A comparison of a left-sided Broncho-Cath with the torque control blocker Univent and the wire-guided blocker

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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
Three procedures for lung isolation in patients undergoing thoracic surgery were examined. The procedures were:

- a double-lumen endotracheal tube (DLT);
- the Univent tube, a bronchial blocker; and
- the Arndt tube, a wire-guided endobronchial blocker.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing elective thoracic surgery.

Setting
The setting was a hospital. The economic study was conducted in the USA.

Dates to which data relate
The dates during which the effectiveness and resource use data were gathered were not reported. The price year was not reported.

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

Link between effectiveness and cost data
The costing was conducted prospectively on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations were based on the variability in positioning time and time for lung collapse in a prior analysis of Univent and DLT, and 80% power at a 5% significance level. A sample of 64 patients (age range: 31 - 80 years; weight: 40 - 130 kg) was enrolled into the study. There were 16 patients (10 men and 6 women) in the DLT group, 16 patients
(5 men and 11 women) in the Univent group and 32 patients (17 men and 15 women) in the Arndt group. The authors stated that no patient refused to participate, or was excluded from participation.

**Study design**
This was a prospective, randomised clinical trial that was, presumably, conducted at a single institution, the University of Iowa Health Care, Iowa City, in Iowa. Randomisation was conducted using a random number generator. There were as many patients assigned to the Arndt group as to the combined DLT and Univent groups. The length of follow-up was not reported, although the patients appear to have been followed until the procedure was completed. No loss to follow-up was observed. Surgeons were absent from the operating room during tube placement and were blinded to randomisation. The same anaesthesiologist administered all anaesthesia.

**Analysis of effectiveness**
The analysis of the clinical study was conducted on an intention to treat basis, as no patient was lost to follow-up. The outcome measures used were:

- time for positioning (defined as the time from passage of the tube until there were satisfactorily placement of the endobronchial lumen or the bronchial blocker),
- time for lung collapse,
- frequency of malpositions,
- frequency of fibre-optic bronchoscopy, and
- surgical exposure (ranked as excellent, fair, or poor).

The number of thoracoscopies performed was also reported. At baseline, the study groups were comparable in terms of age, weight, gender and procedure duration.

**Effectiveness results**
Ten thoracoscopies were performed in the DLT group, compared with 10 in the Univent group and 23 in the Arndt group.

The time of initial positioning was 2:08 minutes in the DLT group, 2:38 minutes in the Univent group and 3:34 minutes in the Arndt group, (p<0.0004 comparing Arndt blocker versus combined DLT and Univent).

Time for lung collapse was 17:54 minutes in the DLT group, 19:28 minutes in the Univent group and 26:02 minutes in the Arndt group, (p<0.0060 comparing Arndt blocker versus combined DLT and Univent).

There were 2 (range: 2 - 3) bronchoscopies per patient in the DLT group, 2 (range: 2 - 3) in the Univent group and 2 (range: 2 - 4) in the Arndt group.

The rank of surgical exposure was excellent for all patients in the DLT and Univent groups.

In the Arndt group, 30 patients rated the surgical exposure as excellent and 2 patients rated it as fair.

No patient rated surgical exposure as bad.

The total number of malpositions was 2 in the DLT group, 4 in the Univent group and 9 in the Arndt group.

**Clinical conclusions**
The effectiveness study showed that similar results were obtained with the three approaches. However, the Arndt
blocker took longer to position and to deflate the isolated lung than the two alternative approaches.

**Measure of benefits used in the economic analysis**
The health outcomes were left disaggregated and no summary benefit measure was used in the economic analysis. In effect, a cost-consequences analysis was conducted.

**Direct costs**
Discounting was not relevant since the costs were incurred during a short time. The unit costs were reported separately from the quantities of resources used. The cost analysis comprised only those costs associated with the procedures under evaluation. The cost/resource boundary of the hospital was used. Resource use was estimated using actual data derived from the sample of patients included in the effectiveness analysis. The costs were derived from the University of Iowa Health Care. The price year was not reported.

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

**Indirect Costs**
The indirect costs were not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were not conducted.

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

**Cost results**
The overall acquisition costs were:

- $1,663.20 with 21 tubes opened in the DLT group,
- $2,329 with 17 tubes opened in the Univent group, and
- $3,567 with 33 wire-guided blockers opened in the Arndt group (this became $1,837.40 when 17 patients were considered).

**Synthesis of costs and benefits**
Not relevant since, in effect, a cost-consequences analysis was conducted.

**Authors' conclusions**
The Arndt bronchial blocker took longer to position and to deflate the isolated lung than double-lumen endotracheal tubes (DLTs) or the Univent bronchial blocker. However, once lung isolation was achieved, comparable outcomes were observed across groups. As the acquisition costs of the Univent were higher, the economic impact of the procedures
should be considered in large-volume anaesthesia practices.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparators was clear. DLT and Univent represented two widely used interventions. They also reflected alternative approaches for lung isolation in patients undergoing thoracic surgery, namely endotracheal tube and bronchial blocker. Arndt was included because it represented a newer wire-guided endobronchial blocker. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness was based on a clinical trial, which was appropriate for the study question. The procedure used to randomise the patients was described. Blinding was also conducted and the same anaesthesiologist anaesthetised all the patients. The length of follow-up was not explicitly reported, but no patient was lost to the final assessment. The size of the sample was appropriate for the study question since power calculations were conducted. The methods used to select the sample were unclear, but the authors stated that no patient was excluded from the study sample or refused to participate. The study groups were comparable at baseline. Therefore, the potential impact of bias and confounding was limited. These issues enhanced the internal validity of the study. However, the patients were recruited at a single centre and it was unclear whether the study sample was representative of the study population. In addition, the authors stated that an inherent bias was the fact that the patients were not stratified according to the side on which their surgery was performed (right versus left).

Validity of estimate of measure of benefit
No summary benefit measure was used in the analysis because, in effect, a cost-consequences analysis was conducted.

Validity of estimate of costs
The authors implicitly adopted a very limited perspective since only device costs were considered. Other costs relating to the performance of the procedures, which could have been relevant to the hospital (e.g. professional fees and surgical services), were not included in the analysis. The unit costs of the devices were reported, as was the source of the data. The price year was not reported, which would make reflation exercises in other settings difficult. The cost estimates were specific to the study setting and no sensitivity analyses were conducted. Similarly, statistical tests were not conducted on the costs. Overall, a very simple analysis of costs was conducted.

Other issues
The authors did not compare their findings with those from other studies, or address the issue of the generalisability of their results to other settings. In addition, sensitivity analyses were not conducted and all the evidence came from a single centre. This reduced the external validity of the analysis. The study involved patients undergoing elective thoracic surgery and this was reflected in the authors' conclusions.

Implications of the study
The authors suggested that caution is required when interpreting their results, owing to some inherent limitations of their study. They recommended the use of bronchial blockers in patients who have small mouths, or sharp and prominent incisors.

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**Other publications of related interest**


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