Cost-effectiveness analysis of prophylactic respiratory physiotherapy in pulmonary lobectomy

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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
The study investigated the implementation of a routine programme of intensive chest physiotherapy in patients undergoing scheduled lobectomy. This intervention was compared with routine care, whereby nurses were in charge to encourage patients for early deambulation and deep breathing manoeuvres using an incentive spirometer with known low imposed work of breathing.

Type of intervention
Rehabilitation.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing a scheduled lobectomy.

Setting
The study setting was inpatient tertiary care. The economic study was conducted in Salamanca University Hospital, Spain.

Dates to which data relate
The effectiveness and resource use data were derived from patients undergoing scheduled lobectomies between January 1994 and January 2004. The price year was not reported.

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

Study sample
No sample size appears to have been determined in the planning phase of the study. All patients undergoing a scheduled lobectomy between January 1994 and January 2004 were included in the study. No patient appears to have refused to participate in the study or was refused access to their medical records. A total of 639 consecutive patients underwent a scheduled lobectomy, of which 119 patients were operated on after November 2002, the period during which the intensive respiratory physiotherapy programme was instituted.

Study design
This was a comparative study with historical controls that was undertaken at a single centre. All patients undergoing a
scheduled lobectomy during the study period were included, with those operated on after November 2002 receiving the intensive respiratory physiotherapy. The patients appear to have been followed up for 30 days or until discharge from hospital, whichever was longer. There was no loss to follow-up.

Analysis of effectiveness
The primary health outcomes were the occurrence of postoperative pulmonary complications (i.e. nosocomial pneumonia or atelectasis) and 30-day postoperative death. Nosocomial pneumonia was defined according to published clinical criteria. All patients included in the study were accounted for in the analysis. At analysis, the patients were found to be comparable in terms of their age, predicted postoperative forced expiratory volume (FEV1%) value and body mass index. It was unclear if the patients were comparable in terms of their diagnosis (i.e. inflammatory or malignant disease).

Effectiveness results
Mortality rates were lower in the physiotherapy group (0.8%) than in the control group (3.5%), but the difference was not statistically significant (odds ratio 0.23, 95% confidence interval, CI: 0.03 to 1.79).

Rates of nosocomial pneumonia and atelectasis were higher in the control group than in the physiotherapy group, but only the difference in atelectasis rates was significant. The pneumonia rate was 9.2% for the control group versus 5% for the physiotherapy group (odds ratio 0.52, 95% CI: 0.22 to 1.25), and the atelectasis rates were 7.7% (control) and 2% (physiotherapy), respectively (odds ratio 0.20, 95% CI: 0.05 to 0.86).

Clinical conclusions
The study found that patients receiving a prophylactic respiratory programme after pulmonary lobectomy had significantly lower rates of atelectasis.

Measure of benefits used in the economic analysis
The authors did not derive a summary measure of benefit. In effect, a cost-consequences analysis was performed.

Direct costs
The direct costs to the health care provider (i.e. hospital) were included in the analysis. Such costs were for the chest physiotherapy programme, including newly appointed staff wages and charges for physiotherapy facilities and consumables, and for hospital inpatient stay. The costs of the operating room were considered to be the same for all cases and were therefore excluded from the analysis. The resources used and costs were derived from the Hospital Accountancy Department. Discounting was not relevant, as the costs were incurred during a short time, and was therefore not performed. The study reported the incremental costs. The authors reported the average length of stay for both patient groups. It was unclear if the costs were adjusted for inflation as the authors did not report the price year.

Statistical analysis of costs
The recorded length of stay in both patient groups was compared using a non-parametric Mann-Witney test. The costs were treated as point estimates (i.e. the data were deterministic).

Indirect Costs
Inline with the perspective adopted, productivity costs were not considered.

Currency
Euros (EUR).
**Sensitivity analysis**
The authors undertook a Cox regression analysis in order to estimate the variables influencing hospital stay (age, body mass index, ppoFEV1%, malignant disease, physiotherapy and major morbidity). The estimated length of stay value was then plotted against the individual true length of stay, and the difference between the estimated and recorded hospital stay was calculated.

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

**Cost results**
The incremental costs of the physiotherapy programme (i.e. extra staff and new equipment) were EUR 48,447.81.

The additional savings generated by the physiotherapy programme due to reduced hospital length of stay (a total of 157.75 hospital days avoided) were EUR 89,532.50.

Therefore, the net savings generated by the physiotherapy programme were EUR 41,084.69.

**Synthesis of costs and benefits**
The authors did not combine the costs and benefits since the intervention was the dominant strategy (i.e. it generated savings and was more effective than the comparator).

**Authors’ conclusions**
The implementation of an intensive chest physiotherapy programme for lobectomy patients decreased the rate of postoperative atelectasis and generated considerable cost-savings.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparator used. It represented current practice in the authors' settings. You should decide if this represents a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a comparative study with historical controls. Such a study design is associated with some limitations, namely external factors such as differing health care practices over the two time periods or differing lifestyles, and these might have biased the authors' results. No justification for the choice of study design was given. Since the study sample comprised consecutive patients, the sample was representative of the study population. The internal validity of the study is limited as the effect of two different interventions was evaluated over two different time periods. The analysis of effectiveness was handled credibly, although the authors did not report whether the patients were comparable at analysis in terms of their prognosis. Power calculations were reported, thus it is not possible to determine if the study was underpowered to detect differences in mortality and pneumonia.

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of benefit. The reader is referred to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

**Validity of estimate of costs**
The analysis of the costs was performed from the perspective of the health care provider paying for the rehabilitation programme. As such, it appears that all the relevant categories of costs have been included in the analysis. The resources used and costs were derived from the Hospital Accountancy Department. Since the costs were incurred
during a short time, discounting was appropriately not performed. Appropriate statistical techniques were performed to evaluate whether the differences in hospital length of stay were statistically significant. However, no statistical or sensitivity analyses were performed to evaluate uncertainty in the cost data. The authors did not report if the costs were adjusted for inflation. In addition, the price year was not reported, which will hamper any future inflation exercises.

Other issues
The authors reported that they had not found any recent study demonstrating the effectiveness of routine respiratory physiotherapy in lung resection cases. The issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. The authors reported a number of further limitations to their study. First, the study was not a randomised controlled trial. Second, only hospital costs were included, and those incurred when the patient was discharged were not evaluated. Finally, the study did not include a sensitivity analysis, which increases the uncertainty of the conclusions.

Implications of the study
Although the authors made no explicit recommendations, it would appear that in view of their results, the authors would recommend the implementation of an intensive chest physiotherapy programme for lobectomy patients.

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