Impact of a dedicated intravenous therapy team on nosocomial bloodstream infection rates

Meier P A, Fredrickson M, Catney M, Nettleman M D

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
Establishing a professional and fully dedicated intravenous (IV) therapy team in order to reduce primary nosocomial bloodstream infections in an institution providing medical care to military veterans. The IV team consisted of registered nurses whose main responsibilities were the assessment of the ongoing need for an IV device, placement of peripheral catheters under aseptic conditions, inspection of IV sites daily, and replacing IV catheters every 72 hours (or earlier if evidence of phlebitis was found).

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Military veterans.

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

Dates to which data relate
The primary nosocomial bloodstream infection rates were noted between January 1990 and February 1992 (the period before the introduction of the IV team) and from March 1992 to December 1994 (the period after the introduction of the IV team). The mortality rate attributable to nosocomial bloodstream infection was based on a study published in 1993. Resource use data and their corresponding data collection dates were not reported. The cost of nosocomial catheter-associated bacteremia and that of bacteremia from S. aureus were based on 1994 prices. The cost of establishing an IV team was based on 1995 nurses' annual salary.

Source of effectiveness data
The effectiveness data were based on a single study and an assumption made by the authors, and relied on one source from the literature.

Link between effectiveness and cost data
Costing was retrospectively undertaken partially on the same IV team employed in the study institution. The costing for nosocomial bloodstream infection was based on updating the results of a previous study.

Study sample
Power calculations were not used to determine the sample size. The study sample consisted of approximately 6,300 military veterans each year (who received medical care in the study institution). The IV team consisted of 11 registered nurses.

**Study design**
Prospective, non-randomized study with historical controls, carried out in a single institution. The duration of follow-up appears to have been until discharge from hospital. Loss to follow-up was not reported. A senior infection control nurse (who made daily rounds on the medical and surgical wards) and the microbiology laboratory performed prospective surveillance for nosocomial infection at the study institution.

**Analysis of effectiveness**
The principle (intention to treat or treatment completers only) used in the analysis of the clinical study was not clearly stated. The rate of primary bloodstream infection and the rate of primary bloodstream infection with S. aureus were the primary health outcomes used in the analysis.

**Effectiveness results**
After establishing the IV team, the rate of primary bloodstream infection was reduced by 35% from 1.1 to 0.7 infections/1000 patient-days (p<0.01, 95% CI: 0.57 - 0.86). Furthermore, the rate of primary bloodstream infection with S. aureus decreased by 51%, from 0.33 to 0.16 infection/1000 patient-days (p<0.01, 95% CI: 0.09 - 0.23).

**Clinical conclusions**
The introduction of the IV team reduced nosocomial bacteremia by decreasing catheter-related infections.

**Methods used to derive estimates of effectiveness**
An assumption was made by the authors, based on one source from the literature.

**Estimates of effectiveness and key assumptions**
It was assumed that the mortality rate attributable to the nosocomial bloodstream infections was 27%.

**Measure of benefits used in the economic analysis**
The measures of benefits were the number of infections prevented and number of lives saved.

**Direct costs**
Costs were not discounted because of the short time frame adopted for the cost analysis. Quantities were not reported separately from the costs (except for nurses' time devoted to IV tasks). The cost of the IV team was derived from the total salary of 11 nurses who devoted 75% of their time to IV placement and maintenance. This cost was based on 1995 nurses' average annual salary. The authors made a conservative estimation of the cost of any nosocomial catheter-associated bacteremia and that of bacteremia from S. aureus. This estimation was based on a previous study published in 1993, and the authors made a price adjustment to 1994 prices.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).
Sensitivity analysis
A threshold analysis was performed on the average cost of a nosocomial bloodstream infection in order to identify the cut-off value which made the IV team a cost-saving strategy.

Estimated benefits used in the economic analysis
50 infections were prevented (21 with S. aureus). During the study period, 14 lives were saved due to the introduction of the IV team.

Cost results
The conservative estimate of the costs of any nosocomial catheter-associated bacteremia and that of S. aureus were $4,420 and $7,229, respectively. The cost of establishing the IV team was $350,625 per year or $993,438 for the 34-month period. The excess cost of the IV team was $252,000 per year.

Synthesis of costs and benefits
The authors defined cost-effectiveness as the excess cost per life saved and the excess cost per infection prevented. They calculated that the excess cost per infection prevented was $14,000 and per life saved was $53,000. The threshold analysis showed that if the cost of the infection was more than $20,000, the use of the IV team would have resulted in a net cost saving.

Authors' conclusions
The introduction of a dedicated IV team was associated with a significant reduction in nosocomial bloodstream infections.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator is clear.

Validity of estimate of measure of benefit
As the authors acknowledged, the internal validity of the estimates of the measures of benefits can not be guaranteed due to the non-randomized nature of the study design, and the influence of possible confounding variables.

Validity of estimate of costs
Quantities of resources used were not fully reported separately from the costs. Insufficient details of methods of cost estimation were provided. Cost results may not be generalisable to other settings or countries.

Other issues
In view of the non-randomised design, and the lack of extensive sensitivity analysis and statistical analysis of the costs, the study results should be treated with some caution. The issue of generalisability to other settings or countries was not addressed, although appropriate comparisons were made with other studies.

Implications of the study
Further work is needed to maximize the cost-benefit ratio of this intervention.

Source of funding
None stated.
Bibliographic details

PubMedID
9721390

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Bacteremia /economics /epidemiology /microbiology /prevention & control; Blood-Borne Pathogens; Cost-Benefit Analysis; Cross Infection /economics /epidemiology /microbiology /prevention & control; Data Collection; Hospital Bed Capacity, 100 to 299; Hospitals, Veterans /statistics & numerical data; Humans; Incidence; Infection Control /economics /methods; Infusions, Intravenous /adverse effects /nursing; Iowa; Patient Care Team /economics /organization & administration; Prospective Studies

AccessionNumber
21998001532

Date bibliographic record published
31/08/2000

Date abstract record published
31/08/2000