Cost-effectiveness of universal MRSA screening on admission to surgery

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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 universal screening using rapid polymerase chain reaction (PCR) on admission to surgery to reduce hospital-based methicillin-resistant \textit{Staphylococcus aureus} (MRSA) infection. The authors concluded that universal PCR screening was unlikely to be a cost-effective option for reducing MRSA infection in their hospital, but might be cost-effective in other settings with higher MRSA prevalence rate. The analysis used appropriate methods and was based on valid sources that reinforce the authors’ conclusions.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study assessed the cost-effectiveness of universal screening using rapid polymerase chain reaction (PCR) on admission to surgery to reduce nosocomial (hospital-based) methicillin-resistant \textit{Staphylococcus aureus} (MRSA) infection.

Interventions
The three screening strategies were examined were: PCR screening for all patients (universal); screening for risk factors (prior hospitalisation or antibiotic use) combined with pre-emptive isolation and contact precautions pending chromogenic agar results; and no screening (standard surgical admission without MRSA screening on admission).

Location/setting
Switzerland/hospital.

Methods
Analytical approach:
The analysis was based on a decision tree Markov model with a short-term horizon (period of hospitalisation). The authors stated that the study was carried out from the perspective of the hospital administrator.

Effectiveness data:
Most clinical inputs for rapid PCR and no surveillance strategies came from a large, prospective cohort study (Harbarth, et al. 2008, see ‘Other Publications of Related Interest’ below for bibliographic details) that was carried out at the authors’ institution (University of Geneva Hospital, Switzerland). Data on screening for risk factors came from published studies including clinical trials. The median turnaround time of PCR and agar tests were estimated at the authors’ institution. Sensitivity and specificity of rapid PCR tests were taken from the cohort study and were the primary endpoints of the clinical analysis.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
The rate of MRSA infections avoided was used as the summary benefit measure.

Cost data:
The costs included screening (personnel, materials, and overhead), decolonisation, hospital stay, and other tests. All costs were taken from the accounting system of the authors’ institution. Resource quantities were based on data from
the hospital database, supplemented with interviews conducted with infection control staff and informatics units. The costs associated with MRSA infection were estimated as a function of excess length of hospital stay attributable to infection and the cost per bed-day. This additional length of hospital stay was based on an analysis using time-dependent and multivariate methods. Costs were in Swiss francs (CHF). The price year was 2006.

Analysis of uncertainty:
One-way sensitivity analyses were carried out on all model inputs using ranges of values based on published sources or the authors’ institution database.

Results
The expected costs methicillin-resistant Staphylococcus aureus (MRSA) infections were CHF 10,358.46 with no screening, CHF 10,502.53 with universal PCR screening, and CHF 10,511.04 with risk-factor screening. The rate of MRSA infections were 0.0088 with no screening, 0.0041 with universal PCR screening, and 0.0057 with risk-factor screening. The incremental cost per MRSA infection avoided was CHF 30,784 with universal screening over no screening, while risk-factor screening was dominated by universal screening, which was more effective and less expensive.

The sensitivity analysis showed that the most influential input was the prevalence of MRSA carriage. At lower rates of MRSA carriage, the cost-effectiveness of universal screening decreased. Other influential inputs were the probability of cross-transmission, the efficacy of decolonisation and contact precautions, and the costs of infections and rapid screening.

Authors’ conclusions
The authors concluded that universal screening using rapid PCR on admission to surgery was unlikely to be a cost-effective option for reducing MRSA infection in their hospital, but it might be cost-effective in other places with higher MRSA prevalence rate.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. All strategies potentially implemented at the hospital level were considered. Each strategy was appropriately described.

Effectiveness/benefits:
Most clinical data were taken from a large cohort study that was conducted at the authors’ institution. Little information was given on this study, although reference was made to the original publication. Other data were taken from published studies including clinical trials, which should ensure high validity. However, the comparability among these studies was not discussed. Extensive sensitivity analyses were conducted on clinical and epidemiological parameters. The authors highlighted the impact of MRSA prevalence, turnaround time and test accuracy on the cost-effectiveness of universal screening. They stated that the rate of MRSA infections avoided was a valid benefit measure that captured the most relevant clinical impact of the intervention. However, it appeared to be an intermediate measure and the use of a more comprehensive benefit such as lives saved would also have been appropriate.

Costs:
The perspective adopted in the study was that of the hospital and the categories of costs included reflect this viewpoint. Both resource quantities and costs were taken from the accounting system of the authors’ hospital that should be representative of the Swiss setting. Some unit costs were presented. The excess cost of MRSA was directly taken from the increase in length of stay in the hospital. Costs were varied in the sensitivity analyses. The authors stated that capital costs for PCR equipment and depreciation were not included because PCR was also used widely by other departments. Reflation calculations in other time periods would be possible as the price year was reported.

Analysis and results:
An incremental analysis was conducted. Total costs and benefits were presented for each strategy. Uncertainty was addressed satisfactorily using an extensive univariate sensitivity analysis, although the use of probabilistic methods would have provided more information. Results of the sensitivity analyses were presented for each parameter. The Markov model used to estimate costs and benefits was not fully described. The authors underlined the impact of
epidemiological factors and costs on the cost-effectiveness of universal PCR and stated that the study findings were only relevant for their hospital. Published studies had shown contrasting results which strongly depended on MRSA prevalence in the study setting. A strength of the analysis was the inclusion of test turnaround time as model parameter.

**Concluding remarks:**
The study used appropriate methods and was based on valid sources that reinforce the authors’ conclusions.

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