MRSA screening in the vascular day-case population

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ABSTRACT

INTRODUCTION The UK Government has prioritised methicillin-resistant *Staphylococcus aureus* (MRSA) screening and new operational guidance has instructed that all day-case surgical patients should be screened from April 2009. We sought to identify the number of MRSA-positive patients in the vascular day-case population over a 1-year period and to profile this cohort in terms of risk-factors for MRSA. We also sought to identify whether the new guidance from the Department of Health (DH) had resulted in increased screening rates.

PATIENTS AND METHODS Electronic records and laboratory culture results were prospectively consulted to identify whether patients had been screened and if MRSA had been isolated. Consideration was given to whether any patients had a delayed discharge or subsequent admission with an MRSA-related complication.

RESULTS Six patients (2.1%) screened MRSA-positive (DH estimate 7%); five were previously known to be MRSA-positive, therefore only 0.36% patients were newly-identified as MRSA-positive. The proportion of patients screened increased from 35% to 72.5% after April 2009, in accordance with DH guidance. Successful decolonisation was proved in two patients (33.3%).

CONCLUSIONS There is dispute with several of the key assumptions behind the DH's impact assessment justifying an expanded MRSA-screening policy. It is not cost-effective to screen all vascular day-case admissions. We recommend selective screening for patients previously identified as MRSA-positive, or considered high risk.

KEYWORDS

MRSA – Vascular surgery – Elective surgery – Day-case

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The infectivity and prevalence of the Gram-positive bacterium, methicillin-resistant *Staphylococcus aureus* (MRSA) has presented a major problem for acute hospitals in the UK over the past decade, as it has in most developed countries.¹ The UK has one of the highest rates of infection in Europe and the need for improved control has been highlighted by experts.² Specifically, MRSA infection is a significant contributor to prolonged hospital stay, poor clinical outcomes and increased healthcare costs amongst surgical patients.³ In response, the UK Department of Health (DH) has prioritised reduction of MRSA carriage and rates of infection through an expanded screening programme. This policy was initially outlined in 2006⁴ and the broadened inclusion criteria for MRSA-screening were made explicit in the operational guidance⁵ issued in July 2008. The guidance specified that by 1 April 2009 all elective admissions to hospital should be screened for MRSA, with few select exceptions

(day-case ophthalmology, day-case endoscopy, day-case dental, paediatrics, obstetrics, and minor dermatology procedures). This new instruction means that all day-case surgical procedures should now be screened for MRSA prior to admission.

This change in policy was subsequently justified by an impact assessment released by the DH in November 2008.⁶ The document provided an economic analysis supporting the policy shift by illustrating that this widened screening campaign would be cost-effective when compared to the options of: (i) no change in policy; (ii) screening all patient groups; and (iii) screening the proposed group along with immediate screening of emergency admissions. This analysis was not based on any study or trial data but was predicated on a series of assumptions, including: 7% of all patients admitted to hospital were colonised with MRSA; all patients have an equal risk of having MRSA; and that

decolonisation is 90% effective. There was no consideration given to patients being at high-risk for MRSA, or a focused screening programme concentrating on these patient groups.

Screening all day-case surgical admissions would target patients who have previously been colonised with nosocomial MRSA as well as community-acquired MRSA (which refers to MRSA infection in a person lacking established MRSA risk factors such as recent hospitalisation, surgery, residence in a long-term care facility, receipt of dialysis, or presence of invasive medical devices). Although there are increasing numbers of reports of community-acquired MRSA,⁷ the vast majority of MRSA infections are hospital-related.⁸ A meta-analysis of community-acquired MRSA⁸ also revealed that 85% of patients defined as having community-acquired MRSA actually had at least one healthcare-associated risk. The pooled MRSA-colonisation rates amongst community members in that study was 1.3% and, in fact, significantly lower for those with no healthcare contacts (0.2%). A cohort study of patients with MRSA-bacteraemia on admission to hospital revealed that 91% had been in hospital previously.⁹

The aims of this study were to establish the number of MRSA-positive patients in the vascular day-case population over a 1-year period, compiling a profile for each patient in terms of MRSA risk-factors. The secondary aim was to identify the proportion of patients being screened for MRSA, and whether this has been significantly altered since the new policy changes.

Patients and Methods

An analysis was undertaken incorporating all patients undergoing elective day-case procedures over a 1-year period in the Department of Vascular Surgery at Selly Oak Hospital, Birmingham. A total of 801 patients were included from the period September 2008 to September 2009. This time-frame allowed gauging the effect of the DH's guidance that all day-case surgical patients should be screened for MRSA from April 2009 onwards.

