



NHS Scotland MRSA Screening Pathfinder Programme

Final Report Executive Summary

Prepared for the Scottish Government HAI Task Force
by Health Protection Scotland

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1 Key messages

- This report presents the results of a one year pathfinder project for universal MRSA screening in NHSScotland, which was commissioned by the Scottish Government Healthcare Associated Infection Task Force (HAITF). Health Protection Scotland worked in partnership with NHS Ayrshire and Arran, NHS Grampian and NHS Western Isles to implement universal screening for acute care hospital patients in order to inform future national policy decision making.
- Overall, 3.9% of patient admissions tested for MRSA colonisation in this study, were found positive. The prevalence of colonisation was found to decrease significantly during the year of the study. There was also a reduction in the number of MRSA infections following the introduction of screening.
- Colonisation was associated with a 15 times higher risk of developing MRSA infection. However, half of those patients with MRSA infections screened negative. This reinforces the need for a continuing focus on standard infection control precautions for all patients whilst in hospital and a requirement for ensuring screening methods are clinically and cost effective, as no laboratory method is completely sensitive and specific. Cross transmission resulting in new colonisations is the subject of a further special study within this programme.
- Short length of stay (median 3 days overall) often compromised the ability to apply laboratory results from admission screens to interventions such as decolonisation (suppression), or isolation. Only one in 33 patients testing positive at admission successfully completed decolonisation, but half of all patients testing positive had decolonisation initiated during their stay. Those who had the decolonisation initiated had a significantly lower infection incidence than those who did not, thus even a single day's treatment may have a significant protective effect by suppressing colonisation temporarily. New testing technologies with a faster turnaround time may help, but these tend to be expensive and as yet there is limited evidence of additional benefit. Service redesign in acute care is required to ensure the interventions associated with screening are applied at the right time and in the right place.

- Only half of patients testing positive were managed in single rooms, or were cohorted/separated within wards. This relates mostly to short lengths of stay and lack of single room accommodation.
- Assessing risk of colonisation (e.g. higher in >65s, repeat admissions, and transfers from other hospitals or care homes) looks promising as an adjunct to, or partial substitute for, laboratory-based screening. This is the subject of a further special study within this programme.
- The study indicated that many of the HTA model assumptions about the patient population in acute hospitals were not observed in practice. Nonetheless the reworked HTA model with data from the pathfinder study projected an additional benefit in introducing universal screening for MRSA.
- Screening was found to be highly acceptable to patients and the public, though there was a more negative view from a minority of staff. The issue of staff screening requires further research. The public health principles for a screening programme are now largely met.
- Whilst the study reported very few unintended consequences as a result of the implementation of screening, monitoring of key indicators is critical in any roll out, inclusive of: MRSA colonisation and infection, MSSA, and murpirocin consumption and resistance.
- Screening may take the form of clinical risk assessment (CRA) as well as laboratory testing; particularly for specialties with large patient numbers (e.g. general medicine and general surgery), the former may prove highly effective and cost-effective as a first stage screening process. A special study to investigate the sensitivity and specificity of key questions forming a CRA tool has been commenced and will be reported in October 2010. Policy and practice should be reviewed in the light of this and the other special studies now underway.
- Policy decisions to expand screening to universal should consider phased implementation, allowing time for boards to work through the extensive practical issues involved (at least a year). The above noted special studies will be completed in the interim, and further inform what type of 'universal screening' is done, for example clinical risk assessment targeting requirements for isolation and laboratory testing, or chromogenic agar versus near patient PCR testing for specific categories of patient.

2 Introduction

Meticillin resistant *Staphylococcus aureus* (MRSA) is a common hospital pathogen and accounts for around a third of all *Staphylococcus aureus* bacteraemia (SAB) within NHSScotland. It continues to be an international cause for concern in healthcare and is viewed by world authorities as a public health threat. Infections caused by MRSA are damaging and distressing to patients, are difficult to treat and thus have considerable attributable morbidity and mortality. Prevention and control of MRSA infection is therefore an important health protection priority.

