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Do guidelines on the prevention and control of MRSA make a difference?

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Running Title *Guidelines on preventing MRSA*

ABSTRACT

Many countries have national guidelines on the prevention and control of MRSA which are similar in approach. The evidence base for many recommendations is variable and often in the drafting of such guidelines, the evidence is either not analysed or specifically reviewed. Guidelines usually recommend screening and early detection, hand hygiene, patient isolation or cohorting, and decolonisation. While many components of a prevention and control programme appear self-evident, e.g. patient isolation, the scientific base underpinning these is poor and scientifically more rigorous studies are required. Nonetheless, where measures, based on what evidence there is and on common sense, are implemented and where the necessary resources are provided, MRSA can be controlled. In the Netherlands and in other low prevalence countries, these measures have largely maintained healthcare facilities MRSA free. In MRSA endemic countries such as Spain and Ireland, national guidelines are often not fully implemented due to apparent inadequate resources or a lack of will. However, recent studies from France and Australia, demonstrate what is possible in high prevalence countries when best practice is effectively implemented, with potentially major benefits for patients, the respective health services and society.

Keywords MRSA, guidelines, screening, isolation/cohorting,

Background

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a well recognised cause of healthcare-associated infection (HCAI) and is increasingly now seen outside acute healthcare facilities in some countries. Its clinical impact, in terms of morbidity and mortality is well recognised. In an observational study of 198 intensive care units in 24 European countries, *Staphylococcus aureus* was the most common pathogen implicated in sepsis and 14% of isolates were MRSA [1]. MRSA bloodstream infection is associated with significant mortality. In a meta-analysis of studies of bloodstream infection due to methicillin-resistance and methicillin-susceptible *S. aureus*, there was a significant association between death and methicillin resistance [2].

Given the prevalence of MRSA in many European countries, its clinical impact, and the concern of patients, the public and many health care staff, there is widespread recognition of the need for a multi-disciplinary approach to prevention and control. However, the prevalence of MRSA varies considerably amongst European countries and from a review of national guidelines, there are some variations in the strategies adopted and in the effectiveness of their implementation.

Guidelines and recommendations

While many institutions and professional groups have attempted to address the spread and control of MRSA, the implementation of evidence-based guidelines has been somewhat *ad hoc*. For example, the European Practice Database has collected data on renal practice in different European countries and found that 1.3% of haemodialysis patients are MRSA positive [3]. However, in Greece, Italy, England and Belgium,

over 50% of centres screen for MRSA compared with less than 10% of centres in Slovakia, Norway, the Czech Republic and Scotland [3].

Guidelines from Germany, New Zealand, North America, the Netherlands, Ireland and the UK have recently been reviewed [4]. While many of these guidelines share common themes, e.g. the importance of early identification of MRSA, patient isolation or cohorting, hand hygiene, etc., the process by which these guidelines was developed varies somewhat in terms of the analysis of the evidence base. In addition, given the apparent similarity of many aspects in the approach between the various countries, it is somewhat surprising that there is such a range of prevalence between countries, e.g. the Netherlands (low prevalence) and Spain and Ireland (high prevalence). When reviewing the literature on interventions to control and prevent MRSA, there is often an absence of detail about the infrastructure in which outbreaks or studies occur, and the degree to which there is full support from local organisational and national agencies [5]. A recent assessment of antimicrobial drug use and infection control practices in European hospitals confirms this as it showed that there were higher levels of MRSA where there were problems in implementing isolation policies and lower rates of MRSA were associated with the use of alcohol-based hand hygiene [6].

The evidence base for MRSA guidelines

Much of what is included in local or national recommendations on the prevention and control of MRSA is both logical and self-evident and the effectiveness of these interventions when implemented can be seen in those countries where the prevalence of MRSA infection is low, such as in the Netherlands. Nonetheless, it is often

difficult to determine from the literature the degree to which individual specific components of a strategy are effective, and where the emphasis is best placed.

