Journal of Infection and Public Health (2008) **1**, 78—100

ELSEVIER

http://www.elsevier.com/locate/jiph

REVIEW

The role of healthcare personnel in the maintenance and spread of methicillin-resistant *Staphylococcus aureus*

Nevio Cimolai*

Department of Pathology and Laboratory Medicine, Faculty of Medicine, The University of British Columbia, Canada

Received 25 August 2008; received in revised form 3 October 2008; accepted 6 October 2008

KEYWORDS
Staphylococcus aureus;
Methicillin-resistant;
Infection control;
Personnel;
Carrier;
Infection

Summary Healthcare workers may acquire methicillin-resistant *Staphylococcus aureus* (MRSA) from patients, both hospital and home environments, other healthcare workers, family and public acquaintances, and pets. There is a consensus of case reports and series which now strongly support the role for MRSA-carrying healthcare personnel to serve as a reservoir and as a vehicle of spread within healthcare settings. Carriage may occur at a number of body sites and for short, intermediate, and long terms. A number of approaches have been taken to interrupt the linkage of staff—patient spread, but most emphasis has been placed on handwashing and the treatment of staff MRSA carriers. The importance of healthcare workers in transmission has been viewed with varying degrees of interest, and several logistical problems have arisen when healthcare worker screening is brought to the forefront. There is now considerable support for the screening and treatment of healthcare workers, but it is suggested that the intensity of any such approach must consider available resources, the nature of the outbreak, and the strength of epidemiological associations. The task of assessing healthcare personnel carriage in any context should be shaped with due regard to national and international guidelines, should be honed and practiced according to local needs and experience, and must be patient-oriented.

* Department of Pathology and Laboratory Medicine, Children's and Women's Centre of British Columbia, Vancouver, British Columbia, Canada V6H 3V4. Tel.: +1 604 271 9321; fax: +1 604 271 9321.
E-mail address: ncimolai@interchange.ubc.ca.

1876-0341/$ — see front matter
doi:10.1016/j.jiph.2008.10.001

Contents

There is an accelerated interest being directed to methicillin-resistant *Staphylococcus aureus* (MRSA), perhaps being fueled in large part by the explosive nature of community-acquired MRSA spread worldwide [1]. In parallel, control of MRSA has become a renewed focus. Reservoirs for MRSA include three major foci: patients and their families and pets, inanimate environment, and caregivers [2]. Whereas most emphases on control have related to patients, it is becoming more widely accepted that other reservoirs need to be more seriously considered.

From a pragmatist's perspective, the infected or carrier human is a key source for the bacterium. It is thereafter less relevant that the human is either a patient or caregiver, as long as the potential to spread exists. Most recommendations for MRSA containment have emphasized the patient aspect: isolation precautions, screening, treatment of carriers, among other things. There is much greater hesitancy to accept that personnel may have a role in transmission and an even greater hesitancy to intervene in this regard.

Herein, the issue of healthcare personnel (and allied health disciplines workers) carriage and spread of MRSA is detailed.

Staff have a role in MRSA carriage and transmission

Shortly after the introduction of methicillin, patient carriers and hospital outbreaks of MRSA were recognized, and the first citation of a medical staff carrier (nurse) was reported [3]. Since then, it has been generally accepted that the hands of healthcare personnel are critical vectors for transmission of MRSA [4—12]. Whereas the use of gloves might decrease the opportunity for hands to be contaminated, the burden on gloves themselves may be equally important [13]. MRSA may be found on the hands and gloves of those who have not yet initiated patient contact, thereby emphasizing the environmental reservoir [14]. Handwashing has a critical role in containment [15], but opportunity for healthcare personnel to spread MRSA extends beyond direct hand contact.

The establishment and role of the carrier state for *S. aureus* is well documented albeit more so for methicillin-susceptible *S. aureus* (MSSA) [16]. Such documentation includes many excellent examples of the role for medical staff carriage [17,18]. In a general sense, the carrier is more likely to disperse staphylococci when the quantitation, especially for nasal carriage, in the reservoir is high [19,20]. Increased numbers of patient colonizations or infections are soon followed and paralleled by staff carriage [21,22]. That is, the healthcare worker in implicated most often as an innocent bystander. As a consequence of inadequate healthcare worker adherence to preventative strategies and the subsequent lack of recognition of the healthcare worker reservoir, existing precautions may be doomed to occasional failure given the potential for inapparent vectors [15].

The role of the healthcare worker in secondary spread during outbreaks has become established [23], and there are several reports where either individual or multiple staff have putatively contributed to dissemination (Table 1). The consensus of these publications suggests that healthcare personnel do have a significant role in some contexts. Most such transmission was associated with nurses who have the most direct contact with patients. The occasion of transmission has taken place in many acute and chronic care hospital settings, and the healthcare worker has been colonized often unknowingly. Overall, it is becoming increasingly recognized that healthcare worker carriage has the potential to complicate the control of MRSA in medical settings [5,6,19,43,46—60].

Seek and ye shall find

The origin of MRSA is often thought to have arisen opportunistically in the face of antibiotic pressure as methicillin became clinically used. It has been proposed, however, that such resistance was capable of occurring, albeit rare under a lack of