MRSA screening and the associated interventions have potential benefits to the patient in terms of minimising the risk of infection whilst in hospital. It also benefits the whole hospital population in terms of reducing the burden of colonisation and therefore risk of transmission of MRSA between patients. Risk factors for colonisation and infection are well described in the literature as are the multifaceted interventions associated with minimising the risk. The added value of MRSA screening in the prevention and control of MRSA remains a controversial topic in the literature. The Scottish Government Health Directorate (SGHD) therefore commissioned NHS Quality Improvement Scotland (NHSQIS) to develop a Health Technology Assessment (HTA) on the clinical effectiveness and cost effectiveness of MRSA screening. This HTA concluded that screening all patients using direct chromogenic agar testing appeared the best option, and that a study should be carried out to test the model in practice. SGHD commissioned HPS to coordinate a pathfinder study to test the HTA findings.

This report on an MRSA screening pathfinder project within three NHS boards, involving six acute hospitals in NHSScotland over one year, addresses four aims, each presented in a volume of the report:

1. To investigate the clinical effectiveness of MRSA screening as an intervention on outcomes (colonisation / infection / bacteraemia rates) in pathfinder boards.
2. To test the estimates of the NHS QIS HTA economic model assumptions in pathfinder boards.
3. To determine the acceptability of screening for MRSA all acute in-patient admissions in pathfinder boards to patients and staff.
4. To evaluate the feasibility and potential for rollout of the MRSA screening programme in the non pathfinder boards.

The aims and associated objectives are discussed as a summative evaluation, encompassing one-year-long monitoring of system-wide effects in the three pathfinder project NHS boards.

This report has drawn upon a variety of data sources including document review, observation, audit, interviews and surveys at the pathfinder boards, together with indicators from routine surveillance and pharmacy and laboratory systems. The findings from the pathfinder project, together with the other intelligence gathered, are discussed in relation to the NHS QIS HTA and broader literature published on MRSA screening. Limitations of the work to date are addressed, and conclusions and recommendations are also included.

2.1 *Aim 1: The Clinical effectiveness of MRSA screening*

This large prospective cohort study (pathfinder study) of MRSA screening in three NHS boards, including six acute hospitals in NHSScotland and 81,438 admissions (one third elective and two thirds emergency), indicated an overall MRSA colonisation prevalence of 3.9%. The starting colonisation prevalence of 5.5% reduced to 3.5% by month twelve of the study.

Factors influencing the prevalence of colonisation included: number of admissions per patient, specialty of admission, age, source of admission – home, other hospital or care home. Patients older than 65 years were twice as likely to be colonised as those under 50 years. Almost two thirds of all MRSA colonisations were in patients with repeat admissions to hospital. Those presenting from care homes or from other hospitals comprised a small (2%) proportion of admissions to hospital overall, but were three times more at risk of being colonised on admission. The programme identified around 2% prevalence in patients with no prior history of MRSA infection or colonisation.

Patients who were colonised on admission were 15 times more likely to develop hospital associated MRSA infection (i.e. arising >48 hours after admission). However, around half of all the MRSA infections detected were in those admissions who screened negative on admission. This could be due to the effectiveness of the screening test and this the subject of a special study. The role of cross transmission during the hospital stay also requires further investigation. This will help determine the interventions which would maximise the reduction of infections not preceded by confirmed colonisation. However, it is reasonable to propose that at least the majority of infections in those screening negative could be prevented by reducing colonisation, in the population at risk, to very low levels and by maximising measures to reduce risks of transmission within the hospital.

In addition to the MRSA infections classed as hospital associated, a number of the ‘community onset’ cases may have been associated with colonisation associated with previous healthcare interventions – one third of these infections were in patients who had been in hospital within the previous 30 days. Further research is required on the risks of colonisation and infection in the community, particularly for patients with multiple admissions, to clarify if continued decolonisation after discharge would be appropriate for some categories of patient.

