Keeping epidemic MRSA out of Western Australian hospitals

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Since 1982 methicillin-resistant *Staphylococcus aureus* (MRSA) isolated in WA has been notifiable by State legislation. During this time the WA Department of Health (DoH), which administers and sets policy for the government-funded healthcare facilities and licences all private healthcare facilities operating within the State, has promoted a comprehensive MRSA management policy. This policy, which involves all WA healthcare facilities, medical microbiology laboratories and the DoH, is similar to the 'search and destroy policy' used in northern Europe [1] and involves selective screening, isolation and decolonisation. The objective of the policy is the early identification, containment and eradication of MRSA infection and colonisation, primarily targeting EMRSA strains in WA acute care hospitals.

MRSA was first detected soon after the therapeutic introduction of the penicillinase-resistant semi-synthetic penicillins [2]. The subsequent international and intercontinental spread of several hospital-associated MRSA clones (known as epidemic MRSA or EMRSA) has been well documented in the literature. EMRSA now represents a worldwide problem, with an increasing prevalence in many European and Asian countries and in the United States of America [3, 4].

In 2005 the Australian Group for Antimicrobial Resistance (AGAR) conducted a survey on the prevalence of antimicrobial resistance in *S. aureus* from patients admitted to hospital for more than 48 hours [5]. Thirty two laboratories from all States and territories collected 2,908 isolates, of which 32% were MRSA. The regional prevalence of MRSA, however, varied significantly from 22% in Western Australia (WA) to 43% in New South Wales/Australian Capital Territory ($p<0.0001$). Prevalence of MRSA from individual laboratories varied even more, ranging from 4-58%. Although Australia-wide 80% of MRSA were identified as EMRSA (predominantly ST239-MRSA-III), in the four WA hospitals surveyed the majority of strains were characterised as community-associated MRSA (CA-MRSA) clones.

The reasons for the significant variability between regional and institutional prevalence of MRSA can be contributed to several factors. Although it is believed that MRSA initially arose because of selection pressure resulting from antibiotic use and misuse in hospitals, poor infection control and the increasing severity of illness in hospitalised patients have contributed to the increasing prevalence of MRSA in the hospital setting [6]. The possibility of controlling MRSA in the healthcare setting, however, has been well demonstrated and there is now ample evidence that infection control strategies based on screening, isolation and decolonisation are successful and highly cost effective.

WA MRSA management policy

Objectives

There are four main objectives to the WA MRSA management policy – screening of patients and healthcare workers; notification and contact isolation of MRSA carriers; MRSA decolonisation; and epidemiological typing of MRSA.

Screening of patients and healthcare workers

In WA, screening for MRSA carriage is recommended for three groups. The first group comprises patients admitted to WA hospitals who have been an inpatient of a hospital or a resident in a long-term care facility (LTCF) outside WA in the previous 12 months. One set of MRSA screening swabs is collected from the anterior nares and from all broken skin areas. The second group is made up of healthcare workers (HCWs) who have worked in a hospital or LTCF outside WA in the 12 months prior to commencing employment in WA. A set of MRSA screening swab samples is collected from the anterior nares, from the throat, and from all broken skin areas. The third group consists of patients who are epidemiologically linked to non-isolated carriers or a single strain outbreak in a healthcare facility. HCWs may also be screened in the course of managing a single strain outbreak.

Notification and contact isolation of MRSA carriers

All patients or HCWs who are colonised or infected with MRSA are reported to the WA DoH and included in an electronic microbiology alert system to which the majority of the State's public hospitals have access. As a prescribed minimum standard, contact isolation infection control precautions are recommended for patients in acute care facilities who are the subject of an epidemic MRSA (EMRSA) alert. Individual institutions and infection control professionals can use their discretion to apply similar measures in other environments and for patients with other MRSA clones.

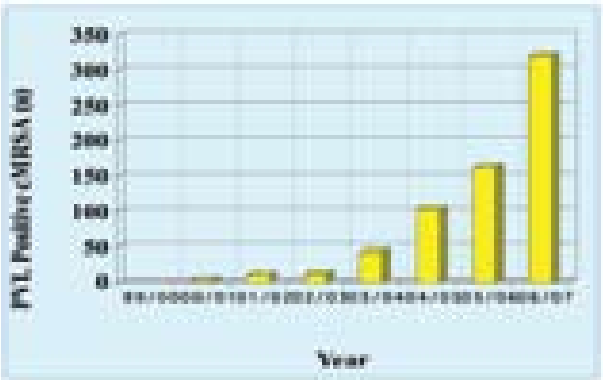
MRSA decolonisation

The WA MRSA policy also recommends procedures for decolonisation and criteria for determining whether an individual can be considered cleared of MRSA. The recommended decolonisation treatment for both inpatients and outpatients includes nasal antisepsis (mupirocin 2% nasal ointment three times per day for 10 days), whole-body antisepsis (hexachorophane 3% emulsion once daily for 10 days), and hair antisepsis (25ml of cetrimide 20% shampoo followed by a conditioner on Days 1, 4, 7 and 10). After decolonisation treatment, screening swabs must be negative for MRSA for at least 10 weeks before the individual can be considered cleared and have the electronic alert removed.

