Practice, efficacy and cost of staging suspected non-small cell lung cancer: a retrospective study in two Dutch hospitals


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
The use of preoperative tumour staging for non-small-cell lung carcinoma (NSCLC). The staging procedures included both invasive and non-invasive investigations. Invasive investigations included rigid bronchoscopy and surgical procedures such as mediastinoscopy and video-assisted thoracotomy. Non-invasive investigations included flexible bronchoscopy, imaging tests and punctures/biopsies not requiring mediastinoscopy, thoracotomy, video-assisted thoracoscopy or rigid bronchoscopy. The aim of the staging was to select candidates for the appropriate treatment (particularly for curative surgery).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with diagnosed or suspected NSCLC.

Setting
The setting was a hospital. The economic study was carried out at an academic hospital (VU University Medical Centre, VUMC) and at a community hospital (Medical Centre Alkmaar, MCA) in Amsterdam, The Netherlands.

Dates to which data relate
The effectiveness and resource use data were gathered from January 1993 to January 1995. No price year was reported.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

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

Study sample
Power calculations to determine the sample size were not performed. All the patients referred by their family physicians to the pulmonologists at the two study hospitals between January 1993 and January 1995 were included in the study. Of the 395 initially identified patients with suspected NSCLC (253 in the MCA and 142 in the VUMC), 58 cases were medically inoperable. Thus, the final sample comprised 337 patients, of which 271 (80.5%) were men. The
mean age was 64 years (range: 27 - 88). No external comparison group was considered in the study.

**Study design**
This was a retrospective study based on a cohort of patients. The analysis was carried out in two hospitals in Amsterdam (MCA and VUMC). The patients' charts were reviewed for a period of one year, and only 6 patients were lost to follow-up.

**Analysis of effectiveness**
The basis of the analysis of effectiveness was treatment completers only. The primary health outcomes assessed were the number of diagnostic procedures performed and several outcomes related to the yield of the test, such as the type of tumour detected, duration of staging and rate of recurrences. The final outcome measure was the rate of futile surgery. The authors stated that the age and gender of the patients identified in the two study hospitals were comparable.

**Effectiveness results**
The average number of diagnostic procedures the patients underwent between the first visit and the final clinical stage classification was 5.1 (+/- 1.5).

The most common procedures were ultrasound and abdominal computed tomography scans (48%), bone scans (36%), and computed tomography or magnetic resonance imaging scans of the brain (16%).

Overall, 50% of the patients (169 out of 337) proved to be ineligible for curative surgery as a result of clinical staging. Thoracotomy was planned for the remaining 168 patients.

In 50% of the patients the diagnostic work lasted more than 3 weeks (median: 20 days; interquartile range, IQR: 10 - 31 days).

For those deemed to be operable this timeframe was 25 days (IQR: 16 - 34 days), and for clinically operable patients it was 14 days (IQR: 8 - 26).

For 24 of the 168 operable patients thoracotomy was cancelled for several reasons, such as benign nature of the carcinoma, pneumonia, cardiac events, deterioration of performance status, or withdrawals.

Of the 144 patients undergoing thoracotomy, the mean interval between staging and surgery was 7 days (IQR: 0 - 17).

In these 144 patients (85 at MCA and 59 at VUMC), 19 tumours were benign (9 at MCA and 10 at VUMC, P<0.01), 33 cases were irresectable at surgery (10 at MCA and 23 at VUMC), 20 patients presented recurrence after radical surgery (13 at MCA and 7 at VUMC), and 2 cases presented other malignancies (2 at MCA).

Curative surgery was consequently futile for 74 patients (51%, 95% confidence interval, CI: 40 - 60%); 34 cases (40%) at the MCA and 40 cases (68%) at the VUMC, (P<0.001).

Of all the patients with NSCLC, 21% (95% CI: 16 - 25) were alive and clinically disease-free at the 12-month follow-up. This rate was similar at the two hospitals.

**Clinical conclusions**
The effectiveness analysis showed that diagnostic staging of NSCLC involved considerable effort in terms of the number of diagnostic procedures conducted and the duration of staging process, with limited success in the prevention of futile surgery procedures.

**Measure of benefits used in the economic analysis**
The health outcomes were left disaggregated and no summary benefit measure was used. A cost-consequences analysis
was therefore carried out.

**Direct costs**
Discounting was irrelevant as the time horizon of the study was short (less than one year). The unit costs and the quantities of resources were not reported separately. The health services included in the analysis of the costs were staging (diagnostic procedures), operated patients, no surgery and thoracotomy, which included hospital stay for staging and postoperative care. The costs of additional treatments were not considered. Each category of costs reflected the costs of personnel, materials, equipment and overheads. The cost/resource boundary adopted was that of the hospital. The costs and resource quantities were both estimated using actual data derived from the study hospitals for January 1993 to January 1995. No price year was reported.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
Euros (EUR). EUR 1 = 2.20 Dutch guilders.

**Sensitivity analysis**
No sensitivity analyses were conducted.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The costs at the VUMC were:
- EUR 1,284 for staging,
- EUR 2,056 for operated patients,
- EUR 498 for no surgery, and
- EUR 6,113 for thoracotomy.

The costs at the MCA were:
- EUR 3,064 for staging,
- EUR 3,180 for operated patients,
- EUR 2,990 for no surgery, and
- EUR 9,018 for thoracotomy.

The costs in the community hospital were higher than in the academic hospital, as there were more hospital admissions for staging and more mediastinoscopies were performed.
Synthesis of costs and benefits
Not relevant as a cost-consequences analysis was conducted.

Authors' conclusions
Staging of patients with suspected non-small-cell lung cancer (NSCLC) led to a high rate of futile thoracotomies, although the overall failure rate was comparable to that of other studies. Staging was also associated with substantial costs from the perspective of the hospital. The most disappointing result was the abundance of negative test results. This issue reflects specificity problems with the diagnostic procedures considered in the study.

CRD COMMENTARY - Selection of comparators
The choice of the comparator was implicitly stated, as surgery was used as the final procedure to assess the sensitivity and specificity of the diagnostic procedures under study.

Validity of estimate of measure of effectiveness
The analysis of effectiveness was based on a cohort of patients without a comparison group. No randomisation was performed, although the potential role of bias and confounding factors should have been limited by the fact that the same group of patients was evaluated using the diagnostic interventions assessed. The study sample was unselected and appears to have been representative of the study population. The main limitation to the internal validity of the analysis was the retrospective design of the study.

Validity of estimate of measure of benefit
No summary benefit measure was used in the economic analysis. The analysis was therefore categorised as a cost-consequences study.

Validity of estimate of costs
The analysis of the costs was carried out from the perspective of the hospital. It appears that all the relevant categories of costs have been included in the study. However, a detailed breakdown of the costs was not given and the unit costs were not reported separately from the quantities of resources. The costs were treated deterministically. No price year was given, thus making reflation exercises to other settings difficult. The cost estimates were somewhat specific to the Dutch setting and sensitivity analyses were not conducted.

Other issues
The authors made some comparisons of their findings with those from other studies. The issue of the generalisability of the study results to other settings was not addressed and no sensitivity analyses were conducted. Thus, the external validity of the study was limited. The study referred to patients with NSCLC and this was reflected in the conclusions of the analysis.

Implications of the study
The authors noted that their preliminary findings may be useful for future studies investigating the cost-effectiveness of more recent diagnostic tools, such as positron emission tomography.

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