MRSA infection incidence was 7.5 per 1,000 patient days over the year but, as with colonisation rates, significantly reduced within the year across the pathfinder boards. MRSA bacteraemia was already reducing in NHSScotland prior to the implementation of the pathfinder study, but there was early indications of a temporal association between the initiation of the universal screening and a decline in MRSA infections, as defined by the number of first clinical isolates from hospital-based laboratory confirmed cases during the study. The reduction reached statistical significance within the combined pathfinder board data, although of course this does not necessarily prove that the screening caused the reduction. However, the decreasing trend persisted during the period after the introduction of the screening. Furthermore, the patients had similar baseline characteristics during the time of the study and the decreasing trend was not seen in the comparator control acute hospitals within the pathfinder NHS boards. No statistically

significant change in meticillin sensitive *Staphylococcus aureus* (MSSA) occurred in any of the pathfinder boards. This is consistent with other smaller studies published to date, but requires monitoring longer term.

The two interventions following screening for MRSA are (i) decolonisation (suppression) of confirmed positive cases, and (ii) isolation of those at high risk of, or confirmed as being, colonised.

Decolonisation therapy was initiated for 44% of patients who screened positive during their hospital stay, and for 46% of those who screened positive pre-admission. Shortening length of stay in hospital plays a part in reducing the risk of infection whilst the patient is in hospital, but reduces the availability of laboratory information (turnaround time 48 hours) and the ability to complete decolonisation (minimum of five days for treatment and at least eight days for repeat testing). It may be argued there is little point in screening if an intervention cannot follow in a timely manner so as to reduce risk of disease, and only 3.1% of those who screened positive at admission successfully completed the decolonisation process by demonstrating three negative screening samples. Nonetheless, those patients initiated on decolonisation (as opposed to completion) had a significantly lower infection incidence during their stay (2.7 versus 4.2 infections per 1000 patient days), implying that even partial application of the regimen may be effective in decreasing risk of infection in these patients by suppressing colonisation.

Use of the topical antibiotic mupirocin significantly increased following the initiation of MRSA screening, as more patients were identified for decolonisation. No significant increase in mupirocin resistance was seen within the pathfinder boards during the year of the intervention; however, antimicrobial resistance may increase with longer term mass usage to suppress colonisation during hospital stay. Mupirocin resistance levels in NHSScotland remain low at around 3% at present; however, careful monitoring will be required throughout the remainder of the pathfinder programme and in the longer term as policy develops.

The second intervention associated with the screening is physical (single room) or functional (cohort) patient isolation. Around half of those patients identified as colonised were isolated at some point during their stay. Where single room facilities were not available, the patients were cohorted or 'separated' from exposure to other patients through enhanced infection prevention and control measures. Factors affecting isolation during hospital stay included the availability of single room facilities and (as with the decolonisation intervention) short lengths of stay relative to laboratory test turnaround times. Given the lack of strong evidence for efficacy of these interventions and delays in implementation for patients with a short stay in hospital questions arise about how best to maximise the overall impact in reducing risks of infection.

Nasal screening alone identified 86% of all confirmed cases of colonisation. Other cases were identified through screening wounds, other body sites and invasive devices. Many of those identified as colonised were discharged before their results were known, and therefore the role of clinical risk assessment in assessing the likelihood of colonisation at the point of admission becomes an important consideration in the context of a microbiology test with an average turnaround time of two days for positive cases. One

or more of the risk factors found to be important in determining colonisation status on admission (age over 80 years, readmissions within the year, and admission from a care home or other hospital) were found in 78% (2,124 of 2,717) of confirmed colonisations but also in 54% (36,098 of 66,728) of those who were negative. More research is required to refine a clinical risk assessment tool that could be used as an adjunct to or in place of laboratory based screening and is subject to a special study within this programme.

Epidemiological data from the HPS antimicrobial resistance (AMR) surveillance programme suggests that there were no changes in the incidence of infections caused by organisms other than MRSA as a result of introducing screening, and MRSA was not replaced by MSSA. However, one year is a short time frame and these organisms will require monitoring in the longer term.

The majority of the public health principles which should underpin a national screening programme have been largely met.

2.2 Aim 2: Economic model analysis

The development of, and results from, an economic model were described within the NHS Quality Improvement Scotland 2007 HTA report – The clinical and cost effectiveness of screening for meticillin resistant *Staphylococcus aureus* (MRSA). This cost consequence analysis model was presented with the costs of the different screening strategies and the number of infections avoided. Development of this model was constrained by the lack of robust evidence for key variables in the infection control literature. The NHS QIS HTA recommended model strategy 2, which proposed universal screening for all patients using direct chromogenic agar testing. This required the lowest investment and provided the best outcome as a result of that investment.

