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## Section 1

### Introduction

*Staphylococcus aureus* (*S. aureus*) is a Gram-positive organism that colonizes the skin and nose of approximately one third of healthy individuals. In the majority of cases this organism acts as a harmless commensal. However, in the right setting it can cause severe and at times fatal infections such as skin and soft tissue infection, bone and joint infection, bloodstream infection (BSI), infective endocarditis and pneumonia.  $\beta$ -lactam antibiotics, such as flucloxacillin are the antibiotics of choice in treating staphylococcal infection. Methicillin is an example of a  $\beta$ -lactam antibiotic first used in the treatment of *S. aureus* infections in the 1950's and 1960's. In 1961 the first strain of methicillin-resistant *Staphylococcus aureus* (MRSA) was identified (1). This organism was also found to be resistant to all other  $\beta$ -lactam antibiotics. Although methicillin is no longer in clinical use all  $\beta$ -lactam resistant *S. aureus* isolates are referred to as MRSA.

MRSA has been prevalent in Irish hospitals for over thirty years. Much work was carried out in this country on MRSA in the 1970s and '80s which has enhanced our understanding of the virulence features, clinical effects and epidemiology of this pathogen (2-5). Much of this work continues to this day (6-10).

The prevention and control of MRSA is a global challenge and important in the control of healthcare associated infection (HCAI). Whether it is possible to fully eradicate MRSA in hospitals, where it is endemic, is debatable. However, it is possible to control spread of MRSA, minimize rates of superficial and deep infections and to contain healthcare costs. MRSA BSI rates have been shown to correlate with the hospital-wide prevalence of MRSA, and efforts to reduce the number of patients colonized with MRSA will also reduce BSI rates (11). MRSA control measures have additional merits to those of merely addressing MRSA as they increase the awareness of the importance of all HCAI and their implementation decreases the rates of other HCAs (12). Control of MRSA is a multidisciplinary task, involving surveillance, patient

1 screening, decolonization, isolation and cohorting of patients, environmental cleaning,  
2 antimicrobial stewardship, maintaining adequate staffing levels and hand hygiene. It is the  
3 responsibility of all those who work in the healthcare sector and not just those professionally  
4 involved in infection prevention and control.

5  
6 In the North/South Study of MRSA conducted in 1999, 508 cases of MRSA were identified in  
7 the South (13-17). In the 2006 Hospital Infection Society (HIS) prevalence study over 75,000  
8 patients were surveyed in 190 hospitals in England, Wales, the Republic of Ireland (RoI) and  
9 Northern Ireland, and the prevalence of MRSA as a cause of HCAI in the RoI was 0.49%, i.e.  
10 approximately 10% of HCAI (18). Over the past two to three years the number of invasive  
11 infections caused by MRSA has decreased (19). The 2009 annual report from the National  
12 MRSA Reference Laboratory reported 325 cases of bloodstream infection (BSI) due to MRSA,  
13 compared with 407 and 467 in 2008 and 2007, respectively. This decrease in the number of  
14 MRSA BSI most likely represents a decrease in the total number of cases of MRSA. The reason  
15 for this decline is unclear but it does follow international trends. For example, in the UK the rate  
16 of MRSA BSI between 2003 and 2008 has halved.

17  
18 Since the last set of guidelines was published many new challenges have arisen. Increasing rates  
19 of resistance, not only to glycopeptides but to older antimicrobials such as fusidic acid and  
20 rifampicin are a concern. The prevalence of community acquired MRSA is increasing. Also,  
21 the changing epidemiology of MRSA in Europe with the emergence of livestock-associated  
22 MRSA(ST398-MRSA-V) among farmers has highlighted the versatility of this pathogen (20,21).  
23 However, there is some progress in the battle against MRSA. A number of drugs have been  
24 introduced in recent years for the treatment of MRSA infections such as daptomycin and  
25 tigecycline and new drugs such as ceftobioprole, iclaprim, ceftaroline and dalbavancin have  
26 shown promising results in clinical trials and should be available soon.

27

## 28 **1.1 Objectives**

29 The objectives of these guidelines are –

30

- 1       • to enhance and further improve the prevention and control of MRSA since the last set of
- 2       guidelines were published in 2005
- 3       • to reduce further the prevalence of MRSA BSI and to prevent other serious infections
- 4       such as surgical site, respiratory tract, bone and joint infections caused by MRSA
- 5       • to improve the use of antibiotics specifically for MRSA infections and to contribute to
- 6       other aspects of antibiotic stewardship
- 7       • to raise awareness of HCAI, generally, and the measures required for prevention and
- 8       control, e.g. standard precautions

9

10   The guidelines are relevant and have been developed for all healthcare staff involved in the care

11   of patients, residents or clients who may be at risk of or have MRSA either in acute hospitals,

12   nursing homes/long stay residential units, other institutions and general practices. Such staff

13   include, amongst others, medical doctors, nurses and nursing aids, biomedical scientists, etc. The

14   public and patients will find these guidelines of interest as they outline the general and specific

15   measures required and how these can and should be incorporated in to quality measures to

16   safeguard the quality of patient care.

17

## 18   **1.2 Methodology**

19   The working group that drafted the guidelines was multi-disciplinary and included a range of

20   experience and expertise. In particular, efforts were made to ensure that all the relevant

21   professional groups were represented and that the background of those involved included the

22   acute hospital healthcare setting and community care. Membership of the working group was

23   voluntary, and no member was paid a fee for his/her input. The working group members' names

24   and any potential conflicts of interest are outlined at the end of this document in Appendix I.

25

26   The methodology an approach to developing these guidelines included reviewing those published

27   by the Strategy for the Control of Antimicrobial resistance in Ireland (SARI) Infection Control

28   Subcommittee in 2005. A number of other international guidelines have been produced since

29   then, including recently published guidelines by the Infectious Diseases Society of America

30   (IDSA) on the treatment of adults and children with infections caused by MRSA in 2011 and

1 guidelines produced by the British Society for Antimicrobial Chemotherapy (BSAC) for the  
2 control and prevention of MRSA in healthcare facilities and on the prophylaxis and treatment of  
3 MRSA infections (2009) (22-24).

4  
5 A new development since 2005 has been the publication of guidelines on the management of  
6 community acquired MRSA which recently appeared in Australia, America, Canada and the UK,  
7 and guidelines have also been developed for the management of Panton-Valentine Leucocidin  
8 (PVL) toxin positive MRSA infections (25-30). The groups that have published these guidelines  
9 have made their recommendations, largely on the basis of expert opinion and observation, rather  
10 than on randomised clinical trials (RCT), which are relatively rare in this area. This is a reflection  
11 of the literature on hospital infection control in general, which is largely based upon descriptions  
12 of outbreaks, observational studies and retrospective analyses. A review of various different  
13 international guidelines for the control and prevention of MRSA published in 2007 found that  
14 similar measures were recommended in all the guidelines, even if the aim of the individual set of  
15 guidelines differed depending on the country's ability to fully implement them and the local  
16 prevalence of MRSA (31). Countries in which MRSA rates are low aim to keep their healthcare  
17 institutions free of MRSA while countries where MRSA is endemic aim to minimize its spread.

18  
19 The recommendations that follow build on the Irish guidelines published in 2005 where relevant,  
20 other international guidelines such as those listed above, relevant published literature and the  
21 consensus expert opinion of the working group itself and that which followed the consultation  
22 exercise (Appendix 2) before the finalization of the recommendations.

23

### 24 **1.3 Grading of recommendations**

25 The recommendations are followed by a grade which indicates the strength of the evidence  
26 supporting the recommendation as in the previous guidelines (32). There are a number of  
27 grading systems used in the literature but that outlined below was felt to best fit the needs of the  
28 guidelines and the working group, given the absence of RCT in many of the areas covered, and

1 the inability of the working group to conduct a systematic literature review, due to time and  
2 resource limitations.

3

4 The grades are as follows;

- 5 • **Grade A** - Evidence from a meta-analysis of RCT or from at least one RCT.
- 6 • **Grade B** - Evidence based on one controlled trial without randomisation, a quasi-  
7 experimental study, or extrapolated from category 1 evidence.
- 8 • **Grade C** - Evidence from comparative studies, correlation studies, case control studies or  
9 extrapolated from category A or B.
- 10 • **Grade D** -Evidence from expert committees, reports or opinions, the clinical experience  
11 of respected authorities, and the conclusions of the working group.
- 12 • **No Recommendation** – Where the literature or other guidelines do not provide a clear  
13 recommendation and where the working group itself did not feel it appropriate to make a  
14 recommendation for or against a particular measure.

15

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14

## 15 Section 2

### 16 2.1 Screening

17 Effective strategies for the prevention and control of MRSA rely on early detection so that  
18 appropriate measures may be implemented. Screening, linked to patient isolation and the use of  
19 contact precautions, has been shown to be effective in reducing transmission of MRSA (1-4).  
20 Successfully detecting MRSA carriage is influenced by many factors including the laboratory  
21 methods used, the number of times the patient is screened, the types of samples obtained, and  
22 when they are obtained. It is generally accepted that instituting contact precautions is appropriate  
23 for those patients known to be colonised with MRSA in the acute setting.  
24

#### 25 Who to screen

- 26 • **Recommendations:** Continue with targeted MRSA screening, and not universal screening,  
27 pending further data on its efficacy and feasibility.

28 **Grade D**

- 1 • The taking of screening samples to determine MRSA status should not adversely affect the  
2 individual patient's access to clinical care, e.g. urgent surgery should be carried out with  
3 appropriate precautions and surgical prophylaxis, if there is a delay in the taking of  
4 specimens or in the receipt of results. **Grade D**
- 5 • Patients who should be screened on admission for MRSA include the following:
- 6 1. Patients known to be previously positive and who are being re-admitted to hospital. **Grade C**  
7
- 8 2. Patients admitted from another hospital or health-care facility, e.g. nursing home, unless  
9 that hospital or facility is known to be free of MRSA. **Grade C**
- 10 3. Patients transferred from a hospital abroad or patients who have been an in-patient in a  
11 hospital abroad during the previous 12 months. **Grade C**  
12
- 13 4. Patients with non-intact skin, including wounds and ulcers. **Grade D**
- 14 5. Patients due to undergo elective high and medium risk surgery (e.g. cardiothoracic and  
15 vascular surgery, orthopaedic implant surgery). In particular, hospitals should assess  
16 which patient groups undergoing surgery have a relatively high risk of MRSA infection  
17 and consider pre-operative screening for those particular patient sub-sets. For example, it  
18 may be appropriate for hospitals to screen emergency orthopaedic admissions as many of  
19 these patients are elderly and have frequent contact with the healthcare system.  
20 **Grade C**
- 21 6. Patients admitted to critical care areas, e.g. intensive care unit (ICU) with at least weekly  
22 screening thereafter. **Grade D**  
23
- 24 7. Patients requiring renal dialysis. **Grade C**
- 25 8. Patients frequently admitted to any healthcare institution. **Grade C**
- 26 9. Any healthcare worker being admitted to an acute healthcare facility **Grade D**  
27

28 **Patients who require screening for MRSA subsequent to hospital admission include:**  
29

- 1 1. During an outbreak (two or more patients identified as being MRSA positive on the same  
2 day). **Grade D**  
3
- 4 2. Other patients, as determined by local risk assessment. **Grade D**
- 5 3. Patients transferred to critical care areas e.g. intensive care unit (ICU) with at least weekly  
6 screening thereafter. **Grade D**
- 7 4. Patients requiring renal dialysis. **Grade C**  
8  
9
- 10 5. Patients who have been successfully decolonized, i.e. three negative follow-up samples,  
11 should continue to be screened at weekly intervals while in hospital. **Grade C**  
12

### 13 **Rationale**

14 The NHS Scotland MRSA Screening Pathfinder Programme  
15 ([www.documents.hps.scot.nhs.uk/hai/mrsa-screening/mrsa-screening-interim-summary.pdf](http://www.documents.hps.scot.nhs.uk/hai/mrsa-screening/mrsa-screening-interim-summary.pdf))  
16 identified the following patients requiring screening for MRSA;

- 17 • Patients who are not admitted to hospital from their own home
- 18 • Patients with a previous history of MRSA
- 19 • Patients with any prosthetic device *in situ* or who have broken skin

20  
21 Currently, there is an on-going discussion between the advantages and disadvantages of targeted  
22 *versus* universal screening (which we outline below) and our conclusions are based on the  
23 evidence currently available (5).

24 A. **Targeted screening** – i.e. screen patients with risk factors (see above) for MRSA carriage  
25 that are likely to be positive.

26 Previous Irish and UK guidelines have advocated this approach.

1 The justification is that up to 75% of patients with MRSA will remain unrecognised if clinical  
2 cultures alone, e.g. swabs to confirm the diagnosis of surgical (wound) site infection, are used  
3 to detect them (6-8).

4 **B. Universal screening** – i.e. screening all patients on admission to hospital.

5 This approach has been recommended in the UK i.e. Scottish Health Technology Assessment  
6 and by the NHS in England and Wales (6,7). The latter states that “*From April 2009, all*  
7 *elective admissions must be screened for MRSA in line with Department of Health guidance.*  
8 *This should be extended to cover emergency admissions as soon as possible and definitely no*  
9 *later than 2011”*. The NHS Scotland MRSA Screening Pathfinder Programme (5) reported  
10 on the results of a one year programme for universal screening in NHS Scotland. They found  
11 that 3.9% of patient admissions were colonized with MRSA and that the number of MRSA  
12 infections decreased following the introduction of universal screening. Short length of stay  
13 prevented patients from completing decolonisation regimens and in only one of 33 patients  
14 who were MRSA positive on admission was decolonization completed. Only half of the  
15 patients found to be MRSA positive on admission could be isolated. This was due to a  
16 combination of factors including short length of stay and a lack of isolation rooms. The report  
17 suggested that clinical risk assessment may be a cost-effective first stage screening process for  
18 specialties with large numbers of patients, such as medicine and general surgery. A report on  
19 the sensitivity and specificity of this screening method is expected in the near future.

20  
21 Ideally at-risk patients for MRSA should be screened before admission if possible, such as when  
22 the admission is elective, or at the very least, on admission if emergency or urgent admission.  
23 However, every effort should be made to ensure that screening *per se* does not adversely impact  
24 on patient care such as resulting in delays in the emergency department (8). Periodic e.g. weekly  
25 surveillance cultures, should continue to be taken from patients remaining in high-risk areas of  
26 the hospital, e.g. intensive care unit, special baby care unit, orthopaedic unit, solid organ or bone  
27 marrow transplant, especially where MRSA is epidemic or where it has been endemic in the past,  
28 to assist in minimising transmission from patients who although negative on admission, have  
29 subsequently acquired MRSA while an in-patient.

1 Patients, with MRSA, who have had three consecutive negative sets of screening samples, at  
2 least 72 hours apart after decolonisation regimens, can be removed from isolation. However,  
3 such patients should continue to be screened at weekly intervals while in hospital. Patients, with  
4 MRSA, who have wounds or large areas of non-intact skin (e.g. decubitus ulcers) are not likely  
5 to lose MRSA and generally require isolation until the wound is healed. When re-admitted to  
6 hospital in the future, these patients should be placed in isolation pending the results of screening  
7 samples.

8 All screening is dependent upon adequate laboratory infrastructure.

9 **Screening samples**

10 **Recommendations**

- 11 • Swabs from the anterior nares, perineum or groin, throat, catheter specimen of urine  
12 (CSU) and any skin lesions (e.g. surgical site) should be obtained.

13 **Grade C**

- 14 • Additional samples to diagnose infection (e.g. blood) should be taken as clinically  
15 indicated.

16 **Grade D**

17 **Rationale**

18 The anterior nares is the most important site to sample but omitting sampling of the throat and  
19 perineum will miss a proportion of patients who are colonised with MRSA (9,10). Although this  
20 issue is controversial, some authors suggest that the addition of throat swabs does not increase  
21 sensitivity significantly (11,15).

22 (See Appendix 3 for details on how to obtain a nasal swab)

23

24

1 **2.1.1 Laboratory methods**

2

3 **Recommendations**

- 4 • Laboratories should continue with culture-based methods for the detection of MRSA.

5 **Grade D**

- 6 • Ideally, broth-enrichment should be used but this decision needs to be assessed locally.

