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Staphylococcus aureus

A cross sectional study of prevalence and risk factors in one general practice

Background

Infection control and antibiotic resistant organisms are a community health concern. This article presents findings of a cross sectional study of 100 users of the Thirroul Medical Practice clinical treatment room, in Thirroul, New South Wales.

Methods

Nasal *Staphylococcus aureus* colonisation rates and risk factors were investigated.

Results

Twenty-six percent of participants (n=26) were found to have *S. aureus*; 11.5% (n=3) of cases were community acquired methicillin resistant *S. aureus*. Methicillin resistant *S. aureus* was significantly correlated with older age ($p=0.02$) and skin infection within the preceding year ($p=0.03$). Clinical staff (n=15) had low rates of *S. aureus* at 6.6% (n=1) and no methicillin resistant *S. aureus*.

Discussion

Overall, *S. aureus* rates were unremarkable, but methicillin resistant *S. aureus* rates were higher than elsewhere with older patients most at risk. General practice staff developing infection control strategies should consider the vulnerable nature and cross-contamination risks in this group of patients. Encouragingly, clinical staff showed low levels of *S. aureus* and no methicillin resistant *S. aureus*.

Keywords

staphylococcus aureas; carrier state; general practice; nasal cavity/ microbiology

Infection control and antibiotic resistant organisms are a community health concern. Research has focused on acute and high dependency facilities,^{1,2} but with care of chronically ill patients increasingly taking place in the community, these patients may be more susceptible to persistent bacterial colonisation and invasive infection. *Staphylococcus aureus* (SA), particularly community acquired methicillin resistant *Staphylococcus aureus* (MRSA) is increasingly virulent and invasive.²

Staff at the Thirroul Medical Practice (TMP), in Thirroul, New South Wales, have long committed to minimising cross-contamination within the practice. This article presents a cross sectional study aimed at measuring the point prevalence of nasal SA colonisation in users of the TMP clinical treatment room and identifying associated risk factors.

Methods

Recruitment and data collection occurred between 24 January and 4 February 2011. People aged over 18 years entering the TMP treatment room during this period were eligible to participate. Two refused, both tending to acutely unwell children; however 100 participants formally consented to involvement. All 15 eligible TMP clinical staff were recruited. Remaining participants included nonclinical staff, patients, carers and family members.

Data collection

Participants' nares were swabbed for microbiological examination. Participants were identified as clinical staff or 'other' and verbally surveyed to gather information about age, gender and potential risk factors including if the person:

- entered the treatment room to manage a chronic wound
- was immune suppressed
- had been admitted to a nursing home or hospital within the past 12 months
- had worked as a clinical team member in a hospital or nursing home within the past 12 months
- experienced a skin infection within the past 12 months.

Microbiological processing

Microbiological samples were collected using Transwabs[®]. At the laboratory, samples were cultured onto blood agar plates and incubated overnight in carbon dioxide maintained at 35°C. Results were confirmed by DNase and staphylococcus agglutination latex testing and submitted to antibiotic calibrated dichotomous sensitivity testing.

Statistics

Statistical analyses were conducted using VasserStats calculators.³ Point prevalence of colonisation was established. Data was analysed using a calculated correlation matrix and tested using Fisher's exact probability testing. Two-tailed p values, calculated odds ratios and 95% confidence intervals are reported. Some analyses utilise descriptive statistics where results of interest arise from small subgroups.

Samples were processed at no cost by Southern IML pathology, who had no further involvement and did not seek or receive resulting data.

The study was conducted in accordance with the requirements of the Human Research Ethics Committee of the University of Wollongong and the approval number was HE09/244/10/042.

Results

Staphylococcus aureus colonisation was found in 26% (n=26) of participants. Methicillin resistant

SA was identified in 3% (n=3) which represents 11.5% of SA. Survey responses are shown in *Table 1*. The prevalence of SA was analysed against the surveyed factors (*Table 2*). Two groups demonstrated statistically significant correlation with SA: participants aged over 70 years ($p=0.02$) and participants reporting skin infection within the preceding year ($p=0.04$).

