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Low prevalence of meticillin-resistant *Staphylococcus aureus* carriage at hospital admission: implications for risk-factor-based vs universal screening

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SUMMARY

Background: There is debate over the optimal policy for detecting meticillin-resistant *Staphylococcus aureus* (MRSA) colonization at hospital admission. The emergence of community-associated (CA)-MRSA may compromise targeted screening strategies based on risk factors for healthcare-associated (HA)-MRSA.

Aim: To determine the prevalence of MRSA colonization at admission, and the genotype and molecular epidemiology of the strains involved.

Methods: A 12-month observational study was performed at a 1200-bed London tertiary referral hospital from 1 April 2008 to 1 March 2009. All available MRSA isolates were genotyped by *spa* and staphylococcal cassette chromosome *mec* (SCC*mec*) typing.

Findings: The overall MRSA colonization rate was 2.0% of 28,892 admissions (range 6.6% in critical care to 0.8% in obstetrics/gynaecology/neonatology). The overall frequency of previously unknown carriage of MRSA on admission was 1.4%. Most colonizing strains were epidemic HA-MRSA-15 and -16. However, heterogeneous CA strains accounted for 18% of recovered isolates, including 37.5% of MRSA from accident and emergency and 23.1% of MRSA from surgery. The CA-MRSA strain types had significantly different epidemiological associations from the HA-MRSA strains, so risk factors used for the identification of HA-MRSA may not detect CA-MRSA reliably.

Conclusion: The low rate of HA-MRSA in the UK increases the relative proportion due to CA-MRSA, for which conventional risk-factor-based screening strategies may be less effective. Cost–benefit analyses of universal MRSA admission screening will need to take account of this new epidemiology.

Introduction

Asymptomatic colonization with meticillin-susceptible or meticillin-resistant *Staphylococcus aureus* (MRSA) is a risk factor for subsequent infection.[1] The identification of MRSA carriers on admission can help to control the spread of MRSA in hospitals by facilitating targeted isolation and decolonization.[2,3] For many

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years, England and most other European countries have used a risk-based approach to MRSA screening.[3,4] However, the English Government has mandated that National Health Service (NHS) acute hospitals perform universal MRSA screening for all elective and emergency admissions since December 2010.[2] Several states in the USA have also mandated active MRSA surveillance cultures.[5] These legal directives have prompted considerable debate regarding the cost-effectiveness, ethics and practicalities of implementing universal screening programmes, with many experts maintaining that a targeted screening policy is most cost-effective.[2,4,5]

Risk factors for colonization with healthcare-associated (HA)-MRSA are well established.[1,3,6] However, the same is not true for community-associated (CA)-MRSA strains that have emerged worldwide over the past decade and can affect otherwise healthy individuals of all ages in community settings.[7,8] CA-MRSA have begun to transmit in hospitals, confounding epidemiological definitions and making a case for the definition and identification of CA-MRSA by their distinct genotypes.[9]

The study hospital introduced a universal MRSA screening policy in April 2008. All MRSA isolates identified during the first year of universal screening were collected to determine the prevalence and molecular epidemiology of MRSA colonization among patients admitted to an acute hospital.

Methods

Setting, MRSA screening policy and culture methods

Guy's and St. Thomas' NHS Foundation Trust comprises two hospitals in central London with about 1200 beds and approximately 120,000 admissions per annum, including day visits. From 1 April 2008, an admission MRSA screen was collected from all adult and paediatric elective surgical and medical patients during pre-admission clinics, and from all emergency cases within the first 48 h of admission. Repeated screens from the same patient were excluded. Cotton-tipped swabs (Sterilin Amies Transport, Sterilin Limited, Newport, UK) were used to sample nose, throat and perineal (groin in children) colonization sites. The three swabs were pooled and plated on to MRSA selective chromogenic agar (Brilliance™ MRSA, Oxoid, Basingstoke, UK). Swabs were also taken to detect rectal colonization in patients admitted to the adult intensive care unit (ICU) and high dependency unit and processed separately. Admission MRSA screens were taken at the same time from any clinical sites such as skin breaches and catheter urines.[10] Presumptive MRSA isolates were confirmed by standard methods, and tested for antimicrobial susceptibility by automated broth microdilution (Vitek 2, bioMérieux, Basingstoke, UK). During the study period, one MRSA isolate per patient was collected prospectively and stored on a nutrient agar slope at room temperature.

Identification and characterization of MRSA cases based on clinical and epidemiological factors

Culture results of all MRSA admission screens collected between 1 April 2008 and 31 March 2009 were recorded prospectively. Patient age, gender, record of previous visits to the study hospitals, previous history of MRSA, admitting specialty and underlying medical conditions were obtained from patient electronic medical records. CA-MRSA and HA-MRSA strain types were defined genotypically (see below). Regardless of the strain types involved, cases were classified as healthcare-associated if: (1) their MRSA-positive screen during the study period was collected less than 12 months after a previous inpatient stay, or (2) the patient had (a) previous

Table I
Prevalence of meticillin-resistant *Staphylococcus aureus*-positive admission screens by specialty

Specialty	Total	Positive	% positive	% of all positives
Surgery				
General surgery	2361	41	1.7	7.0
Urology	2250	38	1.7	6.5
Orthopaedics	1822	31	1.7	5.3
Ear, nose and throat/ oral surgery	1561	33	2.1	5.7
Cardiothoracic surgery	1317	21	1.6	3.6
Paediatric surgery	1225	14	1.1	2.4
Plastic surgery	1137	11	1.0	1.9
Vascular surgery	480	12	2.5	2.1
Breast surgery	387	3	0.8	0.5
Total surgery	**12,540**	**204**	**1.6**	**35.0**
Medicine				
General medicine	4632	142	3.1	24.4
Cardiology	2729	32	1.2	5.5
Paediatric medicine	1732	18	1.0	3.1
Haematology/oncology	1150	17	1.5	2.9
Renal medicine	972	19	2.0	3.3
Respiratory medicine	361	17	4.7	2.9
Elderly care	218	9	4.1	1.5
Gastroenterology	171	4	2.3	0.7
Ophthalmology	135	4	3.0	0.7
Rheumatology	129	4	3.1	0.7
Dermatology	85	7	8.2	1.2
Total medicine	**12,314**	**273**	**2.2**	**46.8**
Accident and emergency				
Adult accident and emergency	1280	38	3.0	6.5
Paediatric accident and emergency	72	1	1.4	0.2
Total accident and emergency	**1352**	**39**	**2.9**	**6.7**
Intensive care unit				
Adult intensive care unit	624	40	6.4	6.9
Paediatric intensive care unit	154	11	7.1	1.9
Total intensive care unit	**778**	**51**	**6.6**	**8.7**
Obstetrics/gynaecology/neonatology				
Obstetrics/ gynaecology	1433	16	1.1	2.7
Neonatology	475	0	0.0	0.0
Total obstetrics/ gynaecology/ neonatology	**1908**	**16**	**0.8**	**2.7**
Grand total	**28,892**	**583**	**2.0**	–