Bedside placement of inferior vena cava filters in the intensive care unit

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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
Bedside placement of inferior vena cava (IVC) filters in trauma patients in the intensive care unit (ICU).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients admitted to a Level I trauma centre, meeting the criteria for insertion of a prophylactic IVC filter according to Eastern Association for the Surgery of Trauma (EAST) practice guidelines. Severely injured patients meeting EAST criteria for being at high risk for deep venous thrombosis (DVT), and who were unable to be treated with anticoagulants, were selected for placement of an IVC filter in the ICU.

Setting
Hospital. The economic analysis was carried out in the USA.

Dates to which data relate
Effectiveness and resource use data corresponded to the period between April 1997 and April 1998. The price year was not reported.

Source of effectiveness data
The evidence for the final outcomes was based on a single study.

Link between effectiveness and cost data
Costing was performed on the same patient sample as that used in the effectiveness analysis and appears to have been conducted retrospectively.

Study sample
Power calculations were not used to determine the sample size. The study sample consisted of 25 trauma patients with a mean age of 52.6 (range: 31 - 86) years. Of 810 patients admitted as trauma alerts during the study period, 25 had an IVC filter placed at the bedside in the ICU.

Study design
This was a prospective cohort study, carried out in a single centre. The duration of the follow-up appears to have been until discharge from hospital. The study appears to have had no loss to follow-up. All filters were placed at the bedside by a surgery resident under direct supervision of a trauma attending. After the procedure, patients were followed during their hospital stay for complications. The venipuncture site was assessed daily for hematoma, and the patients were evaluated for signs and symptoms of pulmonary embolism (PE) and/or venous thrombosis.

**Analysis of effectiveness**
The principle used in the analysis of effectiveness (intention to treat or treatment completers) was not explicitly specified. The clinical outcomes were indications for filter placement, intraoperative or postoperative complications, overall mortality, and average time for insertion.

**Effectiveness results**
The indications for filter placement included a contraindication to anticoagulation and one of the following: severe pelvic fracture and/or associated long-bone fracture (32%); bilateral lower extremity fractures (28%); spinal cord injury with para- or quadriplegia (16%); femoral vein thrombosis (16%); and severe brain injury (8%). There were no intraoperative or postoperative complications, and overall mortality was 20%, unrelated to the IVC filter placement. The average time for insertion was 47 minutes for the series and 20 minutes for the last five cases.

**Clinical conclusions**
The insertion-related morbidity of the study patient population was 0%, although the authors were aware that, as they continue to perform this procedure, the complication rate will increase, probably approaching the rate reported in the literature. There was no IVC filter placement-related mortality and no acute symptomatic PE.

**Measure of benefits used in the economic analysis**
No summary benefit measure was identified in the economic analysis, and only individual clinical outcomes were reported, as shown in the effectiveness results. The authors appear to implicitly assume that the bedside procedure is as effective as the OR and RS procedures, resulting in a cost-minimisation analysis.

**Direct costs**
Costs were not discounted due to the short time frame of the cost analysis. Some quantities were reported separately from the costs. Cost items were reported separately. Cost analysis covered the costs of supplies, transport, room, fluoro time, anesthesia, anesthesiologist, radiologist, and surgeon. The perspective adopted in the cost analysis was not explicitly specified. Charge data were used instead of true costs. The price year was not explicitly specified. The costs associated with filter charges were not considered because they were the same for all three locations.

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

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was conducted.

**Estimated benefits used in the economic analysis**
Not applicable.
Cost results
The total charge per filter was $3,388 for the OR placement, $3,789 for the RS, and $1,544 for the ICU bedside placement. This gave savings of $1,844 or $2,245 per filter when compared with OR and RS.

Synthesis of costs and benefits
Costs and benefits were not combined due to the cost-minimisation approach adopted.

Authors' conclusions
Bedside placement of IVC filters in the ICU is a safe, cost-effective method that can be performed without compromising the patient and which avoids the potential disasters involved in transporting critically ill patients.

CRD COMMENTARY - Selection of comparators
The strategies of OR and RS placement were explicitly regarded as the comparators. You, as a database user, should consider whether these are widely used health technologies in your own setting.

Validity of estimate of measure of effectiveness
The internal validity of the effectiveness results can not be guaranteed owing to the non-randomised nature of the study design, the lack of proper control groups corresponding to the OR and RS placement of IVC filters, and the relatively small sample size and lack of power calculations. The authors believed that a learning curve is associated with this procedure, and this was reflected in the average time for insertion of the filter, which was 47 minutes for the entire series, but only 20 minutes for the last five cases. The study sample appears to have been representative of the study population (ICU patients who were at high risk of developing DVT and had contraindication for anticoagulation).

Validity of estimate of measure of benefit
The authors did not derive a measure of health benefit. The study was therefore a cost-consequences (cost-minimisation) analysis.

Validity of estimate of costs
The following were positive features of the cost analysis: some quantities were reported separately from the costs and a cost breakdown was reported. However, the following limitations could adversely affect the validity of the cost analysis: the price year and perspective adopted in the cost analysis were not specified; cost calculations were conducted retrospectively and were based on charge data rather than true costs; and no statistical analysis was performed on resource use and cost data; the effects of the alternative modalities on indirect costs (productivity loss) were not addressed; the cost results may not be generalisable outside the study setting.

Other issues
In view of the inherent limitations of the study design, and the lack of sensitivity analysis and statistical analysis of costs, some degree of caution should be exercised in interpreting the study results. The issue of generalisability to other settings or countries was not addressed, although appropriate comparisons were made with other studies. The degree to which the study sample was representative of the study populations was addressed in the authors’ comments.

Implications of the study
A study with a more methodologically sound design is needed to provide more reliable information in the context in question. The authors reported that bedside insertion of IVC filters has already become a common ICU procedure in the study institution, similar to percutaneous tracheostomy.
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