The prevalence of SA in clinical team members was 6.6% (n=1) and nonteam members 29.4% (n=25) ($p=0.1$). There was no MRSA among team members. Three MRSA colonies were identified; each strain community acquired and all in participants aged over 70 years. The number affected (n=3) is small but represents:

- 9.3% of participants aged over 70 years (n=32, $p=0.03$)
- 23% (n=3) of the SA colonised of participants aged over 70 years (n=13) (*Table 3*).

It was observed that of MRSA colonised participants, two were female and had none of the other risk factors considered in the study.

Discussion

This small study demonstrates a substantially different MRSA prevalence from those identified elsewhere^{1,2,4} including:

- The Netherlands, where nasal swabs of 2691 general practice patients identified 23% prevalence of SA and no MRSA⁵
- the United States, where a large population based study found around 30% SA prevalence and 0.84% MRSA⁶
- Queensland, where a study of 699 adults – 396 patients of a specified practice and 303 others from the community – found SA in 28.9% (n=202) and 0.3% (n=2) MRSA.⁷

Staphylococcus aureus within the TMP group is unremarkable at 26%, however, MRSA rates vary across groups but at 3% were much higher at the TMP group than other community studies.

Older age

Older age significantly correlated with SA ($p=0.02$) and MRSA ($p=0.03$) in study participants. This is generally consistent with other research;^{1,6} although Munckhof⁷ found no significant relationship. Rates of MRSA in older TMP participants 9.3% (n=3) are high compared to a study of 962 older Nottingham

(United Kingdom) health district residents⁸ where MRSA was identified in just 0.83% (n=8). Nottingham participants were aged over 65 years, while older TMP participants were defined as aged over 70 years. Given that, and the small TMP sample size, the reason for the high prevalence in TMP participants is uncertain. Antibiotic use has been linked to MRSA carriage^{6,9} and older participants may

have increased lifetime exposure to antibiotics but differences in prescribing between study regions are not known.

Skin infections

History of skin infection was significantly correlated to current SA ($p=0.04$). Other researchers' findings vary widely;¹⁰ Munckhof⁷ and Miller¹¹ found no significant relationships

Table 1. Demographic and other survey response data (% = n)

Male		33	Female		67
Age <70 years		32	Age 70+ years		68
TMP team member	Y	15	TMP team member	N	85
Chronic wound	Y	31	Chronic wound	N	69
Immune compromised	Y	21	Immune compromised	N	79
Hospital stay	Y	27	Hospital stay	N	73
Hospital team	Y	10	Hospital team	N	90
Infection	Y	29	Infection	N	71

Table 2. Calculated correlations between prevalence of nasal SA colonisation and other surveyed factors

Demographic	Total (% = n)	NSA +ve % (n)	NSA -ve % (n)	OR	CI	p value
Factors which were current						
Total	100	26 (26)	74 (74)			
Male	33	36.3 (12)	63.7 (21)	0.4	0.1–1.1	0.14
Female	67	20.8 (14)	79.2 (53)			
Age 18–69 years	68	19.1 (13)	80.9 (55)	0.3	0.1–0.8	0.02*
Age 70+ years	32	40.6 (13)	59.4 (19)			
TMP team Y	15	6.6 (1)	93.4 (14)	5.8	0.7–46	0.1
TMP team N	85	29.4 (25)	70.6 (60)			
Chronic wound Y	31	35.4 (11)	64.6 (20)	0.5	0.1–1.2	0.21
Chronic wound N	69	21.7 (15)	78.3 (54)			
Immune comp Y	21	23.8 (5)	76.2 (16)	1.1	0.3–3.5	1
Immune comp N	79	29.6 (21)	70.4 (58)			
Factors relating to exposure over previous 12 months						
Hospital stay Y	27	33.3 (9)	66.7 (18)	0.6	0.2–1.5	0.31
Hospital stay N	73	23.2 (17)	76.8 (56)			
Hospital team Y	10	10 (1)	90 (9)	3.4	0.4–28.7	0.44
Hospital team N	90	27.7 (25)	72.3 (65)			
Infection Y	29	41.3 (12)	58.7 (17)	0.3	0.1–0.8	0.04*
Infection N	71	19.7 (14)	80.3 (57)			
* p value of <0.05 was considered significant; OR = odds ratio; CI = confidence interval; NSA = nasal <i>S. aureus</i> ; Y = yes; N = no						