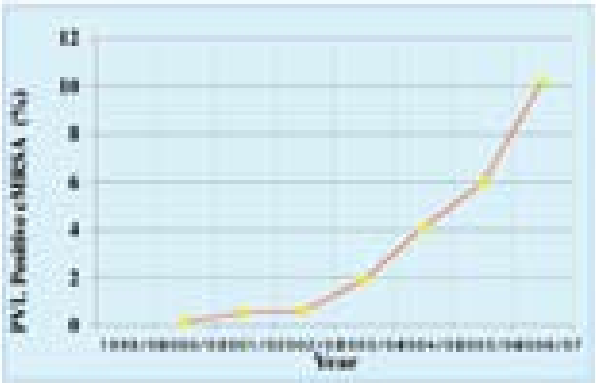
There is little published evidence of efficacy of this or other decolonisation regimens. There are no formal audits of compliance with the State policy, although anecdotal evidence suggests strong support for maintaining this approach.

Epidemiological typing of MRSA

All MRSA isolates recovered in the State are referred to the Gram-positive Bacteria Typing and Research Unit (GPBTRU) for epidemiological typing and are characterised as EMRSA or non-EMRSA strains. Basic epidemiological data, including the residential area code of the infected or colonised person,



Annual number of persons in WA infected or colonised by PVL-positive CA-MRSA.



PVL-positive CA-MRSA as a percentage of the annual number of persons in WA infected or colonised with CA-MRSA

In addition to this increase in the overall number of MRSA strains, the number PVL-positive strains has remarkably increased the last few years and now account for 10% of CA-MRSA strains. Unlike most areas of the world, CA-MRSA in WA have traditionally been PVL-negative.

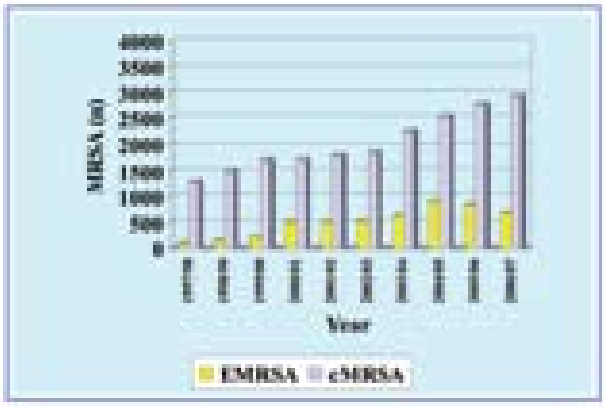
Figure 1. MRSA in WA. PVL-positive MRSA (*LukF*-PV and *LukS*-PV genes).

are recorded for all isolates by the Unit. Typing results and epidemiological data are forwarded to the referring laboratory and to the WA DoH.

Expansion of the policy

In 2007 an increase in strains known to cause moderate to severe CA-MRSA infection in otherwise healthy people has occurred in WA (Figure 1). Molecular typing of these strains have identified several imported Panton-Valentine leukocidin (PVL)-positive CA-MRSA clones including ST8-MRSA-IV (USA300), ST1-MRSA-IV (USA400), ST80-MRSA-IV (European CA-MRSA), ST59-MRSA-V_T (Taiwan CA-MRSA), ST30-MRSA-IV (Western Samoan CA-MRSA) and ST93-MRSA-IV (Queensland CA-MRSA).

Notification rates of PVL-positive CA-MRSA has increased markedly in WA and in 2007 represented 10% of all MRSA (91% of which were clinical isolates). These observations have been accompanied by increasing clinical reports of severe invasive infections and clusters of cases among close contacts leading to a review of measures for limiting the transmission of PVL-positive strains in the community. A community-based 'search and destroy' programme, based on existing WA management strategies, has been developed by the WA Healthcare Associated Infection Unit and was recently implemented by the WA DoH [7].



Annual number of persons in WA infected or colonised by MRSA (1 July 1997 – 30 June 2007).

Although the programme has been successful in preventing MRSA from becoming established in WA hospitals, there has been a huge increase in the number of MRSA isolated in the Western Australian community. As shown in this graph over the last 10 years, the number of persons in WA that MRSA has been isolated from has increased from 1300 to 3,600. During this period there has been a three fold increase in the number of patients with CA-MRSA strains and a eight fold increase with patients with EMRSA strains.

Figure 2. WA MRSA management policy: increasing prevalence in the WA community.

Outcomes of the policy

Although MRSA is increasing in prevalence in the WA community (Figure 2), especially in LTCFs [8, 9], WA has successfully limited the impact of MRSA in its acute care hospitals and, compared to other Australian States, continues to report low levels of healthcare-associated infections due to MRSA [10]. We recently reported the importance of incorporating a MRSA management policy into Statewide public health programmes in controlling a multicentre outbreak involving the New York/Japan MRSA clone [11]. This outbreak demonstrated that the mainstays of such programmes should include comprehensive and effective outbreak identification and management policies (including pre-employment screening of HCWs, where applicable) and MRSA clone identification.

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