7 **Grade B**

- 8 • The advent of rapid diagnostic testing for MRSA with the polymerase chain reaction  
9 (PCR) is a welcome development and it may be appropriate for individual  
10 laboratories/hospitals to introduce rapid diagnostic testing for certain patient groups, e.g.  
11 emergency surgical or ICU admissions and to evaluate its impact. **Grade D**

12

13 **Rationale**

14 The screening methods currently most commonly used are:

15 **A. Broth enrichment culture followed by agar subculture**

16 Broth enrichment is followed by sub-culture to chromogenic media and is probably the current  
17 ‘gold’ standard as it is the most sensitive method. The disadvantage is the time delay (up to 72  
18 hours) to a positive result.

19 **B. Chromogenic agar plating, direct culture)**

20 This method is less sensitive than broth-enrichment culture but has the benefit of a more rapid  
21 result (preliminary results after overnight incubation), due to the use of a selective medium.

22 **C. Polymerase chain reaction, i.e. rapid testing**

23 There are a number of commercially available rapid diagnostic tests that perform well and are  
24 comparable to broth enrichment culture (16). Recent evidence suggests that more rapid results  
25 can impact on MRSA transmission (17) and may improve compliance with screening

1 recommendations (18). Some of these techniques have been evaluated to detect common  
2 circulating strains of MRSA in Ireland and have been shown to be accurate (19). Nonetheless,  
3 these laboratory methods are more expensive than conventional culture based methodologies and  
4 the benefits, in terms of decreased MRSA acquisition and decreased MRSA infections have not  
5 yet been conclusively shown. However, it is possible that the selective use of PCR may increase  
6 the efficiency of healthcare resources, due to the availability of a more rapid result but this awaits  
7 confirmation.

## 8 **2.1.2 Informing patients of MRSA status**

### 9 **Recommendations**

- 10 • All patients (in-patients, out-patients and other patients in the community) identified with  
11 MRSA should be informed as soon as possible of their MRSA status, which should be  
12 documented and information should be provided about eradication/treatment options.  
13 **Grade D**
- 14 • The responsibility of informing patients of their MRSA status lies primarily with the  
15 clinical team (i.e. consultant, non-consultant hospital doctors) caring for the patient  
16 during their in-patient stay. **Grade D**
- 17 • Where a new MRSA case is diagnosed following patient discharge or when a patient is  
18 attending an outpatient clinic, it is the medical team's responsibility to inform the  
19 patient's general practitioner of his/her MRSA status. **Grade D**
- 20
- 21 • If MRSA is only detected upon the patient's admission to the healthcare facility, the  
22 facility where the patient was previously admitted needs to be informed. **Grade D**
- 23
- 24
- 25 • Handing out an information leaflet is recommended. **Grade C**
- 26

## 1 **Rationale**

2 Many complaints from patients, their relatives and the public about HCAI and MRSA relate to  
3 poor communication including when and if positive MRSA status was conveyed. Patient  
4 advocacy groups have prioritized the provision of enhanced information about MRSA and as  
5 rapidly as possible, i.e. once confirmed. This is also consistent with clinical governance,  
6 professional and ethical standards, and is endorsed by professional bodies (20). Reductions in  
7 the spread of MRSA can be accomplished by sharing information, educating personnel about  
8 MRSA, and improving hygiene practices for everyday living.

9

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## 13 **2.2 Infection prevention & control measures in the acute hospital setting**

14

### 15 **2.2.1. Staffing & isolation facilities**

#### 16 **Recommendations**

- 17 • The health service must take steps to prevent patient overcrowding and understaffing, in  
18 order to minimise the risk of MRSA transmission. **Grade B**
- 19 • Staff members of all grades should receive appropriate training, such as education on  
20 hand hygiene, appropriate use of personal protective equipment (PPE) etc

21 **Grade B**

#### 22 **Rationale**

23 Every effort should be taken to minimise the transmission of MRSA, and other pathogens, even  
24 in the absence of specific isolation facilities. Overcrowding and understaffing have lead to  
25 failures of MRSA control programmes via decreased healthcare worker hand hygiene  
26 compliance, increased movement of patients and staff between hospital wards, decreased levels  
27 of cohorting and the overburdening of screening and isolation facilities. (1,2). Increased

1 patient/staff ratios are associated with increased transmission rates of infection (3,4) as are  
2 increased use of temporary or locum nursing staff (5). A high MRSA incidence leads to  
3 increased inpatient length of stay and delayed discharge, exacerbating overcrowding and leading  
4 to a vicious cycle characterised by further infection prevention & control failures (2).

## 5 **Recommendation**

- 6 • Multi-bedded general wards or units should have 19m<sup>2</sup> around each bed in a multi-bedded  
7 room. If this is currently not the case, future refurbishment should address this. Greater  
8 space between beds is required for high-risk units.

## 10 **Rationale**

11 The risks of HCAI are greatly increased by high bed occupancy and by an absence of suitable  
12 facilities to isolate infected patients (6).

13 The NHS recommends a minimum space of 3.6m bed centre-to-centre to minimise spread of  
14 infection (7-8). Multiple-bedded rooms should not contain any more than three beds including  
15 shower and toilet facilities and be designed in a way that allows for future reconfiguration. In  
16 Ireland, the recommendation has been made that there should be a minimum floor space of 19m<sup>2</sup>  
17 around each bed (9). Sufficient space accommodates clinical activities, patient movement and  
18 visitors. This also allows for the fact that droplet spread of pathogens is generally only a risk  
19 within one meter of the source patient (10-11).

## 20 **Recommendations**

- 21 • Newly built acute hospital inpatient accommodation should comprise 100% single-patient  
22 rooms. Newly built non-acute hospital inpatient accommodation should comprise a  
23 minimum of 50% single-patient rooms. **Grade C**
- 24 • All single-patient rooms should have *en suite* shower and toilet facilities, and an  
25 additional clinical hand wash sink, and have a minimum floor area of 25m<sup>2</sup>. **Grade C**

- 1       • The minimum proportion of airborne isolation rooms for newly built acute general  
2       hospitals should be one per 150 acute inpatient beds, or one per 75 acute inpatient beds  
3       for regional or tertiary hospitals. Newly built emergency departments should each have at  
4       least one airborne isolation room. **Grade C**

5

## 6 **Rationale**

7 Experience with epidemic strains of MSSA in the 1960s demonstrated that isolation was a key  
8 component in controlling the spread of staphylococci (12,13). A study from France found that  
9 MRSA infections decreased by 17.9% with the introduction of isolation precautions (14).  
10 Jernigan *et al* demonstrated a 15.6-fold lower MRSA transmission rate when colonised patients  
11 were cared for using strict isolation precautions, compared to standard precautions (15). The  
12 choice of isolation facility depends on hospital size, activity and the local MRSA rates.

13

14 Isolation rooms should have their own toilet en-suite, including dedicated washing/bathing  
15 facilities for patients. There should be a separate hand-washing sink and alcohol hand gel  
16 dispenser at the entrance to the room.

17 Where sufficient isolation rooms, or a dedicated isolation unit, are not available colonised  
18 patients may be cohorted in designated areas. This approach has been effective in controlling  
19 MRSA outbreaks (16).

20 Negative pressure rooms are not generally required for care of patients colonised or infected with  
21 MRSA as MRSA transmission is generally via contact or droplet spread, rather than airborne  
22 spread.

23

## 24 **Recommendations**

- 25       • Risk stratification must be performed locally to identify areas where MRSA infection  
26       results in high morbidity and mortality and where therefore patient isolation or cohorting  
27       is essential. Isolation or cohorting is essential in high-risk areas, i.e. ICUs, orthopaedic

1 units, vascular surgery units, transplant units and other specialised clinical areas with  
2 vulnerable patients. **Grade B**

3  
4 • Hospitals with endemic MRSA may consider the establishment of a dedicated isolation  
5 unit or control of infection ward. Control of infection wards should not be sited away  
6 from the main hospital environment to ensure that patients are not distanced from  
7 specialist care. **Grade D**

8  
9 **Rationale**

10 Dedicated isolation units, also known as control of infection wards, allow patients to be nursed in  
11 an open ward, avoiding some of the psychological impact of isolation in a single room. It also  
12 means that colonised patients are cared for by designated staff, using designated shared patient  
13 equipment. Such units are particularly useful in hospitals where MRSA is endemic, as is the case  
14 in many Irish and UK hospitals, or during large hospital outbreaks. A purpose built MRSA  
15 cohort unit in a hospital has proven effective in controlling MRSA transmission, while  
16 maintaining the overall quality of care (17). The introduction of dedicated isolation units was  
17 associated with significant reductions in MRSA transmission in a number of UK hospitals during  
18 the 1980s, although other pressures subsequently led to most of these being closed (18-21).  
19 Control of infection wards should not be sited away from the main hospital environment, to  
20 ensure that patients are not distanced from specialist care (22).

21

22 **Recommendation**

23 • Where sufficient isolation rooms or a dedicated isolation unit are not available, colonised  
24 patients may be cohorted in designated areas with designated staff, e.g. a six-bedded  
25 room.

26 **Grade C**

27 • All national and international patient transfers to an acute setting should be  
28 isolated/cohorted until MRSA screens are negative. **Grade C**

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- All patient transfers into high-risk units (critical care areas, cardiothoracic units, orthopaedics, trauma, vascular surgical units and transplant units) from non-high risk areas (medical and care of elderly unit) within the same institution should be isolated/cohorted with contact precautions until MRSA screens are negative. If this is not feasible a risk assessment should be carried out before the patient is moved into the high-risk unit.

**Grade B**

- All known MRSA cases on admission and all new MRSA cases upon identification in high- risk areas (critical care units, orthopaedics, surgical wards and transplant units) should be isolated/cohorted with contact precautions.

**Grade B**

- Patients with exfoliative skin conditions who are likely to shed MRSA in high numbers should be isolated until advised by the local infection prevention & control team.

**Grade B**

- Where a new case of MRSA is identified in an open room on a high-risk area, all other patients in the vicinity should be screened for MRSA.

**Grade C**

- Patients awaiting the results of MRSA screening should be nursed in isolation if any of the following apply:

- 1) Previously colonised or infected with MRSA
- 2) Recent and frequent hospital admissions
- 3) Transferred from another healthcare institution (unless that institution is known to be free from MRSA)
- 4) Inpatients in another healthcare institution within the previous six months (unless that institution is known to be free of MRSA)
- 5) Patients with skin ulcers or chronic wounds.

**Grade C**

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- The number of healthcare staff who have direct contact with patients in isolation who are colonised or infected with MRSA should be kept to a minimum. Staff with exfoliative skin lesions should be excluded from the care of patients colonised or infected with MRSA. **Grade D**

**Rationale**

Placing patients with MRSA who are colonised or infected under contact precautions helps reduce patient-to-patient spread of the microorganism within the hospital (23). Healthcare associated infections are a serious patient safety issue and staff must adhere to good infection control practices in particular hand hygiene.

**Recommendation**

- Isolation can be lifted if patients with MRSA have three consecutive negative sets of screening sample, at least 72 hours apart and two days after decolonisation treatment has been concluded. **Grade C**

**Rationale**

The patient is no longer considered infectious in these circumstances but while in hospital such patients should continue to be screened at weekly intervals.

**2.2.2 Hand hygiene**

**Recommendations**

- Hand hygiene must be carried out in the following circumstances:
  - Before and after each patient contact
  - Before and after the handling or manipulation of any invasive device
  - Before and after any aseptic technique
  - Before entering and upon leaving critical care areas, isolation rooms and areas used for cohorting of MRSA cases. **Grade A**

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- Cuts or breaks in the skin of healthcare workers should be covered with impermeable dressings. **Grade B**
- National recommendations on hand hygiene should be followed. **Grade D**
- Hand hygiene should also be carried out regularly by the patients themselves

**Grade C**

### **Rationale**

The transmission of HCAI pathogens from one patient to another via the hands of healthcare workers is well established (24, 25). Expert groups agree that the major focus on MRSA control is the prevention of hand transfer of MRSA (26-29). A recent Irish study showed that MRSA was recovered from 38/822 (5%) fingertips of 523 of healthcare workers after contact with patients and their environment (30). The World Health Organisation (WHO) 2009 states that hand hygiene is concentrated in activities known as the five moments for hand hygiene (31). [www.who.int/gpsc/tools/Five\\_moments/en/index.html](http://www.who.int/gpsc/tools/Five_moments/en/index.html). All senior medical, nursing, allied health professional and administrative personnel, whose staff have clinical involvement, must ensure that staff understand the importance of hand hygiene, are familiar with, adhere to the national recommendations and participate in hand hygiene audit.

Another study has highlighted the role of patients and their relatives as unidentified transient MRSA carriers (32). The study showed that by encouraging patients and visitors to participate in regular hand hygiene, MRSA nosocomial rates could be reduced.

### **2.2.3 Personal protective equipment (PPE)**

#### **Recommendations**

- A risk assessment should be undertaken on activities undertaken in a patient’s room and appropriate PPE selected. **Grade C**

- 1       • PPE (i.e. gloves and plastic apron) should be used when in contact with the patient, their  
2       immediate surroundings, or when in contact with blood, body fluids, secretions,  
3       excretions, mucous membranes or non-intact skin. **Grade B**
- 4       • Gloves should be changed and the hands decontaminated between several procedures on  
5       the same patient. **Grade B**
- 6       • PPE should be removed prior to leaving the isolation room, discarded into appropriate  
7       healthcare waste stream and hand hygiene performed. **Grade B**
- 8       • There is no need for visitors to wear PPE. The most important element for the visitor is to  
9       ensure they perform hand hygiene before and after patient contact. **Grade D**

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## 11 **Rationale**

12 Personal protective equipment is required for potential contact with blood and/or body fluids.  
13 Gloves are used to prevent contamination of healthcare personnel hands when anticipating direct  
14 contact with blood or body fluids, mucous membranes, non-intact skin and other potentially  
15 infectious material. Having direct contact with patients who are colonised or infected with  
16 pathogens transmitted by the contact route e.g. MRSA or handling or touching visibly or  
17 potentially contaminated patient care equipment and environmental surfaces is a significant risk  
18 (33).

19

20 Clothing and uniforms may become contaminated with potential pathogens after the care of a  
21 patient colonized or infected with an infectious agent i.e. MRSA. Although contaminated  
22 clothing has not been implicated directly in transmission, the potential exists for soiled garments  
23 to transfer infectious agents to successive patients (33,34). The value of wearing aprons and  
24 gowns to control the spread of MRSA is generally accepted (34-36).

25

26 Many expert groups advise that staff clothing should be protected in isolation rooms, as clothing  
27 will have contact with the patient, environmental surfaces or items within the patient's room and  
28 protection will limit the transfer of micro-organisms to other patients from such a source (26-29).

1 The protective apron/gown is removed before leaving the patient environment (27,35). Long  
2 sleeved gowns may be recommended for very close patient contact (e.g. lifting), prolonged  
3 patient contact or contact with patients with exfoliative skin conditions or extensive colonisation  
4 with MRSA (27).

5  
6 The use of facemasks for the control of MRSA transmission is controversial (34,35). In Canada  
7 it is suggested that a facemask may be required if a patient with MRSA has a superimposed  
8 respiratory viral infection (35). Hand hygiene should always be performed following removal of  
9 PPE (24).

10

#### 11 **2.2.4 Education**

##### 12 **Recommendations**

- 13 • All healthcare workers (HCWs) should receive adequate training on hand hygiene and the  
14 appropriate use of PPE **Grade C**
- 15 • Patients should be educated on the importance of hand hygiene while they are an in-  
16 patient **Grade D**
- 17 • Hospital management should ensure that all hospital staff (including supervisory staff)  
18 involved in cleaning processes must be trained, and certified as competent. Training  
19 should commence within the first week of employment. **Grade D**
- 20 • The chief executive officer, or equivalent, of every healthcare facility must take corporate  
21 responsibility providing adequate resources for training for those involved in cleaning.

22 **Grade D**

23

##### 24 **Rationale**

25 Adequate training for all HCWs is essential. Staff should receive training on hand hygiene and  
26 the appropriate use of PPE before they commence their employment and regular refresher  
27 courses should be available. Staff involved in cleaning should be adequately trained prior to  
28 commencement of their employment. Evidence now suggests that poor patient hand hygiene is a

1 contributory factor in the spread of pathogens such as MRSA (36). Educating patients on the  
2 importance of hand hygiene has been shown to be beneficial.