Table 3. Calculated correlations between prevalence of nasal SA and MRSA colonisation and age

Demographics	Total % = n	MRSA +ve % (n)	MRSA -ve % (n)	p value
Total	100	3 (3)	97 (97)	
Age 18–69 years	68	0 (0)	100 (68)	0.03
Age 70+ years	32	9.3 (3)	90.7 (29)	
Total number SA +ve	26	11.5 (3)	88.5 (23)	
Age 18–69 years and SA +ve	13	0 (0)	100 (13)	0.22
Age 70+ years and SA +ve	13	23 (3)	77 (10)	

* Note: OR and CI for these analyses were unable to be completed. A complete table of calculated correlations between incidence of nasal SA and MRSA colonisation and all other studied factors is available from the author on request

between SA and recent skin infection while other researchers have linked these factors.¹²

Clinical staff

Clinical staff comprised 15 participants, with one case of SA (6.6%) and no cases of MRSA. In comparison, nasal swabs from 78 Irish general practitioners identified MRSA in 7.9% (n=8) (SA was unreported).¹³ Wider study of community healthcare workers (HCWs) is lacking; however one literature review describes screening of more than 33 000 hospital HCWs and reports 23.7% SA and 4.1% MRSA cases.¹⁰ The lower TMP figures do not support statistically significant conclusions but may initiate discussion and further research.

Thirroul Medical Practice team members have long been committed to staff hand-wash protocols and practices aimed to involve patients – such as the provision of patient hand-wash and masks for those with respiratory symptoms. The possibility that, with these or other measures, TMP staff might have achieved significantly low rates of SA and MRSA carriage is an exciting one. Larger scale research into the prevalence of SA and MRSA among community healthcare providers may help clarify, particularly of correlation between HCW prevalence and local risk reduction measures. Longitudinal follow up would enable the assessment of carrier status as it is estimated that roughly 40% of colonisation will be persistent and 60% transient.¹⁷

Risk management strategies

The study findings have important consequences for infection control planning in general

practices. Broad concern exists about the risk of transmission from HCWs to patients¹² or HCWs' family members.¹⁴ Hospitals in New South Wales have been consistently found to have among the highest rates of MRSA in Australia.¹⁵ In response strict hand washing and other policies aimed at reducing cross contamination between patients and HCWs have been introduced.¹⁶ There is also an increasing need to address these issues within primary care.

Methicillin resistant *S. aureus* colonisation may be the single most important factor determining invasive infection risk.^{17,18} Additional infection control methods may be warranted for TMP patients, particularly the vulnerable elderly. Decolonisation strategies are out of favour^{19,20} as colonies frequently re-form and display increased resistance.^{21,22} Hand washing is somewhat effective in reducing cross-contamination.²³ The extension of hand-wash protocols to all patients and visitors may reduce cross-contamination within community practice. Use of gloves by patients or staff with known risk factors – such as skin infections, paronychia²⁴ or artificial nails²⁵ – is worthy of consideration. Best results are likely where practices actively promote strategic patient collaboration and engagement.⁹

Conclusion

Participants at TMP had SA rates comparable to other prevalence studies, but higher than expected MRSA. Older patients appear most at risk of colonisation and invasive disease.¹⁷ Infection control strategies should reflect the

vulnerable nature and cross-contamination risk posed by this group. Staff at TMP had remarkably low levels of SA and no MRSA, an encouraging preliminary result that warrants further research.

Implications for general practice

- Community MRSA colonisation rates vary and are different to rates in acute care.
- Older patients may be most at risk.
- Long term commitment to risk reduction strategies may contribute to reduced colonisation in practice staff.

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