Many of the assumptions and parameters used in constructing the NHS QIS HTA model were not confirmed by the findings of the Pathfinder project. The model was re-worked, using observed data, in order to better represent the observations found in the Pathfinder Boards.

Although only one quarter of elective admissions attended pre-admission clinics, virtually all of those who did attend were screened (98% compliance). Screening uptake within the study overall was found to be 85%. The main reason for patients not being screened was that they had been discharged before the screen was taken. Uptake of screening by patients who were offered it was high (0.04% refusal rate).

Median turnaround time for laboratory confirmation of colonisation within the study was 48 hours, and 28 hours for negative samples. Within the pathfinder project two thirds of admissions (for both under and over 65s) were admitted to 'high risk' specialties as defined by the HTA, and one third to 'low risk' specialties. This was significantly different to the original HTA model estimates. No difference was found in incidence of infection in high risk or low risk specialty admissions and prevalence of colonisation on admission was in fact found to be higher within low risk specialties. All of these findings differed from the original HTA model assumptions. Patient movement within the hospital between specialties during a single admission was such that defining infection risk by admission speciality was not appropriate.

Seventy-four percent of admissions who were pre-emptively isolated due to presumed colonisation on admission had a confirmed colonisation status, indicating that clinical risk assessment, even as currently practised, has a part to play in allocating patients correctly to isolation. This is the subject of a special study within this programme.

Less than half of the admissions found to be positive were commenced on decolonisation therapy. However, only 3% of these patients were able to complete the course (i.e. were deemed negative during their stay), representing only one in 33 (3.1%) of all patients who screened MRSA positive. This poor compliance was largely due to a median length of stay of three days. Specialties with longer average lengths of stay were better placed to both decolonise and isolate colonised patients.

Availability of single (isolation) rooms varied from specialty to specialty, as did MRSA colonisation prevalence; however, availability of isolation facilities did not necessarily match the requirement for them. During the year of the pathfinder project, just under half of those patients screening positive were isolated at some point during their stay. Many patients were not isolated or cohorted, because they were in hospital for less than two days and their MRSA colonisation status was not known until after discharge. Of those patients who screened positive on admission, that were not started on decolonisation during their stay, two thirds were discharged before their results were returned.

Service redesign in acute care should be considered in order to maximise the potential of the above noted interventions to reduce risk of MRSA infection for patients during a hospital stay. Reduced turnaround times may also have a role to play in ensuring practice is clinically effective, however there is limited evidence regarding the effectiveness of rapid microbiology diagnostic tests (e.g. PCR (laboratory or near patient testing) in reducing actual transmission of MRSA; currently, these tests are considerably more expensive than chromogenic agar. The time required for clinical risk assessment is not as great as the HTA assumed; the modelled time differential between universal laboratory test screening and clinical risk assessment was a significant factor in rejecting the latter within the HTA.

The reworked model, populated with the parameters found within the pathfinder study, projected a reduction in MRSA colonisation over three to five years to low endemic levels (0.5-1.8%). Little difference was seen in the modelled effectiveness of using PCR versus chromogenic agar over this time frame. This is primarily due to the limited availability of isolation facilities. A faster turn around time does not affect the availability of single rooms.

The Pathfinder project was undertaken over the period of one year and was designed as an implementation study. Discretion must be used in interpreting the results of the modelling, and primary consideration must be given to the Pathfinder cohort study measured against the principles of public health as a source for intelligence on which to make policy decisions.

2.3 Aim 3: Patient and staff acceptability

A study of staff and patient acceptability of MRSA screening was undertaken during the pathfinder study. A mixed methods triangulation design was used to enable merging of qualitative and quantitative data sets, incorporating the following data collection strategies:

- Post-discharge qualitative telephone interviews with patients (n=10) and a nominated visitor (n=2)
- Post-discharge paper-based survey of patients (n=51) and a nominated visitor (n=26)
- Electronic survey of NHS staff using Survey Monkey (n=216)
- Structured discussions with NHS staff, using the Nominal Group Technique (six groups involving 34 staff)
- Postal survey of the wider community (n=352).