3

#### 4 **2.2.5 Patient movement and transfer**

##### 5 **Recommendation**

- 6 • The movement and transfer of patients with MRSA should be limited to prevent spread  
7 but the patient should not in the process be deprived of necessary care. **Grade C**

##### 8 **Rationale**

9 If the movement/transfer of the patient is necessary (including transfer to another facility), staff  
10 should ensure that the area is notified in advance of the patient's MRSA status and that  
11 precautions are maintained to minimise the risk of transmission to other patients (37). If in  
12 doubt, the local infection prevention and control team should be contacted. The receiving  
13 departments are required to clean and disinfect surfaces and equipment that come into contact  
14 with patients with MRSA. During transportation between departments it is important to maintain  
15 patient confidentiality. If the patient requires lifting onto a trolley then the healthcare worker  
16 should wear appropriate PPE. Once the task is completed, the HCW should remove PPE and  
17 perform hand hygiene. As patients are not normally in direct contact with the surrounding  
18 environmental surfaces or staff members' clothes during transportation, aprons or gloves are not  
19 required unless indicated by standard precautions. Transport equipment (trolley, wheelchair)  
20 used for transferring the patients should be cleaned and disinfected immediately after use paying  
21 particular attention to areas touched by the patient i.e. hand rails.

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#### 23 **2.2.6 Operating Theatre**

##### 24 **Recommendations**

- 25 • Patients colonised or infected with MRSA do not need to be placed last on the theatre list.

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**Grade D**

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- A sign should be placed on the theatre door to notify staff of contact precautions.

**Grade D**

- Staff within the operating theatre should be kept to a minimum.

**Grade D**

- The operating theatre should be cleaned & disinfected before the next patient.

**Grade B**

- Patient recovery should be in a designated area within the recovery department using contact precautions.

**Grade D**

## **Rationale**

MRSA positive patients do not need to be put last on the theatre list as a conventionally ventilated theatre should have a minimum of 20 air changes per hour of filtered air. This number of air changes results in very little ‘contaminated’ air being present after approximately 10 minutes (38). This provides sufficient protection against airborne spread of MRSA.

### **2.2.7 Equipment & environmental hygiene**

#### **Recommendations**

- Patient care equipment such as blood pressure cuffs and stethoscopes should be designated for use only on a single patient who is colonised or infected with MRSA

**Grade C**

- 1       • Patients' charts including observation charts and drug charts should be kept outside the  
2       patients' room. **Grade D**

- 3  
4       • All equipment should be cleaned and disinfected after use. **Grade B**

- 5  
6       • All healthcare staff should comply with best practice for insertion of invasive medical  
7       devices such as intravascular catheters and urinary catheters. **Grade B**

## 8 **Rationale**

9       Dedicated equipment should be used where possible and only essential equipment and supplies  
10       should be taken into the room (23). All patient care equipment/supplies must be effectively  
11       cleaned and disinfected before use on another patient and this applies especially to contact  
12       surfaces (39,40).

## 13 **Recommendations**

- 14       • The hospital environment must be visibly clean, free of dust and acceptable to patients,  
15       visitors and staff. **Grade C**

- 16       • All hospital surfaces should be intact and made of a durable, washable material. This is  
17       fundamental to the control of all healthcare-associated infections, including MRSA.  
18       **Grade C**

- 19       • Daily cleaning of an isolation room with detergent and water is sufficient with a terminal  
20       clean i.e. clean and disinfection being completed on transfer or discharge of the patient,  
21       paying particular attention to hand touch surfaces.  
22       **Grade C**

- 23       • Additional cleaning and disinfection measures are necessary on the discharge of MRSA  
24       patients and in outbreak situations. **Grade C**

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26

## 27 **Rationale**

1 Dry conditions with dust on environmental surfaces act as reservoirs for MRSA, which facilitates  
2 the transfer to hands when such surfaces are touched. Conversely, MRSA acquired on hands  
3 and/gloves may be transferred to environmental surfaces and equipment when they come into  
4 contact with such surfaces, e.g. curtains, equipment, switches/buttons (ventilators, infusion  
5 pumps, feeding pumps, etc.), phone, touch panel screens, door handles, light switches, bed tables,  
6 bed rails, mattresses and even pens.(23,37,41,26,42). A recent study highlighted the large  
7 numbers of MSSA and MRSA from hand-touch sites with the bed, locker and over bed table  
8 being the most commonly contaminated surfaces (43,44). While one study ascertained that  
9 computer keyboards can harbor organisms and act as potential reservoirs for nosocomial spread.  
10 Another study stated that 24% of computer terminals were contaminated with MRSA (46).

11 The most probable mode of transmission is via ‘hand-touch’ sites, since these sites offer a niche  
12 to microorganisms deposited from the hands, particularly fingertips. MRSA can survive for long  
13 periods in the environment and could present an infection risk for patients.

14 The correct colour coded system should be used for cloths/mops in isolation rooms. The  
15 National Hospitals Office cleaning manual for acute hospitals 2006 and equivalent Irish  
16 guidelines recommend white cloths for isolation rooms (47).

17 **Grade C**  
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## 19 **2.2.8 Laundry and healthcare waste**

### 20 **Recommendation**

- 21 • All laundry should be treated as potentially infectious and placed directly into an alginate  
22 or water-soluble bag at the bedside. **Grade C**

### 23 **Rationale**

24 All laundry should be managed *as per* Irish guidelines (47). Curtains are changed on terminal  
25 cleaning of a room of a patient with MRSA.

1 **Recommendation**

- 2 • The majority of waste from a room where a patient has MRSA should be considered non-  
3 risk waste i.e. gloves and aprons, unless contaminated with infectious body substances i.e.  
4 blood or sputum. **Grade C**

5 **Rationale**

6 The management of healthcare waste should be in line with national guidelines on the  
7 segregation, packaging and storage of Healthcare Risk Waste (48).

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3

## 4 **2.3 MRSA in the non-acute healthcare setting**

5 Changes in the way healthcare is delivered over the past ten to fifteen years have resulted in  
6 increases in the number of patients who are cared for in non-acute healthcare settings including  
7 adult day care centres, facilities for the homeless and special schools. MRSA positive patients  
8 may be encountered in non-acute healthcare settings including long term care facilities, such as  
9 nursing homes, residential homes and mental health services. Also MRSA colonised and  
10 infected patients may be cared for in the home. Although the management of patients in these  
11 settings is very different to the management of patients in the acute hospital setting, efforts, as  
12 detailed below should still be made to prevent transmission of MRSA in these settings.

### 13 **2.3.1 Screening**

#### 14 **Recommendations**

- 15 • Good communication between healthcare facilities is essential to prevent and control  
16 MRSA. **Grade D**
- 17 • Healthcare facilities should be informed on admission and discharge of recent MRSA  
18 screening results, decolonisation treatments received and any requirement for post  
19 decolonisation screening. **Grade D**
- 20 • Routine screening for MRSA in non-acute healthcare settings is not recommended.  
21 **Grade D**
- 22 • Expert infection prevention and control advice should be sought before embarking on  
23 screening for MRSA. **Grade C**
- 24 • Carriage of MRSA is not a contraindication to the transfer of a patient to a non-acute  
25 healthcare setting. **Grade C**
- 26 • Routine screening before discharge to a non-acute healthcare facility or home is not  
27 required. **Grade D**

1 • Screening before admission to an acute hospital setting may be required, for example, pre  
2 operatively. The need for screening prior to admission should be advised upon by the  
3 patients' consultant in conjunction with the hospital infection prevention and control  
4 team. **Grade D**

5 • Screening after decolonisation treatment will not normally be required after discharge.  
6 However, screening after decolonisation treatment may be requested in certain cases for  
7 example;

- 8 1. pre-operatively on the advice of the admitting physician/surgeon
- 9 2. where a patient is to be readmitted for further treatment

10 **Grade D**

11

## 12 **Rationale**

13 Healthcare associated infections such as MRSA are not limited to acute care hospitals. A high  
14 prevalence of MRSA amongst residents and staff of some long term care facilities (LTCFs) are  
15 making these facilities a substantial reservoir for MRSA. Prevalence of MRSA amongst residents  
16 of LTCF varies significantly from low rates of 1.1% in Germany to rates of over 20% in the  
17 United Kingdom and 30% in the United States. (1,2). A prevalence rate of 8.6% was reported in  
18 an Irish study in Nursing Homes in 2000 (3). Vast differences in rates of colonisation have been  
19 identified between different LTCF (range 0 -73%). (2) Rates of colonisation may depend on  
20 various factors including the prevalence of MRSA in the referring hospitals, the resident  
21 population, the percentage of staff colonised with MRSA and the infection control practices in  
22 the facility (1-3).

23 Risk factors identified as predictive of MRSA colonisation and infection amongst residents of  
24 LTCFs include host factors such as advancing age, antibiotic use, poor functional status,  
25 hospitalisation and the presence of invasive medical devices. (4).

26 Extra nasal carriage of MRSA has been seen to increase with the use of invasive devices (7) and  
27 admissions of greater than 10 days to acute healthcare facilities have been shown to increase the  
28 risk of colonisation. Antibiotic use had been shown to be independently associated with MRSA

1 colonisation (9). In LTCFs persistent carriage with MRSA has been reported in between 47% and  
2 65% of those colonised, with between 19% and 25% having transient carriage and between 9%  
3 and 23% having intermittent carriage of MRSA (8, 9).

4 Despite the high prevalence of MRSA carriage amongst residents of LTCFs the frequency of  
5 infection with MRSA in these settings appears to be low. Colonisation amongst residents of  
6 nursing homes in Belgium was associated with a higher mortality rate, but the excess mortality  
7 rate was restricted to residents with impaired cognitive function. The findings showed that no  
8 excess mortality was found amongst residents with normal or moderately impaired cognitive  
9 function (9). The diversity of MRSA strains identified in one study would indicate that the  
10 principal source of colonisation was direct or indirect contact with hospitals or other healthcare  
11 facilities (2).

12

### 13 **2.3.2 Decolonisation**

#### 14 **Recommendations**

- 15 • Non acute healthcare facilities should seek expert infection prevention and control advice  
16 before embarking on decolonisation for MRSA (Refer to Section on Decolonisation)  
17 **Grade C**
- 18 • MRSA carriers will not normally require decolonisation following discharge from an  
19 acute hospital to a non-acute healthcare setting, the community or home. **Grade B**
- 20 • If decolonisation treatment has been commenced prior to discharge it should be  
21 completed. **Grade B**
- 22 • The need for decolonisation after discharge should be advised upon by the patients'  
23 consultant in conjunction with the hospital infection prevention and control team.  
24 Decolonisation may be required in certain circumstances e.g. pre-operatively on the  
25 advice of the admitting physician/surgeon where a patient is to be readmitted for further  
26 treatment. **Grade D**
- 27 • The need for decolonisation treatment must be communicated to the non-acute healthcare  
28 facility, general practitioner on discharge. **Grade D**

1     **Rationale**

2     The effectiveness of decolonisation with nasal mupirocin has not been demonstrated for use  
3     in the non-acute healthcare setting. A high rate of recolonisation has been reported in a study  
4     examining the use of mupirocin for decolonisation of *S. aureus* in residents of two long term  
5     care facilities. A 90 days post treatment, 39% of residents were recolonised with MSSA.  
6     Four residents who were colonised with MRSA did not respond to decolonisation therapy  
7     (10). Also prolonged use and multiple courses of mupirocin have been associated with the  
8     development of mupirocin resistance and prolonged or repeated course are to be avoided in long stay  
9     patients (11).

10

11    **2.3.3 Infection prevention & control measures**

12

13    **Recommendations**

- 14     • Non-acute healthcare facilities should have an infection control program which  
15     incorporates
- 16         1. Monitoring for infection control problems, including outbreaks of infection,
  - 17         2. Education of employees in infection control precautions
  - 18         3. Policy and procedure development and review
  - 19         4. Monitoring of care practices
  - 20         5. Occupational health
  - 21         6. Antibiotic stewardship **Grade D**
- 22     • Standard precautions are advised for the care of all residents regardless of their MRSA  
23     status (Please refer to HPSC Standard and Transmission Based Precautions). **Grade B**
- 24     • Hand hygiene must be performed by all staff before and after each contact with a  
25     resident, or when in contact with their immediate environment, regardless of MRSA  
26     status in line with the WHO five moments for hand hygiene. **Grade A**
- 27     • The resident with MRSA should be encouraged to practice good hygiene and be assisted  
28     with this if their physical or mental condition makes this difficult. **Grade C**

- 1       • Isolation of a resident colonised with MRSA is not generally required as this may  
2       adversely affect rehabilitation of the resident. **Grade C**
- 3       • The potential for transmission of infection should be considered in resident placement  
4       decisions. Local risk assessment of the individual and the environment will be required  
5       prior to placement. **Grade C**
- 6       • Contact precautions may be required where a resident has an infection caused by MRSA  
7       or to control outbreaks of MRSA infection. **Grade C**

## 9       **Rationale**

10      A Cochrane review of the infection control strategies for preventing the transmission of MRSA  
11      in nursing homes for older persons did not find any studies meeting its criteria. The background  
12      for this study stated that nursing homes for the elderly provide an environment likely to promote  
13      the acquisition and spread of MRSA, putting residents at increased risk of colonisation and  
14      infection. The review found no studies specific to the long term care setting (12). However they  
15      acknowledged that infection control practices work to prevent the spread of MRSA in acute  
16      health care, and that general advice based on well established principles of infection control  
17      could be applied to all healthcare environments including LTCFs (12).

18      Data on the prevalence of MRSA in non acute healthcare settings such as in psychiatric services  
19      is not available. In general patients of such services are not at high risk of MRSA infection or  
20      colonisation. A recent investigation into the management of MRSA in a closed psychiatric unit  
21      found that hand hygiene was sufficient to prevent the spread of MRSA (13).

22      In the non acute healthcare and residential settings, adherence to standard precautions are  
23      required for the care of all patients including those known to be colonised with MRSA (14). A  
24      recent study of nursing homes in Northern Ireland highlighted that compliance with standard  
25      precautions was suboptimal in the nursing homes studied, despite an intervention which included  
26      education on infection prevention and control and an infection prevention and control audit. The  
27      authors highlighted the importance of a full infection prevention and control programme to

1 enhance compliance with standard precautions as a means of reducing transmission of MRSA  
2 within the Nursing Home setting (15).

3 A recent study showed a substantial decrease in the rate of MRSA nosocomial infections  
4 following an intervention which encouraged hand hygiene for patients and visitors. MRSA  
5 infections decreased by 51% and the intervention may have prevented up to 51 cases of MRSA  
6 infection over a period of one year (16).

7

#### 8 **2.3.4 Facilities**

9

##### 10 **Recommendations**

- 11 • Routine facilities in all non-acute healthcare facilities should include adequate sinks for  
12 staff hand washing, paper towels and alcohol hand gel. **Grade D**
- 13 • In non-acute healthcare, single rooms with hand hygiene facilities should be available  
14 which can be used for infection prevention and control purposes. **Grade D**
- 15 • In rooms with multiple beds, a minimum of 2.4 metres between the centres of adjacent  
16 beds is required. **Grade D**

17

##### 18 **Rationale**

19 National and international guidance on hand hygiene highlights the importance of the availability  
20 of hand hygiene facilities at the point of care to optimise compliance (17,18).

21

#### 22 **2.3.5 Education**

##### 23 **Recommendations**

- 24 • Education on general aspects of infection prevention and control and on national policies  
25 should be provided for all healthcare staff in non acute healthcare settings.

26

**Grade D**

- 1       • Education on the use of invasive devices such as urinary catheters, enteral feeding tubes  
2           and tracheostomies should be provided to healthcare staff in non-acute healthcare  
3           facilities. **Grade D**

4  
5       **Rationale**

6       A recent clustered randomised controlled trial to test the impact of an infection control education  
7       and training programme on MRSA prevalence in nursing homes in Northern Ireland found that  
8       the intervention did not change the prevalence of MRSA amongst staff or residents during the 12  
9       month intervention period (15). However, a significant improvement was seen in the infection  
10      control audit score for the intervention nursing homes and reasons for lack of effect included  
11      non-compliance with the intervention and lack of organisational commitment as despite feedback  
12      to managers of the poor audit findings, not all non-compliances were addressed. The authors also  
13      highlighted the need for more intensive training in infection prevention and control. Compliance  
14      with infection control practices remained poor in the intervention homes, particularly in the area  
15      of hand hygiene and equipment cleaning, areas which are essential to control of MRSA (15).

16

17      **2.3.6 Antimicrobial use in long term care facilities**

18

19      **Please also refer to Section 2.8 - Treatment and Prophylaxis of Healthcare associated**  
20      **MRSA**

21

22      **Recommendations**

- 23      • Antibiotic stewardship programmes should be implemented for long term care facilities. **Grade B**
- 24
- 25      • When antibiotics are being prescribed to control MRSA local advice should be sought  
26      from the consultant microbiologist or infectious diseases physician. **Grade D**

- 1       • The use of antibiotics associated with MRSA selection or resistance should be avoided or  
2       minimised as much as possible. These include cephalosporins, macrolides and  
3       fluoroquinolones. **Grade B**
- 4       • Topical therapy for superficial MRSA skin infections should not be used without advice  
5       from the consultant microbiologist of infectious diseases physician. **Grade D**

## 8 **Rationale**

9 Development of antibiotic resistant organisms has been strongly associated with antibiotic use.  
10 Prudent antimicrobial use is important in the prevention and control of MRSA. This was  
11 highlighted in a recent report (14).

12 Infection control measures, antibiotic restrictions and appropriate therapy for infection were  
13 successful in controlling an outbreak of community acquired MRSA in a residential setting for  
14 adults with developmental disabilities. No host risk factors were identified for acquisition of  
15 MRSA. However, excessive antibiotic use was observed in the facility affected (20).

## 17 **2.3.7 MRSA in the home**

### 19 **Recommendations**

- 20       • Good communication between hospitals discharging patients home with MRSA and  
21       carers or family members, community nurses and general practitioners is essential in  
22       minimising spread. **Grade D**
- 23       • Patients should be asked to inform their healthcare providers that they have previously  
24       tested positive for MRSA, particularly when attending different/new, healthcare  
25       providers. **Grade D**
- 26       • There is little risk of transmitting MRSA to healthy people who are at low risk of  
27       becoming infected. Patients should be informed that the risk to healthy relatives or others

- 1 outside the hospital setting is extremely small, unless they are healthcare workers with  
2 patient contact when they may pose a risk to other patients. **Grade B**
- 3 • Eradication of MRSA carriage in the community is generally not required. **Grade D**
- 4 • If decolonisation treatment has been commenced prior to discharge it should be  
5 completed. **Grade B**
- 6 • The need for decolonisation after discharge should be advised upon by the patients’  
7 consultant in conjunction with the hospital infection prevention and control team.  
8 Decolonisation may be required in certain circumstances, e.g. pre-operatively on the  
9 advice of the admitting physician/surgeon where a patient is to be readmitted for further  
10 treatment. Please refer to section 2.6 – Decolonisation. **Grade C**
- 11 • In the home, the following general precautions should be followed:
- 12 1. Good hand washing practice is the single most important infection control  
13 measure.
- 14 2. Patients should be instructed to wash their hands before and after touching any  
15 dressings or wounds.
- 16 3. Care-givers should wash their hands with soap and water before and after physical  
17 contact with the infected or colonised person and before leaving the home.
- 18 4. Disposable gloves should be worn by care givers if contact with body fluids or  
19 dressings is expected. Hands should be washed after removing gloves.
- 20 5. Cuts or breaks in the skin of patients and carers should be covered with  
21 impermeable dressings.
- 22 6. Linen should be changed and washed if it is soiled and on a routine basis.
- 23 7. The patient’s environment should be cleaned, using standard detergents, routinely  
24 and when soiled with body fluids. Cleaning can be achieved by washing with a  
25 detergent and then rinsing with water. Where rinsing with water cannot be  
26 achieved a disinfectant cleaner can be used.
- 27 8. Cutlery and crockery should be washed as normal. Separate cutlery & crockery is  
28 not required
- 29 9. Items for personal hygiene such as razors, tooth brushes, face cloths, body  
30 lotions/creams should not be shared.



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## 26 2.4 MRSA in obstetrics and neonates

### 27 2.4.1 MRSA during pregnancy

## 28 Recommendations



1 If a mother is known to be MRSA positive ante-natally, antibiotic prophylaxis for caesarean  
2 section (elective and emergency) should include antibiotics that cover MRSA, which should be  
3 discussed with a clinical microbiologist or infectious disease physician.

4

## 5 **2.4.2 Breast feeding and MRSA**

### 6 **Recommendations**

7 • If a lactating mother has known MRSA mastitis,

8 1. The mother can usually continue to breast-feed a healthy term baby in the  
9 community, receiving antibiotic therapy (unless the antibiotics prescribed are  
10 contraindicated in lactation) **Grade D**

11

12 2. If the baby is in the neonatal intensive care unit (NICU) and at significant risk of  
13 developing an invasive MRSA infection, the baby should not be fed the breast  
14 milk until the mastitis is resolved and the maternal treatment course is complete.

15 **Grade C**

16 3. In other circumstances such as a baby in special care nursery, a risk assessment  
17 should occur based on the likelihood that the baby will develop an invasive  
18 MRSA infection. Consider risk factors such as IV catheters, ventilation, recent  
19 surgery, immunocompromised, etc. **Grade D**

20

21 • If a mother is colonised or infected with MRSA at another site,

22

23 1. The mother can continue to breast-feed a healthy term baby in the community.

24 **Grade D**

25 2. In other circumstances such as a baby admitted to a healthcare institution, clinical  
26 staff caring for the baby should be informed of the mother's MRSA status as soon  
27 as possible. In the absence of mastitis, it is usual for a lactating mother to continue

1 to breast feed her baby. Individual cases should be risk-assessed and discussed  
2 with the neonatologist and/or infection control team. **Grade D**

3  
4 **Rationale**

5 Mothers with known MRSA mastitis can continue to breast-feed a healthy term baby in the  
6 community. Acquisition of MRSA by the infant is expected, but the vast majority of such  
7 acquisitions are not followed by infection, unless the baby is in the intensive care setting. For  
8 treatment of MRSA mastitis ideally use antibiotic therapy that is considered safe in lactation e.g.  
9 clindamycin. Therapeutic options should be discussed with a clinical microbiologist or infectious  
10 disease physician. If susceptibility results necessitate prescribing an antibiotic which should not  
11 be used during lactation, the mother should be advised to express breast milk and discard for  
12 duration of treatment course.

13 Breast milk has been associated with transmission of MRSA to neonates in the NICU and  
14 subsequent infection (14,15). Mothers with known MRSA mastitis are usually advised not to  
15 feed a baby in the NICU, until maternal symptoms have resolved and antibiotic therapy is  
16 complete. Individual cases should be discussed with the neonatologist, clinical microbiologist or  
17 infectious disease physician.

18 **2.4.3 MRSA screening in neonates**

19 **Recommendation**

- 20 • Neonates in high risk units should be screened for MRSA, similar to all high risk patients  
21 (on admission and weekly thereafter). Neonates <28 days old should include the  
22 umbilical site in addition to other recommended sites

23 **Grade B**

1 **Rationale**

2 Skin colonisation with *S. aureus* can occur within 24-48 hours of birth from contact with the skin  
3 of carers and the environment. Although MRSA is not endemic in most maternity and neonatal  
4 units in Ireland, vigilance is recommended because

5 (a) MRSA is endemic in many other healthcare institutions in Ireland

6 (b) MRSA is endemic in NICU's in some areas of the world, e.g. 41% of infants in an  
7 NICU in Taiwan carry MRSA (11).

8 (c) Infants known to be colonised with MRSA are more likely to develop MRSA  
9 infection than those without colonisation (26% vs 2%) (11) and therefore appropriate  
10 empiric antibiotic therapy should be commenced in MRSA colonised infants who  
11 develop signs of sepsis

12 (d) Clinical MRSA isolates are indistinguishable from the colonising isolate in >90% of  
13 episodes in a NICU (11).

14 (e) *S. aureus* is the second most common cause of late-onset (>48-72 hours of age) sepsis  
15 in NICUs (16).

16 MRSA screening should occur on admission and at least weekly thereafter in NICU, paediatric  
17 ICUs and in other high risk units. In neonates, as in older patients, the nares are the most  
18 important site of colonisation. Screening at multiple sites provides significantly improved  
19 sensitivity and specificity compared to one site. In neonates, the combination of nasal and  
20 umbilical sites achieves a sensitivity >90%.(11,17). A USA. consensus paper only recommends  
21 screening of the nares in neonates <28 days (10). However, the paper states that many centres  
22 screen multiple sites including various combinations of the nares, throat, umbilicus, and rectum.  
23 Overall, the evidence favours inclusion of the umbilicus as a screening site in infants <28 days in  
24 addition to screening sites used for all other patients.

25

26

1 **2.4.4 MRSA decolonisation in neonates**

2 **Recommendations**

- 3 4. De-colonisation of infants outside of high risk units is not usually required, unless  
4 recommended by the infection prevention and control team. **Grade D**
- 5 5. For infants in the NICU and other high risk units, nasal mupirocin is recommended  
6 for decolonisation if the MRSA isolate is susceptible. **Grade D**
- 7 6. If the neonate >26 weeks gestation strongly consider gentle skin bathing with  
8 octenidinedihydrochloride. **Grade D**
- 9 7. Chlorhexidine powder may be used on the umbilical and nappy area. **Grade D**
- 10 8. Chlorhexidine 4% disinfectant should not be used on the skin of premature  
11 infants, on account of the risk of burns and dermatitis. **Grade C**

12 **Rationale**

13 For general comments on decolonisation, please see relevant section in 2.2

14 MRSA is a rare cause of perinatally-acquired or early onset neonatal sepsis. During a two year  
15 period (June 2005-May 2007) there were only 20 cases of MRSA sepsis seen in the UK and  
16 Ireland in infants <2 days old, suggestive of mother to child transmission (9). In the National  
17 Maternity Hospital, Dublin during 2005-2010, there were ~50,000 deliveries with no cases of  
18 MRSA early-onset neonatal or puerperal sepsis (personal communication, Dr S Knowles).

19 MRSA sepsis in the paediatric population is uncommon. The incidence of MRSA bloodstream  
20 infection in Irish children <16 years is 1.1 per 100,000 child population (9). Most MRSA sepsis  
21 occurs in children <1 year (61%) and 35% of cases are in infants <1 month. Nearly two thirds,  
22 62%, of children with MRSA were receiving high-dependence or intensive care at the time of  
23 their first positive culture. In a study from Taiwan of 90 episodes of healthcare associated MRSA  
24 bloodstream infection in an NICU, the most common clinical diagnoses were: 54%, catheter  
25 related, 21%, SSTI, 20%, bloodstream infection without a focus, 17%, pneumonia, 7%,  
26 conjunctivitis, 3%, bone and joint, 2%, meningitis 1%, peritonitis and 23/90, infants had >1 site  
27 of infection (18). Prolonged MRSA bloodstream infection was common. Metastatic  
28 complications developed in 18% and 9% developed recurrent infection. Overall mortality was

1 18% with 1.2% attributable to MRSA. In a US consensus paper on management of MRSA  
2 infection in the NICU infants with an invasive MRSA infection were more likely to have a lower  
3 birth weight, be parenterally fed, have a CVC and have an endotracheal tube *in-situ* (10). A study  
4 from Texas Children's Hospital on 17 infants with *S. aureus* BSI, of which eight were MRSA,  
5 describe the emergence of CA-MRSA (based on genetic characteristics) in six of eight infants  
6 with MRSA bloodstream (19).

7 Neonates who are MRSA positive and in a high risk unit (e.g. NICU, special care baby unit,  
8 paediatric ICU, haematology-oncology unit, cardiothoracic surgery, neurosurgery, transplant) or  
9 pre-elective surgery, should be decolonised. Clinical MRSA isolates are indistinguishable from  
10 the colonising isolate in >90% of episodes in a NICU (11). Decolonisation may reduce the  
11 subsequent infection rate and may reduce transmission within the NICU.

12 There is evidence that mupiricin has been used for many years in neonatal units without cause for  
13 concern. In a US National survey of MRSA eradication in NICU's, 100% of respondents who  
14 attempted to decolonise MRSA carriers used topical mupiricin (20). The use of octenidine  
15 dihydrochloride baths (especially if >26 weeks gestation) can be considered as well as the use of  
16 chlorhexidine powder on the groin and umbilical area. Topical 4% chlorhexidine wash is not  
17 recommended for premature infants, as it may cause dermatitis or burns (21,22).

18

#### 19 **2.4.5 Informing pregnant women and parents of infants of MRSA carriage or infection**

##### 20 **Recommendation**

- 21 • Information leaflets on MRSA should be available for parents of affected infants.

22

**Grade D**

##### 23 **Rationale**

24 A US consensus statement on the management of MRSA in NICU recommends that  
25 'standardised instruction sheets describing methods to prevent transmission of MRSA' should be  
26 available as a resource for parents and visitors of infants in the NICU (10).

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25

## 26 **2.5. Community-associated MRSA**

27 Community-associated MRSA (CA-MRSA) is defined using clinical, epidemiological and  
28 microbiological characteristics (1,2). The characteristics of CA-MRSA include

29

- 30 1. Isolate must be confirmed as MRSA

- 1 2. Patients with CA-MRSA usually reside in the community as opposed to the healthcare  
2 environment and have no risk factors for the acquisition of MRSA.
- 3 3. CA-MRSA isolates are usually resistant to  $\beta$ -lactam antibiotics but are relatively sensitive to  
4 most other classes of antibiotics, compared to healthcare associated MRSA strains. CA-  
5 MRSA isolates are usually susceptible to ciprofloxacin, co-trimoxazole, gentamicin,  
6 tetracycline and clindamycin.
- 7 4. In the many cases, a patient with CA-MRSA usually presents with skin and soft tissue  
8 infection. However, other clinical manifestations may present, e.g. pneumonia
- 9 5. When typed, CA-MRSA is predominantly Staphylococcal Chromosomal Cassette (SCL) *mec*  
10 type IV or V

11

## 12 **2.5.1 Surveillance and screening**

### 13 **Recommendations**

- 14 • Patients with CA-MRSA in the following categories should be reported to the  
15 Director of Public Health.
  - 16 1. Clusters/outbreaks of skin and soft tissue infection (SSTI)
  - 17 2. Cases, with severe invasive disease, resulting in death, in at-risk groups such as  
18 healthcare workers, those involved in gym or close contact sports.
  - 19 3. Cases in a closed community where there may be potential for onward  
20 transmission (e.g. prison, military camps, nursing home, etc.)
- 21 • Screening for CA-MRSA should only be considered in the following circumstances;
  - 22 1. The case is at high-risk from infections
  - 23 2. Recurring infection in an index case or infection occurs in close contacts  
24 following two decolonisation courses
  - 25 3. There is a risk to others e.g. healthcare worker, household contact of a healthcare  
26 worker or a carer of at-risk people
  - 27 4. To investigate clusters or an outbreak in a closed population, e.g. prison inmates
- 28 • There is no clear evidence as to the optimal sites to screen for CA-MRSA in  
29 community settings. A minimum swab set should include:

1                           **Nostrils** - (both anterior nares)

2                           **Throat**

3                           **Skin lesions** - Discharging wounds/lesions, dry lesions or broken skin.

4                   **Additional sites**, i.e. perineum, axillae (armpits) and the umbilicus for neonates can be  
5                   included at the discretion of health providers.

6

7   **Rationale**

8   In Ireland there is no formal surveillance system to monitor CA-MRSA cases or SSTI clusters.

9   However, some countries have such systems, e.g. in Switzerland, and in Western Australia (2,3).

10   In England, the focus is specifically on PVL-positive *S. aureus* infection rather than CA-MRSA,  
11   especially in at-risk groups, i.e. health care worker, residential/care home staff, those involved in  
12   gyms or close contact sports such as wrestling and rugby, cases in a closed community where  
13   there may be potential for onward transmission, e.g. prison, military camps, nursing home (4).

14   Neither PVL nor SCCmec IV (clone associated with CA-MRSA in other countries) carriage can  
15   be used in Ireland as sole markers for CA-MRSA as a significant proportion of CA-MRSA  
16   strains are PVL negative (5,6). Recently, a CA-MRSA carriage rate of 0.57% was reported in  
17   healthy Irish volunteers (5/879), all of whom were PVL negative and there was an association  
18   with sport (7). Although CA-MRSA is not currently endemic in Ireland, it is essential that cases  
19   are appropriately managed, the potential for ongoing spread is minimised, and that SSTI clusters,  
20   cases in high risk groups or cases in closed communities are reported to the director of Public  
21   Health.

22  
23   Screening after attempted decolonisation evaluates the effectiveness of the decolonisation  
24   treatment. If the case has no active infections and /or negative screening results are achieved one  
25   and three months after decolonisation, then no further action is recommended in a community  
26   setting unless further infections occur.

27

28   **2.5.2. Prevention**

29   **Recommendation**

- 1       • Prevention of transmission of CA-MRSA requires the consistent application of good  
2       hygienic practices, i.e. standard precautions, with an emphasis on hand washing, not  
3       sharing potentially contaminated personal articles (e.g. towels, razors, brushes, and  
4       clothing) and covering draining skin lesions to prevent direct or indirect contact with  
5       infected secretions of another person.

6

## 7 **Rationale**

8 The aim of community control of CA-MRSA is to prevent spread from an infected/colonised  
9 individual to other persons in the family and in the community. Drainage from CA-MRSA  
10 infections, wound dressings and other materials contaminated with wound drainage are infectious  
11 and therefore should always be contained with clean dry dressings that completely cover lesions,  
12 i.e. adherence to standard precautions.

13

### 14 **2.5.3 Diagnosis of suspected CA-MRSA infection**

#### 15 **Recommendations**

- 16       • CA-MRSA infection should be suspected in the following groups:
- 17       1. Patients with SSTI such as furunculosis, impetigo and folliculitis (or other infections)  
18       that do not respond to empiric beta-lactam antibiotic therapy
- 19       2. Patients presenting with recurrent SSTI (two or more in six months)
- 20       3. Clusters of SSTI within a household or social group
- 21       4. Patients with rapidly progressive pneumonia – haemoptysis should be an alerting sign
- 22       5. Patients with necrotising SSTI
- 23       • Microbiological culture of appropriate clinical specimens is the only way of detecting  
24       CA-MRSA cases and should be performed in the patient groups above. Appropriate  
25       specimens include:
- 26       1. Fluid from a purulent lesion or abscess cavity
- 27       2. Respiratory secretions (e.g., sputum, tracheal aspirations)
- 28       3. Blood cultures from a moderately or severely ill patient with signs and symptoms of  
29       systemic infection



1 **Grade A**

2 • A glycopeptide is recommended for severe SSTI. **Grade A**

3 • Alternatives include linezolid, daptomycin or clindamycin. **Grade D**

4 • Severe CA-MRSA infection with toxic shock or necrotising disease should be treated  
5 intravenously with a combination of linezolid and clindamycin with the addition of  
6 rifampicin if necessary. **Grade D**

7 • Early surgical debridement should be carried out where possible in more severe cases of  
8 CA-MRSA SSTI. **Grade D**

9 • The use of adjunctive therapy such as intravenous immunoglobulin (IVIG) may be  
10 considered in severe disease on the recommendation of a microbiologist or infectious  
11 diseases consultant. **Grade D**

12

### 13 **Rationale**

14 The management of confirmed CA-MRSA infection involves treatment of infection (drainage of  
15 abscess and antibiotic therapy), decolonisation of the index case, increased individual and  
16 environmental hygiene, investigation of close contacts and notification of the case to the public  
17 health specialist if the case meets the criteria outlined earlier.

18

19 Patient education is a critical component of CA-MRSA case management. Patients and their  
20 carers/household members should be educated on methods to limit further spread within their  
21 household and among other close contacts with an emphasis on covering wounds at all times and  
22 hand washing (HPSC link – **to be added**).

23

24 Although there is no unequivocal evidence to support the combination of linezolid, clindamycin  
25 and rifampicin the high mortality (>60%) in necrotising pneumonia supports the use of this  
26 combination. Linezolid and clindamycin suppress PVL and alpha toxin production while  
27 rifampicin is added for *in-vitro* synergy to enhance the intracellular clearance of staphylococci.

1 Serum levels of linezolid are reduced by rifampicin, and concurrent use should be monitored  
2 closely to ensure effectiveness. Further details on the treatment of MRSA are outlined in section  
3 2.8. Initial options for CA-MRSA are outlined in table 1.

4  
5 There is a theoretical benefit in using IVIG in the management of severe CA-MRSA infection  
6 where toxins are involved. Clinical data is sparse and it is unlicensed for this indication but  
7 clinical improvement and a sustained fall in inflammatory markers have been noted in case  
8 reports. The HPA guidelines recommend that IVIG “should be considered” for patients with  
9 necrotising pneumonia as an addition to intensive-care support and high-dose antimicrobial  
10 therapy because it neutralises toxins and the expected benefits outweigh the risks in a condition  
11 with a mortality rate over 60%. The recommended dose is 2g/kg, repeated once after 48 hours if  
12 the patient has not responded (9). US guidelines on the treatment of MRSA infections do not  
13 routinely recommend IVIG as adjunctive therapy for the management of invasive MRSA  
14 disease; however they do recognise that some experts may consider these agents in selected  
15 scenarios (10).

16

### 17 **2.5.5 Decolonisation**

18

#### 19 **Recommendations**

- 20 • Decolonisation is recommended for all index colonised/infected CA-MRSA cases and is  
21 outlined in Fig 1 and 2.
- 22 • Decolonisation should commence only when the CA-MRSA infection has been  
23 successfully treated.
- 24 • Decolonisation is unlikely to be successful and is not recommended where there are open  
25 wounds or permanent indwelling devices *in-situ*. Decolonisation should not be  
26 commenced in patients with active exfoliative skin conditions, until the underlying  
27 condition is treated first in consultation with a dermatologist.

28

29

## 1 Rationale

2 Current North American guidelines do not recommend decolonisation of cases nor contact  
3 tracing of CA-MRSA cases. (10,11). Decolonisation is recommended only in certain situations  
4 such as multiple (two or more cases within six months) recurrences of MRSA infection, ongoing  
5 transmission in a well-defined, closely-associated cohort such as a household, and only after  
6 documenting that reinforcement of standard preventative measures has been unsuccessful. In  
7 contrast many European countries and Australia have taken a different approach recommending  
8 decolonisation and contact tracing albeit with different strategies (9,12,2,13,14). The difference  
9 in prevalence of CA-MRSA between countries could support the differing approaches, i.e. CA-  
10 MRSA is so prevalent in North America. The evidence base to support decolonisation is poor.  
11 Decolonisation has been recently shown to be effective in settings with sporadic CA MRSA  
12 infections. (13) CA-MRSA is not endemic in Ireland at present and therefore a similar approach  
13 as taken in other European countries in terms of decolonisation is recommended (Fig 2).

14  
15 Decolonisation is recommended for all index infected CA-MRSA cases, especially if in a close  
16 community or if severe disease to reduce the risk of recurrent CA-MRSA infections and  
17 transmission. Standard precautions, e.g. environmental cleanliness, are important in reducing the  
18 potential risk of recolonisation from the environment.

19  
20 **Table 1: Recommendations on antibiotic choices for the management of moderate CA-**  
21 **MRSA SSTI in the community\***

22

<b>Antibiotic CHECK IF SUSCEPTIBLE FIRST!</b>	<b>Adult</b>	<b>Pregnancy</b>	<b>Children</b>	<b>Infants &amp; Neonates</b>
Clindamycin <sup>1</sup>	450mg orally, 4 times daily x 7 days	450mg orally 4 times daily x 7 days	Check BNF <sup>c</sup>	
Trimethoprim/ Sulphamethoxazole <sup>2</sup>	160+800mg orally twice daily x 7 days	Discuss with clinical microbiologist or	Check BNF <sup>c</sup>	Discuss with a paediatrician, clinical microbiologist

			infectious diseases physician		or infectious diseases physician
Doxycycline <sup>3</sup>	100mg orally twice daily x 7 days	Not recommended		<u>Child over 12 years ONLY:</u> Check BNF	
Linezolid	Discuss with a clinical microbiologist or Infectious diseases physician. Reserve for patients who are not able to take or tolerate the above regimens				

**CA-MRSA  
RESISTANT to  
antibiotics above**

***Or***  
**Patient's drug  
allergy or potential  
drug interaction  
precludes the use of  
antibiotics above**

Discuss with a clinical microbiologist or  
infectious diseases physician

---

1 \*If the patient requires treatment in hospital with intravenous therapy, please refer to Section  
2 2.8

3  
4 <sup>1</sup> Clindamycin should NOT be used for MRSA isolates RESISTANT to erythromycin.

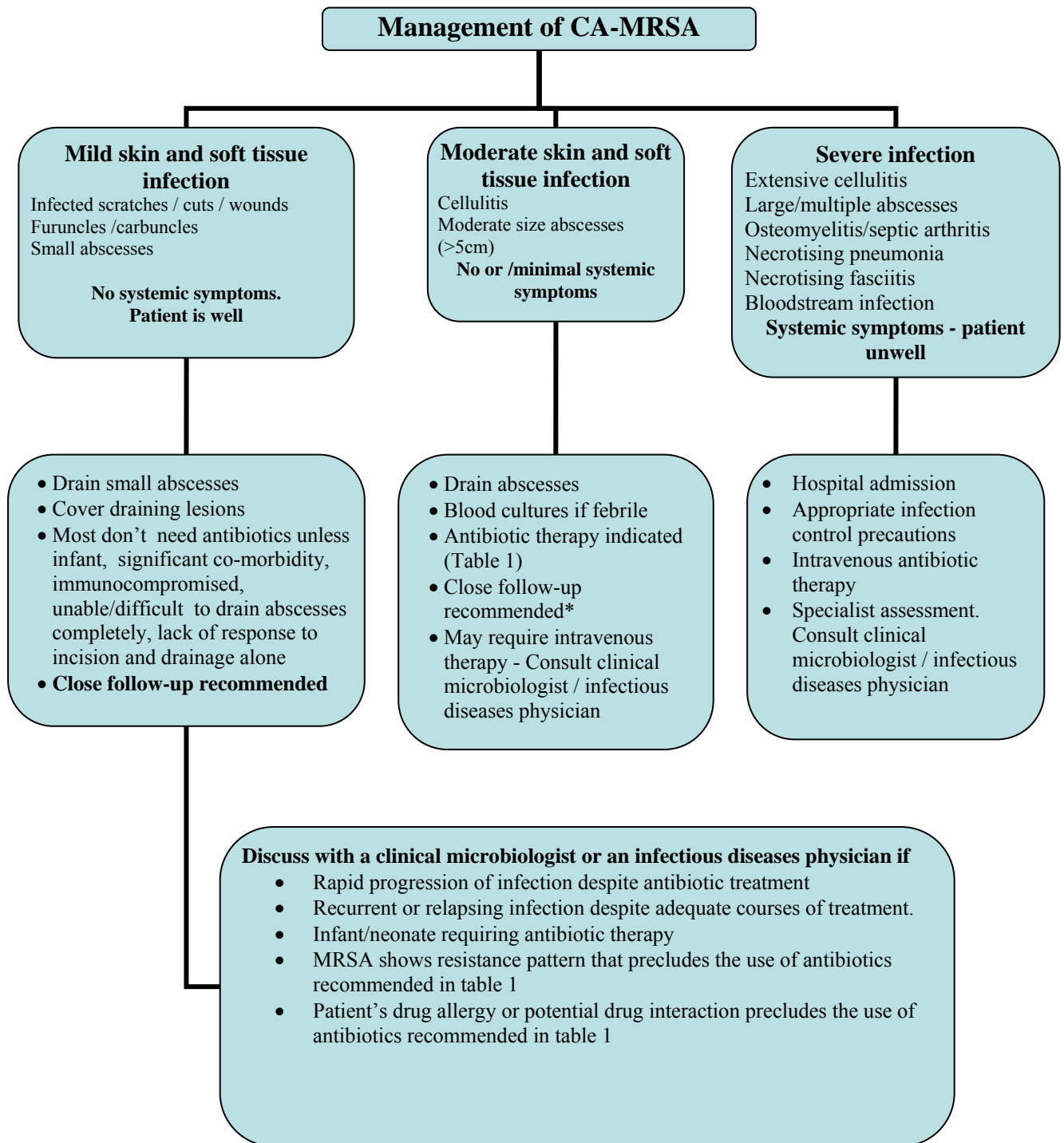
5 <sup>2</sup> Trimethoprim-sulphamethoxazole is not recommended in infants and neonates under 6 weeks of  
6 age.

7 <sup>3</sup> Doxycycline is not recommended for infants and neonate

8  
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1 **Fig 1: Management of suspected CA-MRSA infection**

2



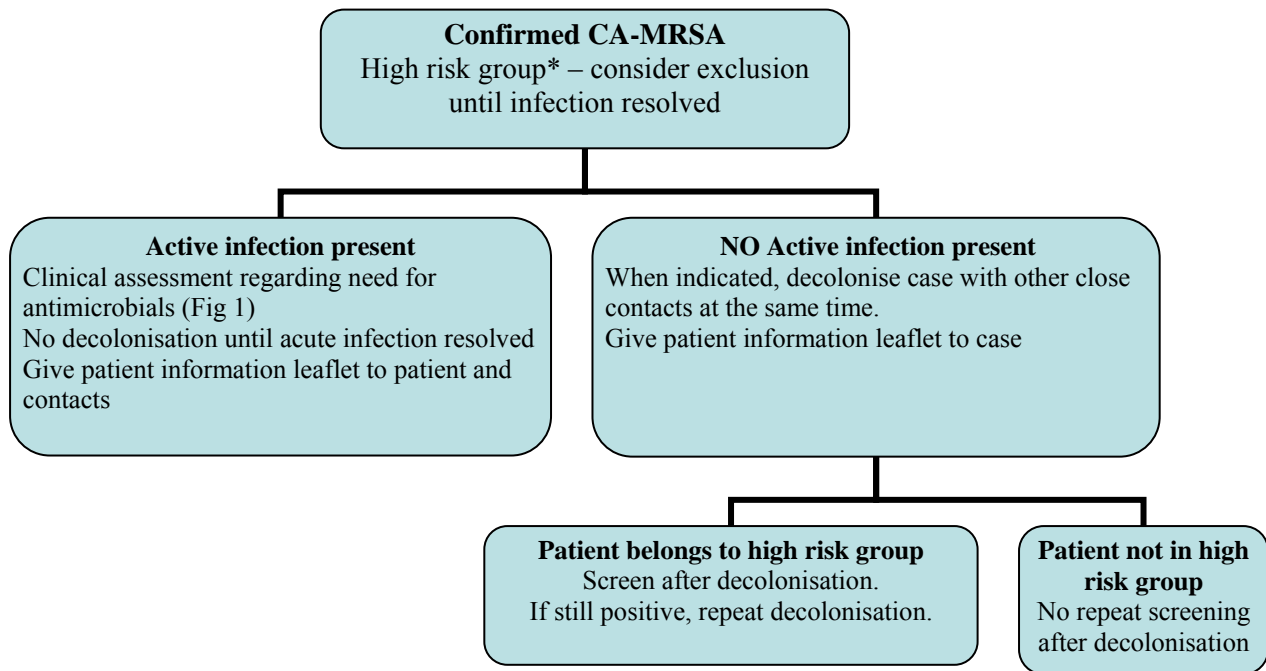
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4

5

1 **Fig 2: Algorithm for management and decolonisation of confirmed CA-MRSA infection**

2



3

4

5 \*High risk group = Healthcare worker, residential/care home staff, those involved in close  
6 contact sports, e.g. rugby, wrestling, etc. gyms.

7

### 8 **2.5.6 Management of household and lower risk contacts**

#### 9 **Recommendations** (see also Table 2)

- 10
- 11 • Household contacts of an index case, i.e. those with frequent skin-to-skin contact, or
  - 12 those who share items in common with a patient with CA-MRSA infection, should be
  - 13 provided with an information leaflet. (link to HPSC). Others at less risk of acquisition
  - 14 should also be provided with an information leaflet as required.
  - 15 • Clinicians should routinely ask about similar cases of SSTI in household members and
  - 16 other close contacts of an index case with CA-MRSA infection. If a potential
  - 17 cluster/outbreak of cases in a defined cohort is suspected the local public health specialist
  - 18 should be notified.
  - Decolonisation is recommended for household contacts with:

- 1 1. A history of recurrent SSTI (two or more in the last six months)
- 2 2. Ongoing spread within the household
- 3 3. Increased risk for infection, e.g. immunocompromised individuals such as those on
- 4 cancer chemotherapy
- 5 • Patients with CA-MRSA infection should be excluded where possible from participation
- 6 in activities involving close skin-to-skin contact until the infection has cleared and any
- 7 wounds have healed
- 8 • Screening and decolonisation is not routinely recommended for lower-risk contacts unless
- 9 transmission is identified i.e. at least one other case is identified in that group of contacts.

10

### 11 **Rationale**

12 The Centre for Disease Control (CDC) defines conditions promoting CA-MRSA spread as the “5  
13 C’s” :

- 14 • Contact - Frequent skin
- 15 • Compromised skin – i.e. cuts and abrasions, skin infections
- 16 • Contaminated items and surfaces
- 17 • Crowding
- 18 • Cleanliness – lack of

19 A sixth ‘C’, antimicrobial use (capsules) has also been proposed (15).

20

21 The approach to management of contacts differs significantly from country to country in the  
22 absence of hard scientific data and or clinical trials. There is little information concerning the  
23 effectiveness of decolonization in the community and an evidence-base to support  
24 recommendations is lacking.

25

### 26 **Table 2: Definition of contacts of CA-MRSA index cases (Australia – see reference 3)**

	<b>Definition</b>
<b>CA-MRSA contact</b>	People with frequent close skin-skin contact with an MRSA index case and /or share items that come in close contact with the skin of the index case.
<b>Higher-risk (household) contacts</b>	Persons who regularly live in the same household as the index case and therefore have frequent close skin contact or are likely to share items that come in close contact with the skin of the index case. This includes dormitory room contacts, group homes etc. where

**Lower-risk contacts** people live together. Closely-associated cohorts outside of a single household. These groups include day-care centres or contact sports teams (football, wrestling) where there is close skin-skin contact (especially with skin abrasions), sharing of personal hygiene items (e.g. towels) or shared surfaces or items that come into contact with skin (e.g. equipment).

---

1  
2 Household transmission of CA-MRSA is commonly reported. Decolonisation of cases should  
3 only commence once any infection has cleared and wounds are healed or almost healed. If  
4 decolonisation is indicated for cases and household contacts, the treatment for that household  
5 should commence simultaneously. If a contact requiring decolonisation has any pre-existing  
6 dermatological conditions this should be discussed with a dermatologist prior to starting the  
7 course of treatment. CA-MRSA cases and their close contacts should be provided with  
8 information about measures to prevent the spread of CA-MRSA (HPSC link to be added).

9  
10 Lower-risk contact groups, e.g. those attending the same day-care centre, members of the same  
11 contact sports team, e.g. football and those sharing the same items of personal hygiene, e.g.  
12 towel, should be identified and provided with information. Screening and decolonisation is not  
13 routinely recommended for lower-risk contacts unless transmission is identified i.e. at least one  
14 other case is identified in that group of contacts. Managers / key personnel from the group  
15 should be informed when a CA-MRSA carrier is identified in the group, maintaining  
16 confidentiality of the person's details, and be provided with information to prevent spread for  
17 dissemination to members. Enquiries should be made about any other cases of SSTIs that may  
18 have been noted. The group should be instructed to report any further infections arising to the  
19 local public health doctor. If there is suspicion of spread of CA-MRSA infections in a group, the  
20 public health specialist will assess potential risk, and the practicalities of screening and  
21 decolonisation, to determine action.

- 22
- 23 • **All** persons should be excluded from participation in group activities if they have infected  
24 wounds that are draining and cannot be adequately covered or contained.

- 1 • **All** wounds, cuts and abrasions on **all** persons should be covered with an impermeable  
2 dressing.
- 3 • Good hygiene and frequent hand washing should be promoted.
- 4 • Sharing of personal items should be discouraged e.g. towels, lotions, uniforms, clothing
- 5 • Commonly used surfaces, items and equipment should be cleaned regularly with detergent  
6 and water.

7

### 8 **2.5.7 Follow-up after decolonization of CA-MRSA**

9

#### 10 **Recommendations**

- 11 • Patients with CA-MRSA infection should be instructed to seek medical assessment if  
12 infections recur.
- 13 • Screening after decolonisation is not recommended unless:
  - 14 1. The case is at high-risk from infections, e.g. on cancer chemotherapy
  - 15 2. Infections are recurring in cases or close contacts following decolonisation
  - 16 3. The case is a risk to others e.g. healthcare worker, household contact of a  
17 healthcare worker, or a carer of high-risk people.
- 18 • The decolonisation regimen should be repeated if decolonization fails after the first  
19 course of treatment and after assessing the patient and rectifying any obvious reasons for  
20 decolonisation failure, e.g. underlying skin condition.

21

22 Decolonisation should not be commenced in patients with active exfoliative skin conditions,  
23 such as psoriasis, as it is likely to fail and the skin treatments may exacerbate their condition. The  
24 underlying condition should be treated first in consultation with a dermatologist. In the case of  
25 failure following a second course of treatment, the advice of a microbiologist, infectious diseases  
26 physician and dermatologist (as indicated) should be sought.

27

28 Pets colonised with MRSA have been implicated in ongoing household transmission (16-19).  
29 Treatment of pets is not indicated and colonisation tends to be short-term. Therefore,

1 investigations and interventions with pets should occur only in exceptional circumstances where  
2 the household is at risk and following reinforcement of hygiene measures. Consultation with a  
3 veterinarian, in addition to a clinical microbiologist/ infectious disease physician and public  
4 health specialist, is recommended.

5 Please refer to the HPSC website for information leaflets on CA-MRSA including;

- 6
- 7 • Information for people and their close contacts, who have been informed they have CA-
  - 8 MRSA.
  - 9 • Information for groups when there is a case of CA-MRSA e.g. sports teams, day care etc
  - 10 • Infection prevention and control of CA-MRSA in primary care settings – reducing the
  - 11 risk of transmission
  - 12 • Information for day-care centres and schools
- 13

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## 1 **2.6. Eradication of MRSA Carriage (Decolonisation)**

2

### 3 **2.6.1 Justification for decolonisation**

#### 4 **Recommendations**

5 • MRSA decolonisation is not sufficiently effective to warrant routine use in all colonised  
6 patients **Grade A**

7 • Excessive use of mupirocin, should be avoided as this will select for resistance  
8 **Grade B**

9 • Decolonisation may be considered in certain cases but the likely success or impact of  
10 such therapy should be risk assessed to evaluate the aim, the optimal agents and whether it  
11 is likely to be successful **Grade C**

12 • An attempt at decolonisation may be considered in the following groups:

13 1. Patients colonised with MRSA who are due to undergo an elective operative  
14 procedure especially high risk surgery e.g. cardiothoracic surgery, orthopaedic  
15 implant

16 2. Patients in a clinical area where there is a high risk of colonisation leading to invasive  
17 infection, e.g. the ICU/NNU

18 3. If the risk of infection is high and the consequences severe e.g. immunosuppressed  
19 patients

20 4. As part of a strategy to address uncontrolled transmission despite the use of other  
21 measures

22 **Grade C**

23 • In patients with colonisation at non-nasal sites there is a high possibility that  
24 decolonisation therapy will fail. Therefore decolonisation in such populations should be

1 carefully considered and the aim and likely outcome taken into account before such  
2 therapy is initiated. **Grade C**

- 3 • Attempts at decolonisation are unlikely to be successful in patients with chronic skin  
4 conditions, ulcers, indwelling urinary catheters and therefore use in such populations  
5 should be carefully considered and the aim and likely outcome taken into account before  
6 such therapy is initiated. **Grade C**

7

## 8 **Rationale**

9 Decolonisation of MRSA refers to the use of either topical and or systemic agents for the purpose  
10 of eradicating carriage. Such a strategy may be used in an attempt to prevent the spread of the  
11 organism or to reduce the risk of infection in the individual patient carrying MRSA.  
12 Decolonization is also used in patients colonized with meticillin-susceptible *Staphylococcus*  
13 *aureus* (MSSA). However, the aim in such cases is to reduce the risk of infection in the  
14 colonized patient.

15 A Cochrane systematic review in 2003 concluded that there was insufficient evidence to support  
16 use of topical or systemic antimicrobial therapy for eradicating nasal or extra-nasal MRSA (1).  
17 There was no demonstrated superiority of either topical or systemic therapy, or of combinations  
18 of these agents and they also concluded that antimicrobial resistance can result from therapy.

19 However, a Cochrane review in 2008 suggested a benefit to the screening and decolonisation of  
20 patients at high risk of MSSA infection e.g. cardiac surgery, implant surgery (2). A subgroup  
21 analysis showed a pronounced effect for surgical patients and patients undergoing dialysis,  
22 confirming previous findings in relation to dialysis patients. In a recent Dutch study a significant  
23 reduction in *S. aureus* hospital acquired surgical site infection was found by the use of rapid  
24 screening and decolonization of *S. aureus* carriers on admission (3). The rate of *S. aureus*  
25 infection was 3.4% (17 of 504 patients) in the mupirocin-chlorhexidine group compared with  
26 7.7% (32 of 413 patients) in the placebo group. The effect was most pronounced for deep  
27 surgical-site infections. The length of hospital stay was also shortened. Although showing

1 benefits for patients with MSSA, and not MRSA due to the relative absence of MRSA in that  
2 country, it is plausible that the same result would have occurred had MRSA been endemic.

3 Factors that appear to affect the efficacy of available strategies include; whether MRSA is  
4 endemic in the institution, the presence of mupirocin resistance, the number of patient sites  
5 colonised with MRSA, in particular throat colonization, the presence of wounds, extensive skin  
6 lesions, whether the gastrointestinal tract is colonised and the presence of foreign bodies such as  
7 urinary catheters, percutaneous gastrostomy (PEG) tubes, haemodialysis lines, etc. In such cases  
8 the risk of failure is higher.

9 A number of studies have shown that short term decolonization can be achieved and that this can  
10 be beneficial. An observational study of mupirocin and chlorhexidine baths in an intensive care  
11 unit by Sandri *et al* found a significant reduction in the incidence of MRSA nosocomial infection  
12 (4). Ridenour also found that an intervention utilizing nasal mupirocin and chlorhexidine baths  
13 lead to a significant 52% decrease in colonization/infection; all MRSA isolates remained  
14 susceptible to chlorhexidine and the overall rate of mupirocin resistance was low, i.e. 4.4% (5).

15 Other studies found that the use of mupirocin did not affect the risk of infection though there was  
16 a trend towards delayed infection in the treated patients (6).

17 The possible role of decolonisation in the reduction of MRSA rates in the UK has recently been  
18 reviewed (7). The author concludes that the evidence is incomplete but it is possible that the  
19 widespread use of decolonization has contributed to the significant reductions in MRSA  
20 bloodstream infection observed there in recent years. However, in high risk groups e.g.  
21 haemodialysis, although decolonisation may be effective in the short term, there are data to  
22 demonstrate that the risk of recolonisation is high (8).

23 Apart from the role of decolonization in the endemic setting such as in most acute Irish hospitals,  
24 decolonization has also been used as an adjunct to other control measures during outbreaks of  
25 MRSA. Khan *et al* reported complete cessation of transmission in a medical surgical intensive  
26 care unit after the initiation of decolonization therapy for all colonized patients (9).

27 Although questions regarding MRSA decolonization still exist, it is now generally accepted that  
28 the treatment of proven carriers reduces the risk of infection in patients undergoing surgical

1 procedures and in other high risk groups. Most experts agree that MRSA decolonisation is not  
2 sufficiently effective to warrant routine use in all colonised patients and that excessive use of nasal  
3 decolonisation agents should be avoided as this will select for resistance (10-12). There is also a  
4 consensus that more studies are needed both in terms of the benefit to the patient from MRSA  
5 decolonization and also the role that decolonizing therapy might play in the control of MRSA  
6 transmission and outbreak control measures within institutions (13).

7

## 8 **2.6.2 Decolonisation protocols**

9

### 10 **Recommendations**

- 11 • The following decolonisation protocol is recommended:

12 **A.** Apply a small amount of 2% mupirocin in paraffin base (with cotton swab or gloved tip  
13 of little finger) to the inner surface of each nostril (anterior nares) three times daily for  
14 five days. Apply enough to cover the inner surface.

15 **B.** Pinch the distal end of nose gently after application, the patient should be able to taste  
16 mupirocin at the back of the throat a minute or so later. Other agents that may be  
17 considered include naseptin (0.5% neomycin + 0.1% chlorhexidine), chlorhexidine  
18 cream, bacitracin, or povidone iodine ointment although data on their use is lacking and  
19 suggest that they are less effective than mupirocin.

20 **C.** Patients should bathe daily for five days with an antiseptic detergent, if the patient's skin  
21 condition allows. Agents such as 4% chlorhexidine, 7.5% povidone-iodine, 2% triclosan  
22 or octenidine dihydrochloride (0.1%) can be used. There are also data demonstrating  
23 the effectiveness of tea tree oil for skin carriage.

24 **D.** Antiseptic detergents should be used as per manufacturer's instruction with appropriate  
25 contact times. The skin should be moistened and the antiseptic-detergent applied  
26 thoroughly to all areas before rinsing in the bath or shower. Do NOT dilute in bath  
27 water as the concentration is insufficient. A disposable sponge or flannel should be used

1 to apply the antiseptic solution. Special attention should be paid to sites such as the  
2 axillae, groin, perineum and buttock areas and other skin folds. The antiseptic detergent  
3 should also be used for all other washing procedures and for bed bathing.

4 **D.** Daily application of 1% chlorhexidine powder to axillae and groins following body  
5 washing may be considered.

6 **E.** Hair should be washed twice weekly with an antiseptic detergent.

7 **F.** The value of local treatment for throat carriage such as antiseptic gargles or sprays is  
8 uncertain.

9 **G.** During a course of treatment, clean clothing, bedding, towels and flannel should be  
10 provided, in addition to regular changes of clothing, bed linen etc.

11 **Grade C**

- 12 • Combined topical and oral antimicrobial therapy may be considered, under the  
13 supervision of a clinical microbiologist or an infectious disease physician, for the  
14 eradication of MRSA in certain patient groups e.g. extranasal sites of colonization and  
15 about to undergo high risk surgery. **Grade C**

- 16 • If eradication of throat carriage is required, rifampicin and fusidic acid, or trimethoprim  
17 combined with either rifampicin or fusidic acid, according to susceptibility results, may  
18 be given for 5 to 7 days. The potential for drug interactions and drug toxicity should be  
19 considered. Liver function tests should be monitored.

20 **Grade C**

21  
22 **Rationale**

23 In the case of the decolonisation regimen, the optimal regimen remains unclear and the length of  
24 treatment has varied from 5 to 14 days and the agents used have also varied. In 2009, Ammerlaan  
25 *et al* undertook and published a systematic review to determine the effectiveness of different  
26 approaches for eradicating methicillin-resistant *Staphylococcus aureus* carriage (14). Twenty-  
27 three clinical trials were selected. Seven evaluated oral antibiotics, 12 trials evaluated topically  
28 applied antibiotics and four trials both. Subgroup analysis of studies with similar study

1 populations was performed because of the clinical heterogeneity of the trials selected. They  
2 found that short-term nasal application of mupirocin was the most effective treatment for  
3 eradicating methicillin-resistant *S. aureus* carriage, with an estimated success of rate of 90% one  
4 week after treatment and approximately 60% after a longer follow-up period. The development  
5 of drug resistance during treatment was reported in 1% and 9% of patients receiving mupirocin  
6 and oral antibiotics, respectively.

7  
8 In terms of topical agents mupirocin is well established as the most effective topical agent for the  
9 removal of staphylococci from the anterior nares (15-17). Data have shown that initial clearance  
10 following mupirocin use is high but recolonization after three months is also high. There are now  
11 data available on a number of other agents including povidone-iodine cream, tea tree oil, and  
12 extract of green tea but further studies are needed to determine the potential of these products.  
13 Topical 4% chlorhexidine bodywash/ shampoo or 7.5% povidone iodine are equally efficacious  
14 for decolonisation of non-nasal sites. A review of the use of octenidine hydrochloride, an  
15 alternative, was also recently published (18).

16  
17 Resistance has been associated with the increased use of mupirocin and high level mupirocin  
18 resistance has been associated with decolonization failure (19). The clinical significance of low  
19 level resistance remains unclear. A recent review has recommended that laboratories should  
20 ensure that appropriate methods are in place to detect such resistance and to monitor the impact  
21 of mupirocin use (20,21).

22  
23 Full body decolonization is recommended, irrespective of which site or sites are positive, to  
24 maximize prevention and control measures. Eradication of carriage of MRSA, from sites other  
25 than the nose, is associated with a higher failure rate (22,23). In patients with MRSA in non-  
26 nasal sites, e.g. wounds, higher success rates have been achieved when topical decolonisation is  
27 either accompanied by or followed by the use of a systemic agent. Although such a strategy can  
28 be useful if appropriately used e.g. if one is trying to achieve short term decolonisation for a  
29 procedure or during hospitalisation, the risks of resistance and adverse events need to be  
30 considered.

31

1 Chlorhexidine is now being used in many centres for an increasing number of indications  
2 including MRSA decolonization, universal patient bathing in ICU, oropharyngeal antiseptics in  
3 ventilated patients and as part of the routine care of vascular catheter sites. Chlorhexidine  
4 resistant MRSA strains have been described but the significance and the likely clinical impact is  
5 poorly understood (24). The use of chlorhexidine baths in ICU may be a reasonable alternative to  
6 the use of mupirocin or systemic agents given the adverse events associated with their use.

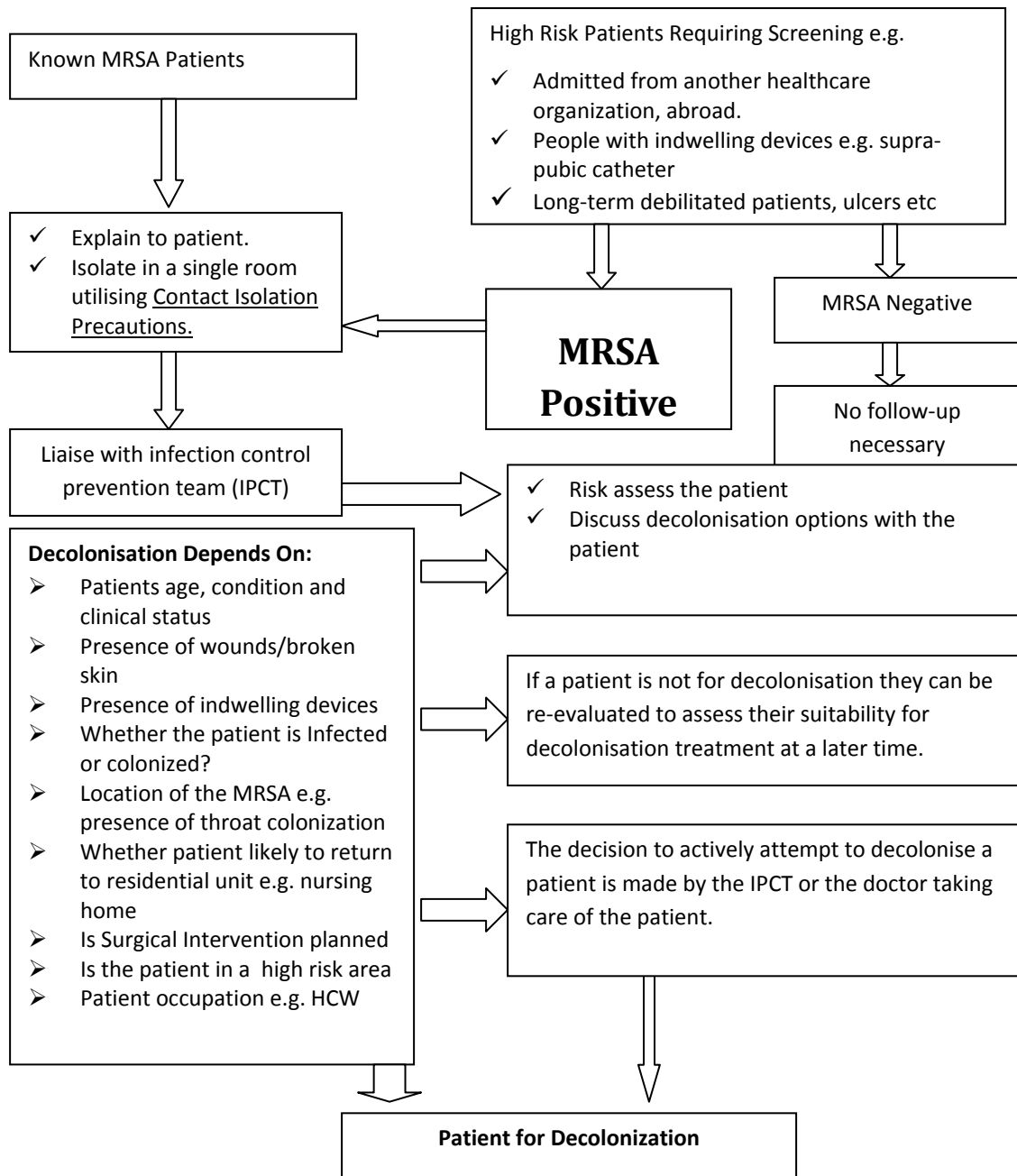
7 It is generally agreed that prolonged repeated i.e. two or more courses, decolonisation regimens  
8 are not likely to be effective and may lead to the development of resistance to some topical  
9 disinfectants, antiseptics and antibiotics, or may result in side effects for the patient. If further  
10 decolonization is required, please discuss with your local infection prevention and control team.

11 Please refer to the Figure 1 for an approach to the decolonisation of meticillin resistant  
12 *Staphylococcus aureus*.

13

14

## Flow Chart for the decolonisation of MRSA\*



\*Original source, Bons Secours Hospital, Cork

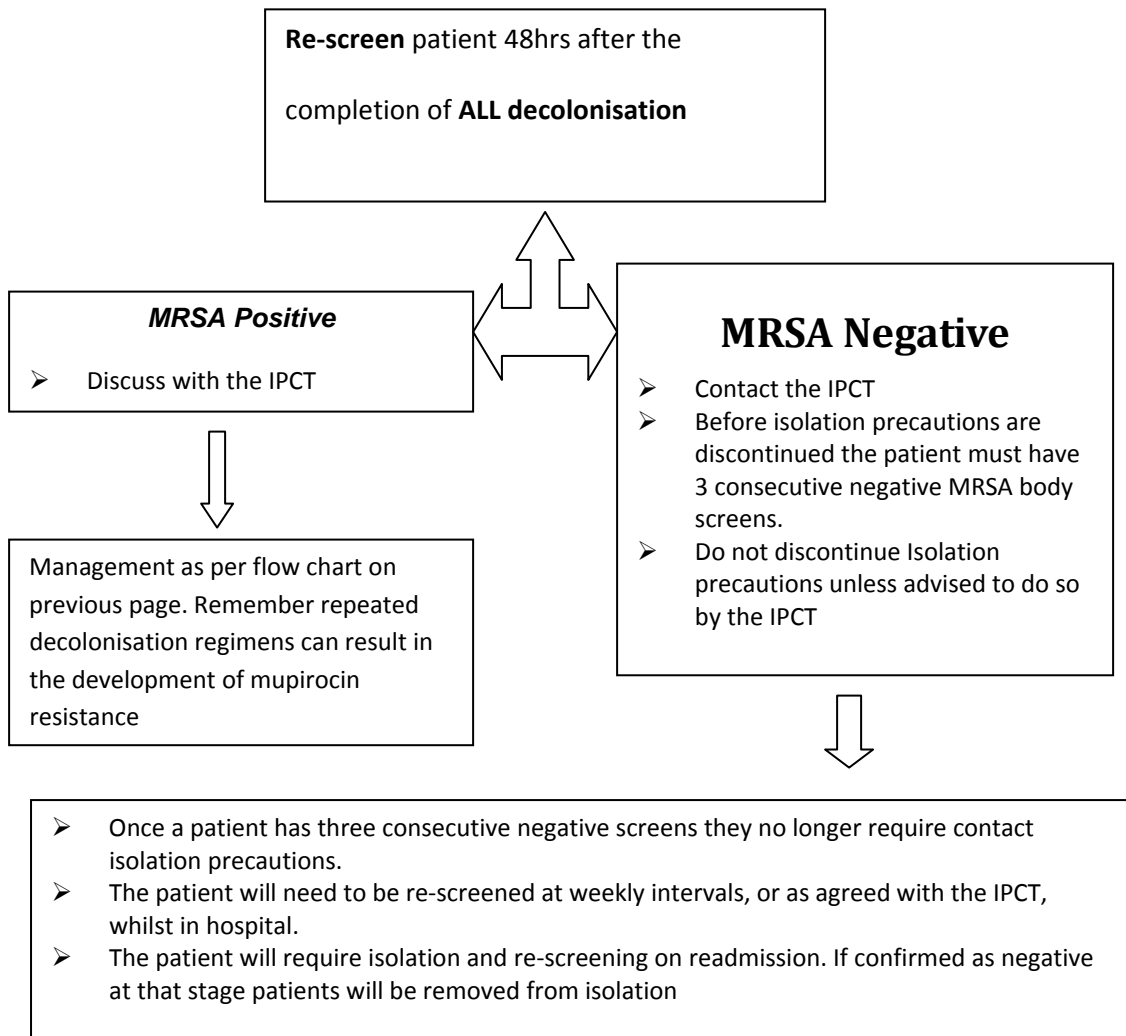
Topical decolonisation:

- Apply mupirocin 2% (Bactroban®) nasal ointment to both nostrils TDS for 5 days
- Wash with chlorhexidine gluconate 4% (Hydrex®) daily for 5 days, washing the hair with this solution on day 2 and day 5.
- Depending on the location of colonisation chlorhexidine powder may be recommended to be applied to the skin after washing e.g. axilla or groin area.
- Consider a mouth wash if throat colonisation
- All agents **MUST** be discontinued after the recommended period. Failure to do so can lead to excoriation of the skin, continued colonisation in excoriated areas and resistance.
- If decolonization causes adverse reactions then it should be discontinued immediately and discussed with the IPCT.

**Systemic agents: May be PO or IV**

- Treatment may be prescribed by the consultant in charge of the patient or on the advice of a consultant microbiologist or infectious disease physician and will be guided by the antibiotic susceptibility pattern.

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- 16

## 17    **2.7 Role of antimicrobial stewardship in the prevention and control of MRSA**

18

### 19    **Recommendations**

- 20       • Unnecessary or prolonged antibiotic use, particularly of broad-spectrum agents, should be  
21           avoided **Grade A**
- 22       • Healthcare institutions should implement the recommendations included in the SARI  
23           Guidelines for Antimicrobial Stewardship in Hospitals in Ireland issued in 2009 **Grade B**
- 24       • Healthcare institutions should implement the Centre for Disease Control and Prevention  
25           HICPAC recommendations on the prudent use of glycopeptide antibiotics **Grade B**
- 26

## 1 **Rationale**

2 Antibiotic use promotes the spread of existing strains of MRSA through reduction in colonisation  
3 resistance in individual patients and by negative ecological effects on MRSA acquisition,  
4 persistence and transmission, giving such resistant strains a survival advantage in the hospital  
5 environment (1,2).

6 MRSA prevalence in hospitals has been linked to overall levels of antibiotic consumption and to  
7 consumption of specific antibiotic classes, most notably fluoroquinolones, cephalosporins,  
8 amoxicillin/clavulanate and macrolides (3-6). A recent systematic review and meta-analysis  
9 found that antibiotic exposure in individual patients was associated with a 1.8-fold increase in the  
10 risk of subsequent acquisition of MRSA, and that the relative risk was higher for specific  
11 antibiotic classes, i.e. fluoroquinolones 3; glycopeptides 2.9; cephalosporins 2.2; and other beta-  
12 lactams 1.9 (7). Antibiotic exposure has been identified as a risk factor for carriage of  
13 community-acquired CA-MRSA strains (8).

14 Antibiotic stewardship programmes have consistently demonstrated a reduction in MRSA  
15 colonisation and infection rates, usually after reduction in beta-lactam and/or quinolone use (2,9).  
16 More emphasis needs to be put on antibiotic stewardship to control MRSA (9). Please refer to  
17 the 2009 SARI antibiotic stewardship guidelines for further details [http://www.hpsc.ie/hpsc/A-](http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/StrategyforthecontrolofAntimicrobialResistanceinIrelandSARI/KeyDocuments/File,4116,en.pdf)  
18 [Z/MicrobiologyAntimicrobialResistance/StrategyforthecontrolofAntimicrobial](http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/StrategyforthecontrolofAntimicrobialResistanceinIrelandSARI/KeyDocuments/File,4116,en.pdf)  
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20 Colonisation or infection with glycopeptide-intermediate and glycopeptide-resistant  
21 *Staphylococcus aureus* (GISA and GRSA) is strongly associated with prolonged exposure to  
22 glycopeptides and prior colonisation or infection with MRSA. Promotion of prudent  
23 glycopeptide use has been shown to reduce the prevalence of vancomycin-resistant enterococci  
24 (VRE) in intensive care units and it follows that prudent glycopeptide use should also be  
25 promoted to prevent glycopeptide resistance in staphylococci. See also section 2.11.

26

27

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31

## 1 **2.8 Management of MRSA including treatment and prophylaxis**

2 Please note in the section below the guidelines refer to the hospital management, including  
3 antibiotic treatment of HA- and CA-MRSA (please also refer to Section 2.5) and that no  
4 evaluation or assessment has been made of the pharmacoeconomic implications of the  
5 recommendations which are outside the scope of these guidelines. In the case of complicated  
6 infections or of infections that fail to resolve with first line agents expert advice from clinical  
7 microbiology, infectious diseases and antimicrobial pharmacists should be obtained. Prescribers  
8 should also be aware that:

- 9 • All doses are for adults with normal renal function; modifications may need to be made for  
10 patients with impaired renal and hepatic function
- 11 • It is recommended to check the British National Formulary for Children for paediatric doses.

### 13 **2.8.1 Initial approach before treatment**

#### 15 **Recommendations**

- 16 • Healthcare associated MRSA (HA-MRSA) infection should be considered in any patient  
17 exhibiting signs and symptoms of infection and who is known to have been previously  
18 infected or colonised with MRSA or have risk factors for same **Grade A**
- 19 • In patients with MRSA bloodstream infection, a thorough examination and appropriate  
20 investigations should be carried out to identify the underlying source of infection.  
21 **Grade C**
- 22 • Serious consideration should be given to the removal where feasible of *in-situ*  
23 devices/prosthetic material such as intravascular catheters, infected pacemakers, shunts,  
24 prosthetic joints and valves **Grade C**



1 MRSA is difficult to eradicate with prosthetic devices in place and their retention may also  
2 encourage the selection of more resistant strains. If the focus is not removed or is irremovable,  
3 the chances of successful antimicrobial therapy are small. Surgical debridement may be required  
4 in some soft tissue infections (5).

5  
6

## 7 **2.8.2 Choice of antimicrobial agents**

8

### 9 **Recommendations**

- 10 • For patients with suspected serious/life-threatening MRSA infection, timely empiric  
11 intravenous therapy with a glycopeptide is the recommended treatment as it is safer to  
12 commence treatment with an antibiotic with activity against MRSA, with subsequent step-  
13 down to a beta-lactam, unless the proportion of hospital acquired and community acquired  
14 MRSA infection is low as established by local surveillance. **Grade C**
- 15 • Intravenous therapy is required in the initial management of patients with bloodstream  
16 infection and in patients with serious MRSA infection requiring hospitalisation **Grade A**
- 17 • Vancomycin trough concentration should be monitored and advice sought as required  
18 regarding dosing modification. Adequate doses of glycopeptides and other agents must be  
19 used when treating MRSA infections **Grade D**
- 20 • Teicoplanin, instead of vancomycin, may be considered in patients with significant renal  
21 impairment or in those at high risk of deterioration in renal function. Specialist advice  
22 should be sought regarding the indications for teicoplanin therapeutic drug monitoring.  
23 **Grade A**
- 24 When managing deep-seated infections with teicoplanin, therapeutic dose monitoring is  
25 recommended. Teicoplanin may also be used in the outpatient setting due to the long half-life  
26 which enables extended dosing intervals. **Grade D**
- 27 • For severe SSTIs, when patients are initially treated with IV antibiotics effective against  
28 MRSA, it may be possible to step down to oral treatment with doxycycline, clindamycin,

1 linezolid or co-trimoxazole, after an initial clinical response, based on results of susceptibility  
 2 tests, following discussion with a consultant microbiologist or infectious diseases physician.

3 **Grade D**

4 • Topical therapy for superficial MRSA infections should not be used without advice from a  
 5 consultant microbiologist or infectious diseases physician **Grade D**

6 • The use of antibiotics associated with MRSA selection or resistance should be avoided or  
 7 minimised as much as possible. These include cephalosporins, macrolides and  
 8 fluoroquinolones. **Grade A**

9

10 **Rationale**

11 There are few clinical trials to determine the optimal antimicrobial therapy for MRSA infections,  
 12 and even fewer specifically for CA-MRSA. In many studies, vancomycin is the “gold standard”  
 13 against which other agents are compared. Alternative agents should be considered if a  
 14 glycopeptide is not suitable e.g. due to adverse reactions, or if the infection is due to an organism  
 15 with reduced susceptibility to vancomycin (4-7). Delays in the administration of appropriate  
 16 therapy are associated with poorer outcomes (8).

17 Co-trimoxazole is not licensed for staphylococcal infections, but it has become an important  
 18 option as 95 to 100% of CA-MRSA strains are susceptible (3). Advice recommending restricted  
 19 use pre-dates the emergence of CA-MRSA (9). Table 1 summarises treatment recommendations  
 20 for MRSA infection in adults in hospital.

21

22 **Table 1: Treatment recommendations for MRSA infections in adults**

- 23 • If the patient is being treated empirically they may also require antibiotic therapy for  
 24 other potential causes of infection such as Gram negative bacteria, anaerobes, fungi etc

<b>Indication</b>	<b>First line agent</b>	<b>Alternative</b>	<b>Comments</b>
<b>Non-severe</b>	Doxycycline or	Clindamycin:	Consider linezolid

<b>MRSA SSTI (Boils and furuncles may only require drainage)</b>	co-trimoxazole	check susceptibility and test for inducible resistance	(expert advice required)
<b>Severe or complicated MRSA SSTIs</b>	Glycopeptide	Linezolid (expert advice required) or daptomycin	Clindamycin IV/PO
<b>SSTIs with toxic shock, necrotising fasciitis, purpura fulminans or suspected PVL positive isolate IV line related infection</b>	Linezolid plus clindamycin +/- rifampicin		Consider IVIG Rifampicin reduces serum levels of linezolid
	Glycopeptide	Daptomycin	The IV line should be removed if possible.  Review empiric treatment at 48 hours once susceptibility data available.
<b>HA-MRSA pneumonia</b>	Glycopeptide	Linezolid – on expert advice	
<b>CA-MRSA necrotising pneumonia</b>	Linezolid plus clindamycin +/- rifampicin		Consider IVIG
<b>Bronchiectasis</b>	Linezolid		Unresolved but BSAC suggests linezolid offers better lung penetration
<b>Bloodstream infection</b>	Glycopeptide	Daptomycin	For persistent bloodstream infection or vancomycin treatment failure consider high dose

			daptomycin (10mg/kg once daily) if susceptible PLUS either low dose gentamicin OR rifampicin OR linezolid OR a beta-lactam.
			If reduced susceptibility to vancomycin and daptomycin consider linezolid, co-trimoxazole as single agent therapy or in combination with other antibiotics.
			Expert advice required
<b>Endocarditis, native valve</b>	Vancomycin	Daptomycin	
<b>Endocarditis, prosthetic valve</b>	Vancomycin plus rifampicin plus low dose gentamicin		
<b>Severe sepsis with toxic shock</b>	Glycopeptide plus clindamycin +/- rifampicin	Linezolid plus clindamycin +/- rifampicin	Consider IVIG
<b>Osteomyelitis and septic arthritis</b>	Glycopeptide +/- rifampicin or sodium fusidate.  Add rifampicin after clearance of bloodstream infection	Linezolid (limit to 4 weeks) +/- rifampicin.	Other options include daptomycin or clindamycin (check susceptibility/inducible resistance) +/- rifampicin.  Consider a combination of rifampicin PLUS sodium fusidate OR co-

trimoxazole

Expert advice required

<b>Prosthetic joint/spinal infection</b>	See IDSA guidelines (3)	
<b>CNS Infection</b>	See IDSA guidelines (3)	
<b>Simple MRSA UTI</b>	Doxycycline, nitrofurantoin or trimethoprim if susceptible	Co-trimoxazole
<b>Complicated MRSA UTI</b>	Glycopeptide	Daptomycin

---

1

2 IVIG – intravenous immunoglobulin; BSAC – British Society for Antimicrobial

3 Chemotherapy

4 Further guidance on treatment can be obtained from other sources (3,5-7,10-14)

5

### 6 **2.8.3 The role of glycopeptides**

#### 7 **Recommendations**

- 8 • An initial vancomycin dose of 15mg/kg (based on actual body weight), not to exceed 2g,  
9 every 12 hours is recommended for patients with normal renal function. A loading dose  
10 of 25mg/kg (based on actual body weight), should be considered for seriously ill patients.  
11 It is essential that patients are given in dose appropriate to their weight and not just 1gm  
12 12 hourly when using vancomycin.

13 **Grade D**

- 14 • Subsequent dose adjustment should be based on trough serum vancomycin concentrations  
15 in order to achieve effective targeted therapeutic concentrations of vancomycin.

**Grade C**

- 1
- 2 • Trough levels should always be maintained above 10mg/L to avoid the development of
- 3 resistance **Grade D**

- 4 • Trough serum vancomycin concentrations of 15 to 20mg/L are recommended to ensure
- 5 improved clinical outcomes for serious infections, such as bloodstream infection,
- 6 endocarditis, osteomyelitis, meningitis, pneumonia and severe SSTI caused by MRSA

**Grade C**

- 7
- 8 • Check the first trough serum vancomycin level before the fourth dose, then once weekly
- 9 in hemodynamically stable patients. More frequent monitoring is advisable in patients
- 10 with serious infection, morbid obesity, renal dysfunction, who are haemodynamically
- 11 unstable, or on concomitant nephrotoxins serum creatinine should also be monitored.

**Grade D**

- 12
- 13 • The patient's clinical and microbiological response (including the vancomycin MIC) will
- 14 guide the continued use of vancomycin and expert advice should be sought in any patient
- 15 not responding to treatment. **Grade D**

- 16 • Vancomycin or teicoplanin are equally effective. It is unclear whether the lower adverse
- 17 event rate associated with teicoplanin, including nephrotoxicity, should influence the
- 18 choice of glycopeptide **Grade A**

- 19 • An initial teicoplanin dose of 10mg/kg every 12 hours for three doses, then 10mg/kg once
- 20 daily is recommended for severe infections. The recommended target trough level is
- 21 greater than 10 mg/L for the majority of severe infections and greater than 20mg/L for
- 22 endocarditis and bone or prosthetic infection. Therapeutic monitoring is recommended for
- 23 deep seated infections **Grade C**

24

25

1

## 2 **Rationale**

3 A glycopeptide is currently the treatment of choice for severe invasive MRSA infections and  
4 vancomycin remains the most commonly used glycopeptide. There is ongoing debate about the  
5 place of vancomycin in the management of serious MRSA infections (15, 16). The shortcomings  
6 of vancomycin include poor tissue and intracellular penetration, lack of activity against  
7 organisms growing in biofilm, slow bactericidal effect, lack of interference with toxin  
8 production, and poor activity against some *S. aureus* isolates, including heteroresistant and VISA  
9 strains (17). Therapeutic drug monitoring is required when prescribing vancomycin to ensure  
10 effective concentrations and to minimise the occurrence of toxicity (18).

11 The emergence of vancomycin-intermediate and vancomycin-resistant *S. aureus* is of ongoing  
12 concern (19). Recently, a number of studies have established a relationship between vancomycin  
13 treatment failures and infections caused by MRSA isolates displaying an MIC of 2mg/L (20).  
14 Increased mortality occurred in patients infected with MRSA strains having an MIC of 1.5 or  
15 2mg/L compared with patients infected with low-MIC strains, despite achieving target trough  
16 vancomycin concentration of 15 to 20mg/L (21).

17 Guidelines on the therapeutic monitoring of vancomycin treatment for *S. aureus* infections in  
18 adults were published in 2009 by an expert panel of the Infectious Diseases Society of America,  
19 the American Society of Health-System Pharmacists, and the Society of Infectious Diseases  
20 Pharmacists, recommending larger vancomycin doses and higher trough serum concentrations of  
21 vancomycin to achieve a target AUC/MIC of 400. The potential benefit of increased dosage was  
22 felt to be worth the risk of mostly reversible adverse events, but they advise close monitoring of  
23 vancomycin levels (18).

24 Limited data suggest that there is a relationship between vancomycin exposure and  
25 nephrotoxicity and that the vancomycin trough level best indicates this (21,22). On the other  
26 hand, it has been suggested that the increased rates of nephrotoxicity observed with aggressive  
27 vancomycin dosing may be due to selection bias and confounding by other factors. Clinicians

1 unwilling to use vancomycin aggressively at higher doses in accordance with clinical practice  
2 guidelines should use an alternative agent (23).

3 Vancomycin-induced nephrotoxicity is defined as multiple (at least two or three consecutive)  
4 high serum creatinine concentrations, i.e. increase of 44 micromol/L or  $\geq 50\%$  increase from  
5 baseline, whichever is greater after several days of vancomycin therapy in the absence of an  
6 alternative explanation (20).

7 The appropriate dose of teicoplanin will depend on the clinical indication. Higher doses e.g.  
8 10mg/kg have been suggested for endocarditis, septic arthritis and osteomyelitis. Therapeutic  
9 monitoring is not necessary to avoid toxicity but can be helpful to ensure that dose regimens are  
10 optimised to achieve target trough concentrations (24-27).

11 Teicoplanin is significantly more expensive than vancomycin. A pharmacoeconomic analysis is  
12 needed to evaluate the overall cost benefit of using teicoplanin or vancomycin.

13

#### 14 **2.8.6 Duration of Therapy**

15

#### 16 **Recommendation**

17 The duration of therapy will depend on the type of infection and the clinical response, and should  
18 be discussed with a consultant microbiologist or infectious diseases physician

19

**Grade D**

#### 20 **Rationale**

21 There is a lack of good data on optimum duration of therapy. Short course therapy may be  
22 associated with relapse and seeding of distant foci particularly in cases of bloodstream infection  
23 and deep seated infection. However, unnecessarily long courses are associated with the  
24 development of resistance (5).

1 The duration of therapy should be individualised depending on the patient's clinical response (3).  
2 In general, primary uncomplicated MRSA bloodstream infection, i.e. no underlying focus, should  
3 be treated for at least two weeks and up to 4 to 6 weeks for complicated infection (3). Pneumonia  
4 should be treated for 7 to 21 days, depending on the extent of infection (3). Deep-seated  
5 infections with MRSA should be treated for longer (e.g. 3 to 12 weeks). In patients with a non-  
6 removable focus of infection long-term suppressive therapy with oral agents may be considered  
7 (3).

8  
9 Treatment duration for less severe infections such as SSTI and UTI should be guided by clinical  
10 response and infection markers such as the CRP. Non-severe SSTI will require five to ten days  
11 of treatment (3). A simple UTI can be treated for 5 to 7 days (3)

12

### 13 **2.8.7 Combination therapy**

14

#### 15 **Recommendations**

- 16 • The adjunctive use of rifampicin is not recommended for the treatment of SSTI

17 **Grade A**

- 18 • Despite recent guidelines produce by the IDSA (3) that recommend the use of single  
19 agent therapy for the treatment of bloodstream infection or native valve endocarditis,  
20 combination therapy may be deemed necessary in certain clinical situations. Expert  
21 advice should be sought be in these situations.

22 **Grade C**

- 23 • Combination therapy with high dose daptomycin (10mg/kg) and a second agent may be  
24 considered for persistent MRSA bloodstream infection and vancomycin treatment failure .  
25 Combination therapy may be considered when isolates have reduced susceptibility to both  
26 vancomycin and daptomycin

**Grade D**

27

## 1 **Rationale**

2 There is no evidence that the adjunctive use of rifampicin for SSTI provides benefit (3, 28).  
3 Studies of MRSA bloodstream and endocarditis have shown increased risk of nephrotoxicity  
4 with low dose gentamicin in combination with vancomycin (29) and a longer duration of  
5 bacteraemia with rifampicin in combination with vancomycin, compared to vancomycin  
6 monotherapy (30).

7 The use of a second antibiotic (e.g. gentamicin, rifampicin or sodium fusidate) is not  
8 recommended for the initial treatment of MRSA infection, in the absence of data to support use  
9 (31).

10 Rifampicin and sodium fusidate's favourable pharmacokinetics, with excellent penetration into  
11 bone and biofilm, support their use as adjunctive therapy in bone and joint infection (3,12).

12 Data is very limited on combination therapy in the setting of persistent MRSA bloodstream  
13 infection and reduced susceptibility to vancomycin and daptomycin.

14

## 15 **2.8.8 Surgical prophylaxis**

### 16 **Recommendations**

- 17 • A glycopeptide should be included as surgical prophylaxis in any patient undergoing  
18 implant surgery and who is known to be positive for MRSA or in any patient at high risk  
19 of MRSA where screening has not excluded MRSA **Grade B**  
20
- 21 • Patients undergoing non-implant surgery should be prescribed a glycopeptide as part of  
22 their prophylaxis regimen if they are confirmed as being MRSA positive. **Grade A**  
23
- 24
- 25 • For elective procedures, either implant or non-implant surgery, every effort should be  
26 made to screen at-risk patients to determine if they are MRSA positive or negative prior  
27 to surgery. **Grade C**



1 At present, two new antibiotics with activity against MRSA (ceftobiprole and iclaprim) are under  
2 consideration by the European Medicines Agency (EMA). A further four agents have  
3 completed phase III clinical trials (ceftaroline, dalbavancin, oritavancin and telavancin) (34).  
4 Dalbavancin has a very long half-life, allowing for weekly dosing, which may prove useful for  
5 out-patient treatment (35). These new agents are pharmacodynamically promising and effective  
6 in clinical trials. They may prove valuable as resistance to the currently available anti-MRSA  
7 drugs evolve.

8

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9  
10

## 11 **2.9 Occupational health aspects of MRSA**

### 12 **2.9.1 Role of occupational health (OH)**

#### 13 **Recommendations**

- 14 • Individual employees need to act responsibly with regard to their own health and seek  
15 advice from OH when appropriate **Grade C**
- 16 • Managers should refer their staff to OH when relevant issues of personal health or MRSA  
17 exposure arise **Grade C**
- 18 • OH staff providing services to the healthcare sector should be familiar with the  
19 multifaceted approach required to manage MRSA in their workplace setting and of the  
20 need for a risk assessment approach in understanding the complex interplay between  
21 staff, patients and the environment **Grade C**
- 22 • The appropriate elements of an OH strategy for managing MRSA are risk assessment,  
23 risk control, education and evaluation **Grade D**
- 24 • OH practice and guidance should be informed by the hierarchy of risk controls  
25 incorporating knowledge of standard precautions as an administrative control **Grade D**  
26  
27

## 1 **Rationale**

2 There is an expanding literature on the role of the healthcare worker (HCW) and MRSA (1).  
3 Many questions remain unanswered as there have been no controlled intervention studies  
4 specifically addressing the role of HCWs in MRSA transmission (1). For the purposes of this  
5 document the term health care worker is used to include any individual who has the potential to  
6 acquire or transmit an infectious agent during the course of his or her work in health care. This  
7 includes the three categories of employee identified by the Association of National Health  
8 Occupational Physicians (ANHOPS) in their guidelines on immunisation of healthcare workers  
9 (2), i.e. clinical, laboratory staff and non-clinical ancillary.

10 Both asymptomatic carriers of MRSA and those with symptoms of infection have been causally  
11 associated with outbreaks in the healthcare setting (1). The more recent threat of community-  
12 associated MRSA (CA-MRSA) which affects young healthy people without traditional risk  
13 factors has additional implications for HCWs. