Appendix 3: Analysis without uncertainty and scenario analyses

Screening in combination with decolonisation

Combining analyses of costs and effects enables strategy comparison in terms of cost-effectiveness. Figure A3.1 evaluates each strategy on a cost-effectiveness plane where parameter estimates are 'best guess' values. Once dominated strategies (i.e. those that cost-more but are less effective than another strategy) are eliminated, the remaining options (which are named the 'cost-effectiveness frontier') are evaluated in Table A3.1.

All screening and decolonisation strategies provide some degree of health benefit and monetary saving (compared to the baseline strategy) (Figure A3.1). Pre-emptive decolonisation of all patients dominates all other strategies: it provides both the greatest savings as well as the greatest health benefits (at a saving of £2,476 per QALY).

However, due to the potential emergence of resistance with 'decolonisation' of all patients, we also present results assuming that universal decolonisation is not a viable option. In this case, two strategies dominate: screening all patients with chromogenic agar or polymerase chain reaction followed by mupirocin treatment of patients identified as positive (Table A3.1). Despite having a higher incremental cost-effectiveness ratio value than universal chromogenic agar screening, screening all patients with polymerase chain reaction, is still well below the NHS threshold costing £3,155 per QALY and is therefore the most cost-effective option in this scenario.

If the estimate for the effectiveness of mupirocin derived from expert opinion is used (rather than results of the Cochrane review)[1] the incremental cost-effectiveness ratio values shift slightly as the experts have a slightly more optimistic opinion of mupirocin effectiveness. In this case the cost-effectiveness frontier is similar to that shown in Table A3.1 (when universal decolonisation was excluded): screening all patients with either chromogenic agar or polymerase chain reaction are the remaining options, with admission and weekly screening with polymerase chain reaction being the most cost-effective, costing £3,094 per QALY.

In the base case analysis it was assumed that decolonisation treatment cleared carriage in 53% of patients.[2] In a sensitivity analysis assuming no patients reverted to a MRSA negative state following decolonisation, only that their transmission potential and daily probability of progression to clinical infection was reduced for the duration of the therapy, the decision remains the same, with pre-emptive decolonisation for all patients the most cost effective option (although not providing a cost saving), with an incremental cost-effectiveness ratio of £1,438 per QALY. If universal pre-emptive decolonisation is excluded then polymerase chain reaction screening of all patients followed by decolonisation of positives has an incremental cost-effectiveness ratio just above the cost-effectiveness threshold at £30,865 per QALY. The assumption that 100% of patients undergoing decolonisation are decolonised provided the same results except universal pre-emptive decolonisation and decolonisation based on universal polymerase chain reaction screening become even better value for money, with incremental cost-effectiveness ratios corresponding to costs of £-3,354 and £3,617 per QALY gained.

Pre-emptive decolonisation of all patients remains the most cost-effective option under three further sensitivity analyses: i) when a higher percentage of patients are classified as high risk (36%, rather than the baseline 18%); ii) in a low prevalence setting (where 2% of admissions

are colonised); and iii) in smaller intensive care units (of 5 beds). The strategy becomes even better value for money in high prevalence settings (with 10% colonised on admission), saving £3,532/QALY compared with the baseline strategy, and also in larger, 20-bed intensive care units where savings increased to £4,565/QALY.

When universal pre-emptive decolonisation is excluded, decolonisation based on results of universal polymerase chain reaction screening remains the most cost-effective option under the following sensitivity analyses: i) when a higher percentage of patients are classified as high risk (36%, rather than the baseline 18%); ii) in a low and high prevalence setting (2% and 10% colonised on admission, respectively); and iii) in smaller and larger intensive care unit (of 5 and 20 beds, respectively).

Screening in combination with patient isolation

Figure A3.2 presents all screening and isolation strategies on a cost-effectiveness plane, assuming certainty in all variables. An evaluation of the frontier (Table A3.2) shows the only cost-effective move (<£30,000/QALY) is from the baseline 'do nothing' approach to a strategy of isolation informed by screening high-risk patients using chromogenic agar (and using both the early and late result).

This result was not affected by different scenarios: when the proportion of patients categorised as high risk was doubled and when prevalence on admission was decreased to 2%, screening high risk patients using chromogenic agar (using both the early and late result) and isolating those identified as positive remained the only cost-effective option. In the 10% prevalence setting, this strategy became better value at only £1,058 per QALY gained, and polymerase chain reaction-screening all patients also shifted beneath the National Health Service cost-effectiveness threshold (£19,806 per QALY) as did pre-emptive contact precautions for all patients (£24,264 per QALY). In a small intensive care unit of 5 beds screening high risk patients with chromogenic agar remained cost-effective (although at a higher cost) and screening all patients with chromogenic agar was on the threshold at £29,563 per QALY. In a larger intensive care unit (20 beds) screening high risk patients using chromogenic agar and isolating those identified as positive became better value and, as in a high prevalence setting, screening all patients with polymerase chain reaction became cost-effective (£28,641 per QALY).

References

1 van Rijen M, Bonten M, Wenzel R, Kluytmans J. Mupirocin ointment for preventing *Staphylococcus aureus* infections in nasal carriers. *Cochrane Database of Syst Rev* 2008;8:CD006216.

2 Rohr U, Mueller C, Wilhelm M, Muhr G, Gatermann S. Methicillin-resistant *Staphylococcus aureus* whole body decolonisation among hospitalized patients with variable site colonisation by using mupirocin in combination with octenidine dihydrochloride. *J Hosp Infect* 2003;54:305-9.

Legends for web extra figures

Figure A3.1. Incremental cost-effectiveness plot comparing each of the screening and decolonisation strategies in terms of cost and effect (or health benefit) per admission. Numbers indicate strategy numbers, as outlined in the key; black dots indicate those strategies with no screening; red those using conventional culture techniques; yellow chromogenic agar; and purple polymerase chain reaction. Filled dots and open dots indicate whether the intervention is applied to all patients or high risk patients, respectively. Error bars represent random error brought about by model stochasticity, and correspond to plus or minus one standard error.

Figure A3.2. Incremental cost-effectiveness plot comparing each of the screening and isolation strategies in terms of cost and effect (or health benefit) per admission. Numbers indicate strategy numbers, as outlined in the key; black dots indicate those strategies with no screening; red those using conventional culture techniques; yellow chromogenic agar; and purple polymerase chain reaction. Filled dots and open dots indicate whether the intervention is applied to all patients or high risk patients, respectively. Error bars represent random error brought about by model stochasticity, and correspond to plus or minus one standard error.