Electronic patient records and culture results were utilised to identify which patients had been screened for MRSA preceding their procedure; a screen 4 weeks prior to surgery was deemed acceptable. We also included patients who were screened on the day of their procedure. All samples were tested using the same laboratory method for the detection of MRSA. In those patients in whom MRSA was isolated, we examined previous culture results to determine if they were known to have MRSA and had previously received decolonisation. Consideration was also given to whether any of the MRSA-positive patients had a subsequent delayed discharge or later admission due to a wound infection. Finally, the patients testing positive for MRSA had

their hospital records examined to compile a patient profile in terms of risk factors for MRSA infection.

Results

Between September 2008 and April 2009, 21.7% of patients were screened (128 out of 590). From April 2009 onwards (the DH's targeted date for implementation of the new screening programme to include all day-case surgical patients) this proportion improved markedly to 72.5% of patients (153 out of 211), as demonstrated in Figure 1.

Six patients in the entire annual study period (September 2008 to September 2009) were identified as being MRSA-positive (2.1% of patients screened; 6 out of 281). Three patients were identified as MRSA-positive between September 2008 and April 2009 (2.3% MRSA-positive rate; 3 out of 128); the other three MRSA-positive patients were identified between April 2009 and September 2009 (2.0% MRSA-positive rate; 3 out of 153).

Of these six identified MRSA-positive patients, five were already known to be MRSA-positive in the past; therefore,

Table 1 Characteristics of patients who tested positive for MRSA and whether there was evidence of successful decolonisation

	Previously MRSA-positive	Recent admission	Residential home	Delayed discharge	MRSA-related complications	Successful decolonisation
Patient 1	Yes	Yes	No	No	Yes	No
Patient 2	Yes	No	Yes	No	No	No
Patient 3	Yes	Yes	Yes	No	No	Yes
Patient 4	Yes	Yes	No	No	No	Yes
Patient 5	Yes	Yes	No	No	No	No
Patient 6	No	No	No	No	No	No

0.36% of patients were newly uncovered as MRSA-positive. Two of the patients had multiple previous hospital admissions and two were residents in nursing homes. Only one patient exhibited no risk factors for MRSA (the newly discovered MRSA-positive).

Patient 1 was a known insulin-dependent diabetic with a recent in-patient stay, who was admitted from his own home for an angioplasty. He was previously identified as MRSA-positive, with unsuccessful decolonisation. He had no delayed discharge or an MRSA wound-infection following his procedure. He was, however, subsequently admitted with a febrile illness, and grew MRSA in a foot ulcer. He went on to require a below-knee amputation. He is the only patient who demonstrated any MRSA-related complications.

Patient 2 was admitted from a residential home for an angioplasty, was a known insulin-dependent diabetic and known to be MRSA-positive from previous culture results. Decolonisation was unsuccessful in this patient with subsequent positive cultures. There was no delayed discharge or subsequent admission related to MRSA or the procedure.

Patient 3 was an 84-year-old haemodialysis patient admitted from a residential home for a right toe amputation. She had multiple previous in-patient episodes and was known to be MRSA-positive. Decolonisation was successful in this patient proven by a subsequent negative culture result. There was no delay in discharge or subsequent admission with a wound infection or other complication.

Patient 4 was a 93-year-old admitted from her own home for endovenous laser therapy (EVLT), with recent in-patient episodes in hospital and known to be MRSA-positive. There was no delay in discharge and decolonisation was successful in this patient with subsequent negative cultures. There was subsequent admission due to an ischaemic stroke but no complications related to MRSA or her procedure.

Patient 5 was a 78-year-old admitted from her own home for an EVLT, with a recent in-patient admission. There was no delay in discharge or subsequent admission with a

wound infection. Decolonisation was unsuccessful in this patient with on-going positive cultures.

Patient 6 was a 37-year-old admitted from her own home for bilateral EVLT, with no past medical history of note and no in-patient episodes. This woman's discharge was not delayed and there was no future admission due to wound infection or other complications. She was never subsequently tested for MRSA so there is no evidence for successful decolonisation. The possibility must be considered that this is a false-positive reading (there is no mention in the DH's impact assessment of the cost of false positives).

No MRSA-positive patients had a delayed discharge and none had a subsequent admission with a wound infection related to the procedure. One patient (patient 1) who had undergone an angioplasty was later admitted with an infected foot ulcer which grew MRSA.

Of the six patients who were identified as MRSA-positive, only two have evidence of successful decolonisation (patients 3 and 4) with subsequent negative cultures (33.3%); three had proven unsuccessful decolonisation (patients 1, 2, and 5) with serial subsequent positive cultures (50 %); and one patient (patient 6) had no further cultures recorded. Table 1 summarises the characteristics of all MRSA-positive patients, together with evidence of successful decolonisation and the presence of any complications.