MRSA screening was found to be highly acceptable to patients, visitors, the wider community and (to a lesser extent) NHS staff. A significant minority of NHS staff tended to have more negative attitudes and did not believe MRSA screening to be acceptable; lack of isolation facilities, increased workload, inconsistencies in screening and decolonisation protocols within and between NHS boards, and uncertainty around future funding were concerns expressed by staff.

All participant groups tended to disagree that there were any other physical, psychological or social barriers to screening apart from a perceived lack of facilities.

The findings indicated that communication with patients about MRSA screening could usefully be strengthened to encompass suitably informed consent for screening (including making patients aware of the consequences of being found positive for MRSA), and ensuring patients are informed of their results.

There was strong support for the screening of NHS staff from all participant groups; there are a number of well-rehearsed arguments against this, however, which it was not appropriate to put forward during this study. Evidence for staff screening and public concern re staff carriage of MRSA needs to be examined more fully.

Patients, visitors and the wider community all expressed a preference for people (including themselves) who are found to be positive for MRSA to be nursed in isolation rather than in a room with other colonised patients.

Overall the patient acceptability was good. The number of patients with a MRSA positive test included (although proportional to the 3.9% prevalence) was too small to make any meaningful judgement of acceptability of interventions or of screening as a whole for patients who screen positive. Further research is required with respect to this.

2.4 Aim 4: Implications for national rollout

The vision of the programme was to make changes to hospital MRSA screening practices to enable the control and management of MRSA in the hospital sector in order to minimise or prevent MRSA infection. It was anticipated that this would reduce the negative impact MRSA infection has on patients and the additional burden on healthcare resources.

Screening for selected patient groups is current policy and practice is being developed to ensure this is in place by January 2010 in NHSScotland. This will mean that all elective patients are screened, and their status being known at admission will maximise the potential for intervention during their stay. For emergency admissions in targeted specialties (vascular, dermatology, care of elderly and nephrology), screening will also be carried out under current policy. There may be additional screening depending on existing local policy, most boards include orthopaedics and ICU as a minimum. This targeted approach has advantages in terms of cost restriction associated with the screening but is not the most clinically effective strategy to reduce MRSA.

The targeted 'high risk of colonisation' specialties identified in current policy were found to feature in the top ten of colonisation prevalence from the pathfinder study. There are issues with local definition of specialties and patient movement between specialties which create missed opportunities to reduce risk by screening on admission to selected specialties. The targeted approach also relies on staff identifying which patients should be screened and this may have an impact on compliance or uptake. The benefit of targeted screening (versus a phased approach to universal screening by clinical risk assessment and/or laboratory testing) in terms of achieving the vision of the programme identified above remains untested and should be evaluated within NHSScotland.

Requirements for national rollout of existing policy on MRSA screening and the pathfinder study are addressed in full in volume four of this report. In summary these included development of national information leaflets, guidance, and laboratory standard operating procedures (SOPs). The programme also addressed key ethical and legal issues including patient acceptability, which had not been addressed before. Potential unintended consequences such as impact on other services or the patient experience (deferrals and waiting lists) have also been examined and indicated no significant negative impact. Projections for national rollout of the pathfinder study across the rest of NHSScotland have also been calculated.

Implications for moving to universal from targeted screening (without clinical risk assessment as a formal screening tool) would result in a three fold volume increase in screening activity and cost for NHSScotland. There are challenges associated with universal screening in endemic settings, such as Scotland, due to the lack of available single room facilities; nonetheless the pathfinder project demonstrated a sustained reduction in colonisation prevalence associated with universal screening despite this limiting step. If the modified model projections transpire in reality, a change in policy may be possible within three to five years within this time frame there could, potentially, be low endemic proportions of MRSA and a 'search and destroy' strategy could be employed at that time. This is the approach currently undertaken in countries with low endemic proportions of

MRSA, such as the Netherlands, and has been successful in maintaining that low level over many years. This search and destroy approach involves clinical risk assessment and pre-emptive isolation in conjunction with decolonisation of the patient and their contacts. A change of policy in this direction from universal screening would mean that there would be far fewer laboratory screening tests required in the future.

