Cost-effectiveness of a \textit{Staphylococcus aureus} screening and decolonization program for high-risk orthopedic patients

\textit{Slover J, Haas JP, Quirno M, Phillips MS, Bosco JA}

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.

CRD summary
The study examined the economic impact of a preoperative \textit{Staphylococcus aureus} screening and decolonisation programme for patients who underwent elective arthroplasty (hip/knee arthroplasty or spine fusions). The authors concluded that a preoperative \textit{Staphylococcus aureus} screening and decolonisation programme needed to produce only a modest reduction in the surgical site infection to be cost saving. The study presented some potential methodological limitations and was based only on threshold cost-effectiveness analysis. Caution is required when interpreting the authors’ conclusions.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study examined the economic impact of a preoperative \textit{Staphylococcus aureus} screening and decolonisation programme for patients who underwent elective arthroplasty (hip/knee arthroplasty or spine fusions).

Interventions
In the screening and decolonisation programme, all patients were given a prescription for mupirocin treatment and received a nasal culture preoperatively. Patients with cultures positive for methicillin-resistant \textit{Staphylococcus aureus} (MRSA) received perioperative antibiotic prophylaxis with vancomycin rather than conventional cephalosporin given to methicillin-sensitive cases. The comparator was no screening programme.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a Markov simulation model with a short-term time horizon (length of hospital stay). The perspective adopted in the study was that of the hospital and the patient/insurer.

Effectiveness data:
Clinical data were derived using two approaches. A cohort of 365 hip and knee arthroplasty patients and 287 spine fusions that followed the pre-admission testing programme were identified at the authors’ institution. These provided data on patients’ compliance with mupirocin and positive-MRSA infection rate. Published studies were used to obtain other model data. The probability of infection was the primary endpoint of the analysis and was taken from a Swedish registry.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
No summary benefit measure was used. The rate of infection was the most relevant outcome.

Cost data:
The economic analysis included costs of mupirocin treatment, nasal culture, perioperative antibiotic prophylaxis, primary total joint surgery, spine surgery and revision procedures for infected total joint or infected spine surgery. Costs were taken from the authors’ institution database or based on published estimates. Costs were in US dollars ($).

Analysis of uncertainty:
A two-way sensitivity analysis was carried out to examine the relationship between the cost of treatment and the required reduction in revisions for sepsis needed to make the programme cost saving.

Results
In the hip and knee arthroplasty population the intervention was cost saving over no programme if programmes reduced the infection rate by only 10% and the mean cost of a septic revision was greater than $70,000.

In spine patients the programme was cost-saving at a 10% reduction of the infection rate and a cost of an infected spine surgery greater than $30,000.

In general, if the cost of treating an infected hip or knee arthroplasty was equal to the cost of a primary knee arthroplasty, the screening programme needed to produce a 35% reduction in the revision rate or a relative revision rate of 65% for patients in the screening programme for it to be cost-saving. The authors pointed out that much higher costs were observed in the published literature and this suggested a much smaller effect was needed. A similar conclusion was shown for spine patients.

Authors’ conclusions
The authors concluded that a preoperative Staphylococcus aureus screening and decolonisation programme needed to produce only a modest reduction in surgical site infection to be cost saving.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. A clear description of the programme was provided and it appeared relevant in several settings.

Effectiveness/benefits:
The few clinical inputs used in the analysis were based on the cohort of patients enrolled at the authors’ institutions. Some of these estimates were corroborated with data from a published study that was not described. Non-randomised studies are generally associated with issues of selection bias, but in this analysis only data on compliance and test accuracy were used and these did not require comparisons among groups. No justification was provided for the sample size used and there was no sensitivity analysis on clinical parameters. No summary benefit measure was derived. The clinical endpoints used in the analysis represented intermediate measures of the impact of the interventions on patients’ health.

Costs:
The cost categories suggested that the perspective was that of the hospital or third-party payer (including the patient/insurer) as stated and explained by the authors. Costs of screening and treatment were taken from the hospital database which was representative of the authors’ setting. Other costs were taken from published studies that were not described. Most costs were presented as macro-categories and no details on unit costs and resource quantities were given. The price year was not reported and this precluded reflation exercises in other time periods. Only revision costs were varied in the sensitivity analysis.

Analysis and results:
The study results were presented selectively (only the findings of the sensitivity analyses were reported). No base case was shown. The study results were based on threshold values needed to make the screening programme cost saving. The issue of uncertainty was investigated using a deterministic approach that considered only variations in the two most influential inputs. The authors acknowledged some limitations of their analysis such as use of a non-randomised study for most clinical parameters and the exclusion of some costs. The main limitation of the analysis appeared to be the methods used to present cost-effectiveness results. Whether these findings would be transferable to other settings was unclear.
Concluding remarks:
The study presented some potential methodological limitations and was based only on threshold cost-effectiveness analysis. Caution is required when interpreting the authors’ conclusions.

Bibliographic details

PubMedID
20452175

DOI
10.1016/j.arth.2010.03.009

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Anti-Bacterial Agents /economics /therapeutic use; Arthroplasty, Replacement, Hip /economics; Arthroplasty, Replacement, Knee /economics; Cohort Studies; Cost-Benefit Analysis; Decision Support Techniques; Humans; Joints /microbiology; Markov Chains; Mass Screening /economics; Methicillin-Resistant Staphylococcus aureus /isolation & purification; Reoperation /economics; Risk Factors; Spinal Fusion /economics; Staphylococcal Infections /diagnosis /drug therapy /economics

AccessionNumber
22011000750

Date bibliographic record published
03/08/2011

Date abstract record published
17/08/2012