The effect of an education program on the incidence of central venous catheter-associated bloodstream infection in a medical ICU

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
A mandatory education programme directed at intensive care unit (ICU) nurses and physicians, to highlight correct practices for the prevention of catheter-associated bloodstream infections (CABIs), was studied. The programme consisted of a 10-page self-study module on risk factors and practice modifications involved in CABIs and in-services at scheduled staff meetings.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised all patients admitted to the medical ICU in a 1,400-bed university-affiliated urban teaching hospital between January 2000 and December 2003.

Setting
The setting was tertiary care (19-bed medical ICU in a 1,400 university-affiliated urban teaching hospital). The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data were collected between January 2000 and December 2003. The pre-intervention period was 2000 and 2001. The post-intervention period was 2002 and 2003. The resources use data were gathered from papers published from 1991 to 2003. The price year was not reported.

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

Link between effectiveness and cost data
Retrospective costing seems to have been applied at the end of the study, based on the cost of infection.

Study sample
Power calculations were not used to determine the sample size. Members of the hospital infection control team prospectively followed all patients admitted to the medical ICU at a university-affiliated urban teaching hospital during a 4-year period, and surveyed them for the occurrence of central venous CABIs.
Study design
This was a prospective cohort study that was carried out in a single centre over 4 years.

Analysis of effectiveness
The primary health outcome was the number of episodes of central venous CABI. The infection rate per 1,000 catheter-days was calculated. Details of the study groups were not reported.

Effectiveness results
During the 24-month pre-intervention period, 74 episodes of CABI occurred during a total of 7,876 central vein catheter-days. This amounted to an infection rate of 9.4 per 1,000 catheter-days. During the post-intervention period, 41 episodes of CABI were recorded during a total of 7,455 central vein catheter-days. This was equivalent to an infection rate of 5.5 per 1,000 catheter-days, and represented a decrease of 41.5% in comparison with the pre-intervention period, (p=0.019).

The difference in CABI rates between the pre- and post-intervention periods was 3.9 per 1,000 catheter-days (95% confidence interval: 1.2 - 6.6). The monthly percentage of central venous catheters placed in the femoral position statistically decreased between the pre- and post-intervention periods, from 26.3% (+/-5.8) to 20.4% (+/-6.6), (p=0.002).

Clinical conclusions
An education programme directed at nurses and physicians working in the medical ICU setting may significantly reduce the incidence of CABIs.

Measure of benefits used in the economic analysis
No summary measure of benefits was used as the study was a cost-consequences analysis.

Direct costs
The direct costs included the cost of a CABI. The quantities and the costs were not reported separately. The costs were derived from estimates published during 1991 and 2003. The price year was not reported.

Statistical analysis of costs
No statistical analysis of the costs was reported.

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
A sensitivity analysis was not performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.
Cost results
The estimated cost-savings from the decreased rate of CABI for the 24 months following the introduction of the education programme was between $103,600 and $1,573,000.

Synthesis of costs and benefits
The costs and benefits were not combined as a cost-consequences analysis was performed.

Authors’ conclusions
An intervention that focuses on educating health care providers on the prevention of catheter-associated bloodstream infections (CABIs) may lead to a dramatic decrease in the incidence of primary bloodstream infections. Education programmes may lead to a substantial decrease in medical care costs and patient morbidity attributed to central venous catheterisation when implemented as part of mandatory training.

CRD COMMENTARY - Selection of comparators
The selection of the comparators was implicitly given as the practice before the implementation of the education programme.

Validity of estimate of measure of effectiveness
The effectiveness data were derived from a pre-intervention post-intervention observational study that was carried out in a single ICU. The non-randomised nature of the study, along with the absence of control groups, might have affected the internal validity of the analysis as many confounding factors were not detected.

Validity of estimate of measure of benefit
The authors aimed to use episodes of infections prevented as a measure of benefit. The estimate of benefit might also be affected by the study design. Please refer to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

Validity of estimate of costs
The perspective adopted in the study was not stated. Only the cost of a CABI was considered. Other direct and indirect costs were not included. The price year was unclear. Statistical and sensitivity analyses were not performed on the cost data.

Other issues
The authors made appropriate comparisons of their results with the findings from other studies. The issue of generalisability to other settings was addressed. The authors did not present their results selectively. The authors reported several further limitations to their study, such as the study design and the inability to identify the specific interventions accounting for the improvement.

Implications of the study
The implementation of education-based infection control programmes should be routine in hospital areas caring for patients at risk of infections. It should be recognised as a requirement for the optimal functioning of hospital floors and ICUs.

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