Assessment of the influence of test characteristics on the clinical and cost impacts of methicillin-resistant Staphylococcus aureus screening programs in US hospitals

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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 evaluated the impact of screening for methicillin-resistant Staphylococcus aureus (MRSA). The authors concluded that all screening options reduced the MRSA infection rates and saved costs, compared with no screening, and same-day testing for high-risk patients was the preferred option. The methods appear to have been appropriate, but there were some limitations. The incremental costs and outcomes were not reported and combined, making it unclear which of the interventions was the most cost-effective.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to evaluate the potential clinical and cost impacts of a programme of screening for methicillin-resistant Staphylococcus aureus (MRSA) in patients admitted to hospital.

Interventions
Four different screening programmes were evaluated. These were polymerase chain reaction (PCR) screening for all hospital admissions, PCR screening for high-risk hospital admissions, PCR screening for intensive care unit (ICU) admissions, and PCR screening for patients with a history of MRSA. These were compared with no screening.

Location/setting
USA/in-patient secondary care.

Methods
Analytical approach:
A decision-analytic model was used to calculate and compare the clinical and cost impacts of various MRSA screening programmes, in a hypothetical hospital with 370 beds. The time horizon was 30 days and the authors reported that the perspective was that of a hospital administrator.

Effectiveness data:
The effectiveness data were from published studies and expert opinion. An extensive review of published literature in English was performed to identify the published studies. The expert opinion was from a series of interviews with infectious-disease physicians, infection-control professionals, epidemiologists, hospital administrators, and other experts. The main effectiveness parameters were the sensitivity and specificity of PCR screening. These estimates were from published studies.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The measure of benefit was MRSA infections avoided.

Cost data:
The costs included those of MRSA screening, MRSA treatment, and individual isolation of patients. All costs were
from published studies and it was assumed that they had remained constant over the previous 10 years. They were reported in US dollars ($).

Analysis of uncertainty:
Probabilistic multivariate Monte Carlo sensitivity analyses were conducted, using 10,000 simulations and modifying each variable within a set range. One-way sensitivity analyses were conducted on the test-specific variables. Other available screening tests were evaluated, including next-day PCR (the base case was same-day PCR) and selective culture media testing, with three-day or two-day results.

Results
The total monthly costs in a hospital with 370 beds with screening for MRSA were $140,572 for all patients, $112,012 for high-risk patients, $111,994 for ICU patients, and $176,460 for patients with a history of MRSA, and the monthly costs without screening were $188,618. The total monthly MRSA infections with screening were 2.1 for all patients, 2.9 for high-risk patients, 3.5 for ICU patients, and 6.7 for patients with a history, and without screening they were 7.0.

Screening all patients, with PCR, produced the least MRSA infections, but at higher costs than screening only high-risk patients. Screening only ICU patients reduced the costs, compared with high-risk patients, but increased the number of MRSA infections. Screening only patients with a history of MRSA resulted in marginal cost savings and prevented infections, compared with no screening.

The variables with the greatest impact on the cost and MRSA infection rates were the MRSA transmission rates, the days until conversion from colonisation to MRSA infection, the relative increase in MRSA prevalence, and the number of hospital beds. The other tests prevented fewer infections at higher costs for high-risk patients.

Authors’ conclusions
The authors concluded that all screening options reduced the MRSA infection rates and saved costs, compared with no screening. Same-day PCR testing for high-risk patients was the preferred option.

CRD commentary
Interventions:
Both the interventions and the population were described and they might be appropriate for other settings.

Effectiveness/benefits:
The authors reported that an extensive literature review was undertaken, with over 80 articles identified, but they did not report the methods of this review, making it unclear if all the best available evidence was used. The measure of outcome, MRSA infections avoided, will be difficult to generalise to other diseases.

Costs:
The perspective was explicitly reported and the costs appear to have been relevant to this perspective. The authors reported that some important costs, such as those of readmissions, were not analysed. The sources for the costs were given, but the price year was not reported. The costs were not inflated as the authors assumed that prices had remained constant over the previous five to 10 years; this assumption is questionable and increases the uncertainty in these estimates, as health care inflation usually rises faster than general inflation.

Analysis and results:
The analytic approach appears to have been appropriate and the details and assumptions of the model were provided, but no diagram was given. The costs and outcomes of the different screening interventions were not compared incrementally, making it unclear which intervention was most cost-effective. Appropriate sensitivity analysis was undertaken; but the probability distributions were not reported. The most influential results were reported. The authors stated that their main limitation was that their study did not include the costs and potential insurance reimbursements associated with readmitting patients.

Concluding remarks:
The methods appear to have been appropriate, but there were some limitations. The incremental costs and outcomes
were not reported and combined, making it unclear which of the interventions was the most cost-effective.

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