Screening, isolation, and decolonisation strategies in the control of meticillin resistant Staphylococcus aureus in intensive care units: cost effectiveness evaluation

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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
This study assessed the cost-effectiveness of screening strategies, with isolation or decolonisation, to control methicillin-resistant Staphylococcus aureus (MRSA) in intensive care units. Decolonisation strategies were likely to be cost saving if there was no resistance. Universal screening by polymerase chain reaction, with decolonisation for those with MRSA, could be cost-effective. The evidence for isolation was insufficient to support universal screening. The cost-effectiveness framework was robust and the uncertainty was considered; the conclusions seem valid.

Type of economic evaluation
Cost-utility analysis

Study objective
This study assessed the cost-effectiveness of screening strategies, with isolation or decolonisation, to control methicillin-resistant Staphylococcus aureus (MRSA) in intensive care units.

Interventions
Twelve screening strategies with isolation and nine screening strategies with decolonisation were considered.

Three screening tests were used on swabs (conventional culture, chromogenic agar, and polymerase chain reaction), at three screening intensities (no screening with clinical cultures only, screening for all patients on admission and weekly thereafter, and screening for patients considered to be at high risk of MRSA infection on admission and weekly thereafter).

Isolation consisted of contact precautions that continued until three consecutive negative results were obtained. Decolonisation for MRSA carriers was by nasal mupirocin, administered three times daily. Universal decolonisation was by chlorhexidine daily washing, for five days.

The background comparator was no intervention.

Location/setting
UK/hospital.

Methods
Analytical approach:
The analysis was based on a dynamic, stochastic, individual patient model of MRSA transmission. A lifetime horizon was considered. The authors stated that it was carried out from the perspective of a health care manager of resources at a regional or national level.

Effectiveness data:
The clinical inputs were from relevant studies and a search for published systematic reviews in electronic databases. The sources were primary peer-reviewed research articles, where possible, or otherwise, new analyses of primary data. The opinions of five UK-based experts were also used. The epidemiological data were mainly from UK sources, including the Intensive Care National Audit and Research Centre (ICNARC), which provided representative data on
intensive care unit sizes in England, Wales, and Northern Ireland. Screening accuracy was from a published review and
the efficacy of colonisation was from a Cochrane review. Patient-level data from 4,570 patients admitted to two
intensive care units in the UK were used to estimate the transmission parameters (daily probability of infection or
colonisation) and these were key inputs for the model.

Monetary benefit and utility valuations:
The utility values were from a published cohort study that estimated morbidity and mortality for five years after
discharge from an intensive care unit.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of
3.5%.

Cost data:
The economic analysis included the costs of the interventions (screening, decolonisation, and isolation), treatment of
infection, and extra bed-days and their associated opportunity costs. These data were from UK sources, including
published studies and official data, such as NHS reference costs. All costs were in UK pounds sterling (£) and the price
year was 2008.

Analysis of uncertainty:
A probabilistic sensitivity analysis was carried out to assess uncertainty. Various willingness-to-pay thresholds were
considered. There were no published data for decolonisation efficacy, so this was varied in two scenarios. In one
scenario, it was assumed that decolonisation (with mupirocin) did not prevent transmission and, in the other,
transmission prevention was based on expert opinion.

Results

Screening and decolonisation: Universal decolonisation using chlorhexidine had the highest likelihood of being cost-
effective (70% of simulations at a threshold of £30,000 per QALY). If this strategy was not available, the most cost-
effective option was to screen all patients, using polymerase chain reaction, and decolonise those identified as MRSA
positive (total cost £12,659; QALYs 9.1779), with a 30% likelihood of being cost-effective at the £30,000 per QALY
threshold.

Screening and isolation: There was considerable uncertainty on the best strategy at cost-effectiveness thresholds of
£20,000 to £30,000 per QALY; no strategy had more than a 20% chance of being cost-effective. In the base case,
screening high-risk patients with chromogenic agar, using both 24- and 48-hour results, was the preferred option, with a
total cost of £12,670 and 9.1665 QALYs. At a threshold of up to £17,000 per QALY no intervention was the best
option; at thresholds of £20,000 to £30,000 it was either isolation of high-risk patients without screening or
chromogenic agar screening for high-risk patients with isolation of those identified as MRSA positive.

Authors' conclusions
The authors concluded that decolonisation strategies were likely to be cost saving if there was no resistance. If
untargeted decolonisation was considered unacceptable, universal screening by polymerase chain reaction, with
decolonisation for those with MRSA, was likely to be cost-effective. In the absence of decolonisation, evidence for
isolation was insufficient to support universal screening. Screening, with isolation, for high-risk patients was more
likely to be cost-effective.

CRD commentary
Interventions:
The selection of the comparators was appropriate as a range of interventions was considered and they were combined
into many strategies. A clear description of each strategy was given.

Effectiveness/benefits:
The clinical inputs were identified by a review of the literature and, in general, valid sources appear to have been used.
The epidemiological data reflected the UK context and patient-level data were used for some parameters. The efficacy
of interventions and screening accuracy were the best evidence available in the published literature and these values were validated by experts. Extensive sensitivity analysis was conducted. QALYs were a valid benefit measure and they capture the impact of the disease on patients' health. The utility values were from a published study of patients discharged from intensive care units, but the methods used to elicit preferences were not reported.

Costs:
The costs were presented as category totals and were not broken down into individual items. The economic analysis was consistent with the UK NHS perspective. The authors pointed out that a societal perspective would have been more appropriate, but studies had shown that those costs incurred outside the hospital setting were small and had little impact. The data sources were not extensively described, but were appropriate for the UK. The price year was clearly stated, allowing reflation exercises.

Analysis and results:
The results were selectively presented due to the large number of strategies investigated. An incremental approach was used to synthesise the costs and benefits of these interventions. The cost-effectiveness frontiers allowed a clear identification of the most cost-effective strategies. A probabilistic approach was used to investigate uncertainty, but the methods were not described. The dynamic model, with patient-level simulations, was a good design. The results appear to be specific to the UK. Some of the methods, results, and sources were reported in online appendices.

Concluding remarks:
This study had a robust cost-effectiveness framework and considered various areas of uncertainty, which enhances the validity of the authors' conclusions.

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