Cost-effectiveness analysis of active surveillance screening for methicillin-resistant Staphylococcus aureus in an academic hospital setting

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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 examined the cost-effectiveness of targeted versus universal screening for methicillin-resistant Staphylococcus aureus (MRSA) at a hospital level. The authors concluded that targeted surveillance provided the greatest value-for-money as it improved clinical outcomes and saved costs from the perspective of the hospital. The study was based on a valid modelling framework that investigated key areas of uncertainty. The authors’ conclusions appear robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study examined the cost-effectiveness of targeted versus universal screening for methicillin-resistant Staphylococcus aureus (MRSA) at a hospital level.

Interventions
Three strategies were examined: universal surveillance screening for all hospital admissions, targeted surveillance screening for intensive care unit admissions, and no surveillance screening. Screening was based on a real-time polymerase chain reaction (PCR) method via a nasal sample.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a decision tree model. The time horizon was the period of hospitalisation. The authors stated that the perspective was that of the hospital.

Effectiveness data:
A review of PubMed was carried out to search for sources of clinical data. Several studies were identified and used to provide model inputs. The search was restricted to studies in USA published since 2000. The probability of MRSA infections in non-intensive care was based on experts’ opinions and in intensive care units was taken from two published studies. The reduction in the rate of MRSA-associated healthcare-associated infections attributable to screening and isolation was the main input.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
The number of MRSA healthcare-associated infections was used as the benefit measure.

Cost data:
The economic analysis included the costs of rapid PCR test, contact precautions, personnel and MRSA healthcare-associated infections. Most of these costs and data on resource quantities were derived from the literature review. A
conservative estimate was used for MRSA healthcare-associated infection. Some assumptions were made on resource. Personnel costs were based on official wage estimates obtained from Bureau of Labor Statistics. Costs were in US dollars ($). The price year was 2009.

Analysis of uncertainty:
One-way sensitivity analyses were carried out for all model inputs using ranges of values based on published sources. A probabilistic sensitivity analysis was performed using a Monte Carlo simulation and standard distributions for model inputs. Cost-effectiveness acceptability curves were generated.

Results
In a hypothetical large academic hospital with approximately 800 beds, total costs and MRSA healthcare-associated infections were $6,741,630 and 516.6 with no screening, $6,458,860 and 457.2 with targeted screening and $8,133,372 and 423.5 with universal screening.

In comparison with no surveillance, targeted screening was dominant (more beneficial and less expensive) and the incremental cost per MRSA healthcare-associated infection prevented with universal screening was $14,955. When compared to each other, the incremental cost per MRSA healthcare-associated infection prevented with universal over targeted screening was $49,748.

Deterministic sensitivity analyses confirmed the base case findings and the targeted strategy remained the preferred one as long as the effectiveness of screening in intensive care units was above 21%, the cost of MRSA healthcare-associated infection above $8,291 and length of stay was lower than 11.4 days.

Similar results were shown in the probabilistic analysis: compared to no surveillance, targeted screening was more cost-effective than universal screening. Only at a decision maker's willingness to pay greater than $71,300 per MRSA healthcare-associated infection prevented was universal strategy the most cost-effective option.

Authors' conclusions
The authors concluded that targeted surveillance provided the greatest value for money as it improved clinical outcomes and saved costs from the perspective of the hospital. These findings supported recommendations of implementing active surveillance.

CRD commentary
Interventions:
The rationale for selection of the comparators was clear and appropriate. The interventions were generalisable to other hospitals.

Effectiveness/benefits:
Clinical data were all retrieved by means of a review of the published literature. The methods and conduct of the literature review were reported partly; no details on the studies selected were given except that they were conducted in USA after the year 2000. This limited the possibility of objectively assessing the validity of the clinical sources. The authors acknowledged a lack of valid published studies for some key model parameters and expert opinions were needed. Extensive sensitivity analysis was conducted to deal with these issues. The disease-specific benefit measure used might not have captured the overall impact of the interventions on patients’ health. The number of MRSA healthcare-associated infections prevented might not be comparable with the benefits of other health care interventions.

Costs:
The economic analysis was consistent with the stated perspective as costs relevant to the hospital were considered. Most data were taken from published studies that were not described but were likely to be relevant to the USA context. The authors stated that a low value for MRSA healthcare-associated infection cost was selected in order to be conservative against the screening strategies. Some details on unit costs and resource quantities were given and these increased the transparency of the analysis. The price year was reported and this enabled reflation exercises in other time periods.

Analysis and results:
The expected costs and benefits were presented clearly and were synthesised appropriately using an incremental analysis. Valid approaches were used to deal with the issue of uncertainty and the methods and results were illustrated clearly. The authors acknowledged some limitations of their analysis reported in the clinical section. It was pointed out that further studies were required to validate the model results. The authors stated that these results were specific to large hospitals in USA and would not be easily transferable to small hospitals or settings outside USA.

Concluding remarks:
The study was based on a valid modelling framework that investigated key areas of uncertainty. The authors’ conclusions appear robust.

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