Universal laboratory-based screening (without clinical risk assessment as a formal screening tool) might be promoted because it is easier to apply reliably in practice, is equitable, and therefore uptake may be higher than with targeted screening. It does however have substantial cost implications, and for some boards a commitment to substantial capital investment (e.g. building and equipping additional laboratory premises) for a short to medium term policy may be a challenge. Some laboratories would need to consider structural changes (e.g. new buildings) to cope with the change in volume required for universal screening. This would also involve tendering processes (even a requirement for EU tendering) and take time for delivery. If this commitment is made, consideration should be given to emerging technologies such as PCR which, although expensive, could be used for organisms other than MRSA in the longer term if policy were to change in response to low endemic levels of MRSA in the patient population in the future. This would require evidence that these technologies are appropriate and applicable to a range of diagnostic tests.

A number of issues require further work as part of any implementation programme for MRSA screening. These are identified as development of guidelines for decolonisation and confirmation of negative MRSA status, assessment of the value of completion of decolonisation therapy post discharge and engagement with primary care, and balancing the potential role and costs of new technologies in reducing risk of transmission of colonisation and infection. The patient journey, pre-admission and during the admission, should be redesigned in order to minimise the risk of hospital associated infection.

The national rollout of MRSA screening should continue to be coordinated across NHSScotland to ensure the lessons learned and work developed within the pathfinder project are shared with the whole service. Key performance indicators for the programme are a critical component in deciding future policy direction within NHSScotland.

3 Conclusions

MRSA is a common cause of healthcare associated infection in the UK and remains an organism of concern worldwide. There is an early indication from the pathfinder study that universal MRSA screening may be associated with a reduction in MRSA colonisation prevalence and infection incidence.

The pathfinder study has identified many organisational issues in healthcare which call into question the underlying assumptions within the HTA model on MRSA screening. Nonetheless the reworking of the HTA economic model, with pathfinder study intelligence, projects that universal MRSA screening could result in a significant reduction in MRSA colonisation rates over a three to five year period in NHSScotland.

4 Recommendations

- Service redesign should be considered in acute care, with respect to patient movement and bed management of those who are colonised or infected, in order to minimise the risk of MRSA infection to patients.
- Any commitment to a more extensive screening policy should be made with evaluation of the impact built into the policy, with a review of the impact at three years and with a view to policy revision within five years. Policy and practice should also be reviewed in the light of the special studies now underway.
- Further local and national surveillance is required of MRSA colonisation prevalence and infection markers for disease in the longer term, in both pathfinder and non pathfinder boards.
- Changing mupirocin resistance patterns also require to be monitored as do MSSA and selected AMR data to ensure any unintended consequences of focussing on one organism are identified and managed early.
- Turnaround time of the laboratory test can constrain implementation of interventions. This is particularly important for patients with a short length of stay, and therefore work needs to be done to reduce the time from screening to results from the laboratory to enable early intervention. A faster test will fail to deliver improvements if times from screening to arrival at the laboratory, or times from result reporting to implementation of interventions, are themselves slow. The pathfinder study indicates that models for screening using existing ward staff infrastructures to identify patients on admission rather than utilising dedicated screening teams helps with this.
- The Scottish Microbiology Forum (SMF) should consider emerging technologies for MRSA screening, and further development of their national Standard Operating Procedure, to ensure reporting of results as early as possible to reduce total turnaround time for most patients. There is no good information on what the optimal total turnaround time for improving outcomes is, but this is likely to be a very small number of hours.
- Further evaluation of near patient testing (e.g. real time PCR) is needed in terms of the sensitivity, specificity and reproducibility of the test as well as the costs. Evaluation is also needed of the impact of near patient testing on outcome; if earlier identification of colonisation does not translate into earlier action and clinical benefits, then there is no added value.
- The role of clinical risk assessment (CRA) requires further investigation as one possible way of mitigating slow turnaround time, or indeed as a primary screening approach in its own right by selectively identifying those who should be screened. For specialties with large patient numbers, CRA may prove both highly effective and cost-effective as a first stage screening process; this would be particularly applicable to general medicine and general surgery where numbers are high due to large volume,

but rates (i.e. risk of infection to individual patients) are not. A special study to investigate the sensitivity and specificity of a small number of key questions forming a CRA tool will be reported by October 2010. Policy and practice should be reviewed in the light of this and the other special studies now underway.

