment life span of 8 years, and 1993 prices. Information on the cost of materials and time used for each procedure were provided by the departments of radiology and nuclear medicine. Costs and quantities were not reported separately. With the exception of equipment costs, dates for costs were not stated.

**Currency**
Costs were expressed in Dutch Florins (Dfl). A conversion rate of Dfl 1 = US$0.6 was given.

**Sensitivity analysis**
A sensitivity analysis of the data was not performed.

**Estimated benefits used in the economic analysis**
Benefits were measured in terms of the number of lesions detected (the measure of effectiveness). The results are identical to those described above in the effectiveness section.

**Cost results**

- **Carcinoids:** For carcinoid patients, the application of somatostatin receptor scintigraphy, chest radiography and ultrasond of the upper abdomen cost Dfl 1,620 per patient. CT scanning of the chest and abdomen cost Dfl 720 per patient. The incremental cost of somatostatin receptor scintigraphy was therefore Dfl 900.

- **Medullary Thyroid Carcinoma:** It cost an extra Dfl 1220 to perform a somatostatin receptor scintigraph on patients with MTC, who had already been investigated with CT scanning (of the neck, chest and upper abdomen) combined with bone scintigraphy. This conventional imaging cost Dfl 950 per patient.

- **Paragangliomas:** The incremental cost of somatostatin receptor scintigraphy, with the use of SPECT, in patients shown with CT scanning to have one paraganglioma, was Dfl 799 per patient. The cost of conventional imaging alone was not explicitly stated.

- **Endocrine Pancreatic Tumours:** An incremental cost of Dfl 1,042 per patient was given for patients with gastrinomas; costs for the comparator were not supplied. No explicit cost figures for patients with insulinomas were given.

- **Small-Cell Lung Carcinoma:** Conventional imaging for patients with SCLC consisted of a CT scan of the head and upper abdomen combined with a bone scan. This cost Dfl 558 per patient. Those patients in whom Limited Disease was demonstrated were then given a somatostatin receptor scintigraph, incurring an additional cost of Dfl 607 per patient.

**Synthesis of costs and benefits**
For patients with paragangliomas an average cost-effectiveness ratio of Dfl 532 per lesion detected was compared with Dfl 669 per lesion detected for conventional imaging. No incremental cost per additional lesion detected was reported for any type of tumour. No incremental analysis was performed and discount rates were not used. The authors did discuss the cost effectiveness of somatostatin receptor scintigraphy in relation to the other categories of tumour, but did not provide any formal synthesis of costs and effectiveness in these cases.

**Authors’ conclusions**
The authors considered the additional cost incurred by the application of somatostatin receptor scintigraphy to be justified for patients with carcinoids, paragangliomas, gastrinomas and SCLC. For patients with insulinomas, somatostatin receptor scintigraphy could supply valuable information if CT scanning failed to detect a tumour. In the case of patients with MTC, the authors concluded that the application of somatostatin receptor scintigraphy supplied
very little additional information at high cost and did not recommend its use.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparators used. The authors referred to these comparators as 'conventional imaging techniques', suggesting that these were the modalities normally applied to this type of tumour. 'Sensitivity', or detection rate, was the key factor cited for the choice of a particular technique. You should consider whether these are widely used technologies in your own setting.

**Validity of estimate of measure of benefit**
Although 150 patients were included in the study, these were subdivided into much smaller groups, the largest being 34 patients and the smallest only 12. The possibility that chance determined the findings of the study cannot be ruled out. Furthermore, no details were given of the sample selection, introducing the possibility of sample bias. Moreover, there may have been confounding differences between the treatment and control groups, as patients were screened selectively within each diagnostic group. It is not known whether statistical tests were performed at any stage of the analysis. The internal validity of the measure of benefit, the number of lesions detected, cannot, therefore, be certain. There is no evidence that data were used selectively.

**Validity of estimate of costs**
Resource quantities were not reported separately from the prices. Adequate details on the methods used to determine quantities were given, and no important cost items were omitted.

**Other issues**
In the light of the small sample size and the selective use of imaging technologies, it is hard to see how this study can justify the authors' conclusions. The issue of generalisability to other settings was not directly addressed, but adequate comparisons with other studies were made. Results were not presented in a way that makes it possible to establish the cost-effectiveness of somatostatin receptor scintigraphy.

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**Other publications of related interest**

**Indexing Status**
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