Cost-effectiveness of preoperative nasal mupirocin treatment in preventing surgical site infection in patients undergoing total hip and knee arthroplasty: a cost-effectiveness analysis

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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.

CRD summary
The study assessed the cost-effectiveness of preoperative screening and treatment with mupirocin in patients undergoing total hip arthroplasty or total knee arthroplasty. The authors concluded that preoperative treatment for all patients was cost-effective compared with a strategy of screen and treat positive patients. The analysis was based on a robust methodological framework that reported all model assumptions, but did not fully account for uncertainty. The authors' conclusions appear valid within the scope of the analysis undertaken.

Type of economic evaluation
Cost-utility analysis

Study objective
The study assessed the cost-effectiveness of perioperative use of mupirocin in patients who underwent either total hip arthroplasty or total knee arthroplasty.

Interventions
Three strategies were examined: no treatment (no preoperative treatment or screening); screen-and-treat (preoperative screening cultures for all patients and mupirocin to patients with culture positive for Staphylococcus aureus); and treat-all (empirical preoperative treatment with mupirocin for patients without screening).

Screening was based on nasal swab sample culture.

Location/setting
USA/outpatient clinical setting.

Methods
Analytical approach:
The analysis was based on a decision tree model with a one-year time horizon in a hypothetical cohort of 65-year-old patients who underwent either total hip or total knee arthroplasty. The authors stated that the perspective was that of society.

Effectiveness data:
Clinical inputs related to treatment effect were derived from published studies and included a systematic review and other primary studies with various levels of quality of evidence (randomised controlled trials, observational studies, case series). The rate of surgical site infections was a key input of the model. Additional data on colonisation rates were taken from the database of the authors' institution and involved 587 screened patients between January 2007 and June 2008. Some assumptions were made and justified.

Monetary benefit and utility valuations:
Utility valuations were based on the well-being index scores reported in the literature including a longitudinal cohort study and another analysis that used the time trade-off approach.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used as the summary benefit measure.
Cost data:
The economic analysis included the costs of primary total hip or total knee arthroplasty, septic hip/knee revision, mupirocin treatment and screening test. Costs were derived from published studies supplemented by data from the authors’ institution. Some details on unit costs and resource quantities were presented. Costs were in USA dollars ($). The price year was 2005.

Analysis of uncertainty:
All model inputs were subjected to analysis of uncertainty using one-way sensitivity analyses. Published ranges of values were used for most inputs, otherwise plausible ranges based on expert option were used.

Results
In the total hip arthroplasty model, expected costs and QALYs of each strategy were $24,258 and 0.7985 with treat-all, $24,471 and 0.7983 with screen-and-treat and $24,506 and 0.7980 with no treatment.

Differences in costs and QALYs among the strategies were modest but under base case conditions, screen-and-treat dominated (more effective and less expensive) than no treatment and treat-all dominated either comparator. Average cost-effectiveness ratios were similar among the three strategies.

In the total knee arthroplasty model, expected costs and QALYs of each strategy were $24,378 and 0.6787 with treat-all, $24,611 and 0.6785 with screen-and-treat and $24,667 and 0.6783 with no treatment. As in the previous model, differences in expect costs and benefits were modest but screen-and-treat dominated no treatment and treat-all dominated either comparator. Average cost-effectiveness ratios were similar among the three strategies.

The sensitivity analysis confirmed the dominance or cost-effectiveness of treat-all in most scenarios. Empiric treatment was no longer cost-effective at a threshold of $50,000 per QALY when the utility of life after either surgical procedure was less than 0.48 (far above the base case estimate).

Authors’ conclusions
The authors concluded that routine preoperative nasal mupirocin treatment for all patients was a cost-effective strategy. A strategy of restricting treatment to those patients found positive on screening provided less value for money than treating all but was preferred over no treatment.

CRD commentary
Interventions:
The rationale for selection of the comparators was clear. Appropriate strategies for management of this patient population at risk of surgical site infections were considered.

Effectiveness/benefits:
Treatment effect for mupirocin treatment was taken from several studies with a different degree of validity that were partially illustrated by the authors. Given the high uncertainty around this parameter, extensive sensitivity analysis was conducted. Infection rate was appropriately taken from local estimates that were representative of the patient population. The authors acknowledged that the scarcity and low quality of some data on treatment effect represented a potential limitation of the study. The use of QALYs was appropriate given the impact of infections both on morbidity and mortality. Sources for utility weights were reported and it appeared that appropriate instruments were used.

Costs:
The economic analysis focused on direct medical costs. The authors stated that only categories of costs strictly related to total hip and total knee arthroplasty in the eligible patient population were considered. Items such as caregiver time and future health problems were not modelled. Productivity losses were not included, perhaps due to the advanced age of the patient population (most were likely to have retired). Unit costs of mupirocin treatment and screening tests were reported. Costs of primary surgery and subsequent revisions were presented as macro-categories and were not broken down into individual items. These latter costs were derived from published studies for which no methodological details were reported. The price year was stated explicitly, which would enable reflation exercises for other time periods. The impact of variations in cost inputs was taken into account in the sensitivity analyses.
Analysis and results:
The expected costs and benefits of the various strategies were reported appropriately and were combined using both average and incremental ratios. The issue of uncertainty as investigated using a deterministic approach, which considered variations of individual singly. Multiple and simultaneously variations were not taken into account. The authors discussed some limitations of the analysis, such as the short time horizon and issues in the clinical studies selected. No attempt was made to deal with the issue of transferability of study results, which appeared specific to the authors' setting.

Concluding remarks:
The analysis was based on a robust methodological framework that reported all model assumptions. The authors’ conclusions appear valid.

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