In a systematic review of the published literature between 1996 and 2004, well-conducted evaluations reporting the economic benefits arising from infection prevention and control interventions on MRSA were lacking and for four of five specific interventions, i.e. screening patients before or on admission, the use of surveillance data, isolation/cohorting and decolonisation, the conclusions were at best tentative and far from conclusive, not withstanding the logic associated with each of them [7].

Patient isolation is considered one of the most important interventions in reducing the transmissibility of healthcare infection. However, a recent review of 46 studies indicated that there were major methodological weaknesses and inadequate reporting in much of the published research [8]. There is a need for greater rigor in the quality of publications that deal with the control and prevention of HCAI. Recently, a set of standards or guidelines has been published to enable researchers and others in the field to check the validity of their studies and results against a check list [9]. This approach should promote better studies and enable us to have more valid scientific evidence for much of what is currently practiced and implemented in the control and prevention of MRSA.

Current Practice

While national and local guidelines are often disseminated, it is essential to ascertain whether guidelines are partially or fully implemented when trying to understand prevalence data. In a survey of 36 UK adult cardiac surgical units during 2001, it was

found that only 65% of units screened all patients for MRSA and 45% regularly screened long-term patients remaining in the unit [10], even though the national guidelines at the time identified that cardiothoracic units were high-risk areas for MRSA and recommended admission screening [11]. The authors concluded that there was wide variation in practice within the UK for cardiac surgical units, but that there needed to be some rationalisation of pre-operative screening and the use of prophylactic antibiotics [10]. In Ireland, a follow up review of the implementation of recent national guidelines found that 43 of 49 acute hospitals experienced barriers to their full implementation and in four hospitals there was no education programme on hand hygiene [12].

A multi-disciplinary approach that included education, improved ward and theatre hygiene, pre-admission, admission and weekly MRSA screening, isolation and decolonisation, largely based on national guidelines [11], resulted in a significant fall in both the unit-acquisition of MRSA and bloodstream MRSA infections, in a London cardiothoracic unit [13]. Also, in a survey of 207 general intensive care units in the UK, there was a marked variation in practice, including the finding that 75% of units screened patients on admission, isolation cubicles were not present in 10% of units, and 24% of units did not routinely isolate patients with MRSA [14]. These results suggest that up to now in the UK, national guidelines could not or were not being implemented. Although a recent UK study has suggested that isolation in the intensive care unit may not be as effective as originally thought [15], there were confounding variables in that study that would have offset the effectiveness of isolation, e.g. sub-optimal hand hygiene and admission screening for MRSA, many of which were discussed in the accompanying editorial [16].

In the Netherlands, there is an impressive low prevalence of MRSA in hospitals. In a Dutch study that assessed the prevalence of MRSA amongst patients without risk factors for MRSA carriage at the time of admission to hospital, only three MRSA carriers were identified, representing 0.3% of the survey population [17]. When outbreaks of MRSA do occur in the Netherlands, it is clear that considerable efforts are made, with the accompanying resources, to ensure that not only is any initial MRSA spread controlled, but also that MRSA is eradicated, illustrating the effectiveness of the "search and destroy" approach in low prevalence countries.

During a recent outbreak in a 700-bed Dutch hospital, additional laboratory resources were provided, the aggressive screening of patient and staff contacts was undertaken, and additional infection prevention and control staff were made available, to assist in outbreak management [18]. Therefore, although this represented an epidemic in a country with low MRSA prevalence rates, compared with endemic MRSA in many other European countries, best practice consistent with national guidelines (http://www.wip.nl/UK/free_content/Richtlijnen/MRSA(1).pdf) was implemented and the necessary resources, including finance, space and personnel, were provided. This consistent and comprehensive approach ensured that the outbreak was brought to an end.

While there are considerable costs associated with such aggressive measures, this appears to be cost effective. Over a 10 year period (1991-2000), the aggressive implementation of MRSA control measures in the Netherlands resulted in 2,265 lost hospitalisation days but this "search and destroy" approach resulted in the likely prevention of 520,000 infections per year and the cost of the policy was €280,000 per year [19].