Discussion

The proportion of patients being screened for MRSA prior to their procedure improved markedly after the April 2009 target date for implementation of the new screening programme (21.7% vs 72.5%). Although almost a quarter of the patients were still not screened between April 2009 and September 2009, it is unlikely that 100% screening would skew our overall findings; this is evidenced by the fact the rates of MRSA-positive patients are very similar in each time-frame despite the difference in screening rates (21.7%

of patients screened between September 2008 and April 2009 with 2.3% MRSA-positive patients; 72.5% of patients screened between April 2009 and September 2009 with 2.0% MRSA-positive patients). This affirms that the new screening regimen has had a positive impact in terms of increasing rates of MRSA screening.

The prevalence of MRSA within this cohort was significantly lower than that estimated by the DH in its impact assessment (2.1% vs 7%). The figure of 7% is also contested elsewhere, with there being evidence in studies with rates as low as 0.5%,¹⁰ and also reported figures of 1.3%⁸ and 5.1%.¹¹ Furthermore, all but one of the patients exhibited known risk factors for MRSA-infection or was known to be MRSA positive from a previous admission. Previous work has indicated that targeted screening for patients with risk factors would identify 88% of carriers¹² and that the vast majority of patients who have been labelled as having community-acquired MRSA do in fact exhibit healthcare-associated risks.⁸ In the DH's impact assessment there was a base assumption that all individuals were at equal risk of carrying MRSA, with no consideration given to high-risk groups. There is also the possibility that the single newly-identified MRSA-positive patient (patient 6), who was the only member of the cohort who displayed no risk-factors for MRSA, represented a false-positive result. There is no discussion of false positive results and their associated costs in the DH's impact assessment.

Our experience also challenges the assumption in the DH's impact assessment that decolonisation is 90% effective, as in the group of patients identified as MRSA-positive only 33.3% had successful decolonisation. This is supported by previous studies showing that failure of decolonisation within hospitals is common, with success rates varying between 20–26%.¹⁵ A randomised, placebo-controlled, double-blind study in 1999 examined the efficacy of mupirocin in eradicating MRSA, finding that mupirocin was superior to placebo (25% eradication vs 18% in the placebo arm); the conclusion was that mupirocin is only marginally effective in eradicating MRSA in a setting where MRSA is endemic.¹⁴

Consideration must be given to the extra costs associated with an expanded screening programme. A 10-year study in The Netherlands examining a strict MRSA-eradication policy identified 'negative aspects' as the extra costs associated with 78,000 additional cultures.¹⁵ An NHS Quality Improvement document from Scotland¹⁶ outlined a breakdown of costs involved in MRSA-screening, with values for each component of the programme estimated for a nominal 775-bed hospital. The single biggest individual cost was that associated with processing laboratory tests, outweighing even the financial burden of isolating patients and decolonisation treatment. This suggests that the most economically prudent approach would be to employ a more focused screening regimen targeting high-risk patients, as opposed

to broadening inclusion criteria to screen all patients. A paper attempting to quantify the impact of the different interventions involved in The Netherlands' successful 'search and destroy' MRSA-control policy concluded that it is the screening of high-risk patients plus their contacts that is responsible for this effective strategy.¹⁷ A study involving almost 11,000 patients in Switzerland concluded that a universal MRSA screening strategy in surgical patients did not reduce nosocomial MRSA-rates.¹¹

Conclusions

It is not cost-effective to screen all vascular surgery day-case admissions. Many of the collateral cost benefits outlined in the DH's impact assessment (associated with preventing MRSA transmission to other patients) are not applicable to the day-case population. Screening of high-risk patients was not proposed as an alternative strategy by the DH and has not been analysed financially. There is also evidence to dispute some of the core assumptions in the impact assessment, primarily that 7% of patients admitted to hospital are MRSA-positive and that all patients are at equal risk of carrying MRSA. There is also little evidence to support the belief that decolonisation is 90% effective.

The results from this patient group would endorse a policy of selective screening for patients previously identified as MRSA-positive or those considered high-risk (including patients admitted from residential or nursing homes, fre-

quent attenders such as dialysis and chemotherapy patients, those with a history of a critical care stay or with history of recent inpatient admissions). Figure 2 is a flow-chart suggesting a protocol for the screening of vascular day-case admissions for MRSA on the basis of our results. Recommendations for future work include a formal cost-effectiveness analysis using statistics from a patient-based study, and investigation into the results of a selective screening strategy.

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