- Understanding cross transmission of MRSA within the hospital is essential in understanding the additional benefit of admission screening in protecting those who are non-colonised on admission (a special study addressing this is due to be reported in October 2010).
- Patient acceptability of nasal screening for MRSA was very high, but there is a need for a study targeted on those who screened positive to look further at the acceptability of the interventions associated with the screening outcome.
- Further research is needed on the role of decolonisation in reducing risk of infection in hospitalised patients. This should include an assessment of the benefit of continuing decolonisation after discharge, particularly in those patients likely to be readmitted and the potential adverse consequences e.g. resistance, and further consideration of how 'community associated' cases of infection are defined. Evaluation of the optimum timing and approach to decolonisation pre-admission is also needed.
- Policy decision to expand screening to universal should consider phased implementation, allowing time for boards to work through the extensive practical issues involved (at least a year). The above noted special studies will be completed in the interim, and will further inform what type of 'universal screening' is done, for example clinical risk assessment targeting requirements for isolation and laboratory testing, or chromogenic agar versus near patient PCR testing for specific categories of patient.

Current policy, developed following publication of the interim Pathfinder report, aims to screen all arranged admissions, plus emergency admissions to targeted specialties (vascular surgery, dermatology, care of the elderly and nephrology). In terms of the risk to individual patients by specialty, the full Pathfinder study dataset shows that the risk of MRSA infection is highest in intensive care/anaesthesia, some surgical specialties (cardiac, vascular, thoracic), diabetes and dermatology. In addition to these priority areas above, higher risks of colonisation were found in respiratory medicine, rheumatology and gastroenterology.

General medicine and general surgery account for the largest numerical load of colonisation and infection cases, but this is substantially because they are the largest specialties in terms of number of patients – the risk per patient is not high relative to the above groups. This implies that universal laboratory test screening for these two specialties would come at significantly higher cost per colonised patient identified, and they are thus particularly good candidates for application of clinical risk assessment screening (subject to the findings of the special study now underway). Given the major implications in particular for laboratories, in terms of physical space as well as consumables, it is recommended that a policy decision on screening for these specialties is deferred until these studies are completed (October 2010).

The predicted annual revenue cost of universal screening of all specialties (excluding psychiatry, obstetrics and day cases) by laboratory testing in NHS Scotland (£14 - 17m) has to be assessed in relation to the total cost of HAIs in NHS Scotland, identified in the 2007 national HAI prevalence survey as £183million, and the fact that MRSA infections comprise around 17% of laboratory-confirmed HAI. Screening also offers the prospect of reducing MRSA colonisation to very low levels, only at which point a switch to a 'search and destroy' methodology could be contemplated; this, however, is a scenario predicated on expectations from modelling, and reinforces the need to ensure continuing measures of colonisation prevalence as part of overall key performance indicators. Overall, national policy decisions on MRSA screening needs to balance clinical effectiveness with value for money in the context of overall healthcare expenditure.

Questions remain over the value for money of universal laboratory based screening in the context of (a) the currently unknown utility of clinical risk assessment as a primary screening tool and (b) the full implementation of other more generic interventions (e.g. hand hygiene) which could further reduce HAIs including MRSA. Further, any policy commitment for MRSA screening would require evaluation and revision if the programme achieves the success projected by the model within three to five years due to potential diminishing returns.

The majority of the public health principles which should underpin a national screening programme, including patient acceptability, are largely met for MRSA screening.

There is an early indication that MRSA laboratory test-based screening across the majority of clinical specialties is associated with a reduction in MRSA colonisation prevalence and infection incidence within the first year of implementation (despite only half of those colonised being isolated and half commencing decolonisation due to short lengths of stay).

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