France has had a relatively high national prevalence of MRSA but efforts have been under way nationally and locally in recent years to improve this situation with encouraging results. In a programme that involved three intensive care units over seven years and which consisted of screening and contact precautions, but not routine MRSA decolonisation, there was a reduction of MRSA acquired in the intensive care unit from 7% to 2.8% [20]. Similarly, in Australia, a series of interventions in a 35-bed intensive care unit resulted in a decline in the number of MRSA cases in the ICU as well as throughout the hospital [21]. Finally, in the United States of America, screening policies for MRSA vary between ICUs. However, two recent surveys have highlighted the importance of routine ICU surveillance to establish the true prevalence of MRSA (both colonisation and infection) and that this is an important component in reducing MRSA rates, including MRSA bloodstream infection [22,23]. Therefore the implementation of recommended measures, whether they be enhanced screening for MRSA, improved hand hygiene, isolation/cohorting, is effective in reducing rates or minimising transmission.

Recent and future developments

The finding that in general, national guidelines are not dissimilar in terms of their strategic approach to the prevention and control of MRSA, suggests that the difference between countries relates partly to the resources provided for HCAI prevention and control, as well as the priority that is given to such quality measures, i.e. the culture of the healthcare environment. While there are some indications that in previously high prevalence European countries such as France and Slovenia, improvements have been made (http://www.rivm.nl/earss/Images/EARSS%202006%20Def_tcm61-44176.pdf), there

is often discussion in low prevalence countries on the need to continue to implement aggressive control measures as these are perceived as quite costly. A recent review of current policy in the Netherlands in 2006, which was requested by the Dutch Department of Health, concluded that the current aggressive, "search and destroy" approach should be continued because it results in significantly fewer infections and reduced antibiotic costs, than would otherwise be the case if it was to be abandoned (http://www.gr.nl/pdf.php?ID=1461&p=1).

Guidelines need to be tailored to the specific clinical circumstances, without compromising the essential principles underpinning them, but there needs to be buy-in from the relevant healthcare professionals. In Canada, a working group has provided clear and sensible advice for the specific management of outbreaks of MRSA in neonatal intensive care units [24]. This needs to be accompanied by greater consistency in approach, as suggested by another recent Canadian survey. Although 96% of hospitals screened for MRSA, only 21% conducted regular prevalence surveys, 82% undertook decolonisation, and 75% had restrictive antibiotic prescribing [25]. In addition, many countries have recognised the need for guidelines on MRSA in the community to reflect the emergence of true community-acquired strains and the phenomenon of MRSA in healthcare facilities such as acute hospitals 'spilling over' in to community units and primary care [26].

The future may result in greater consistency in policies between both institutions and countries, with greater commitment to their implementation by national and other bodies, driven by patient expectations and demands. However, this will require appropriate governance structures to ensure that a multi-disciplinary approach can be implemented. All healthcare workers must realise that the prevention and control of

HCAI is everybody's responsibility. However, this must be accompanied by suitable educational programmes. Over two-thirds of surgical trainees in the UK were unaware of policies for the transfer of MRSA-positive patients and 62% were misinformed about the prevalence of MRSA bloodstream infections [27]. This implies that apart from an educational deficit, there may remain a perception that the prevention and control of infection is largely the responsibility of specialist personnel whose responsibility it is to minimise all infections including those caused by MRSA.

The successful implementation of healthcare bundles to reduce central line-associated infections [28] suggest that it is possible to reduce HCAI, including MRSA to an irreducible minimum, but this requires a major change in attitude. However, such change will result in improvements in the quality and safety of patient care, and is likely to have significant cost benefits for the health services and society. In conclusion, guidelines on the prevention and control of MRSA are effective if they are implemented and if they are resourced. In many European countries this requires a major change in culture that prioritises the quality and safety of patient care.

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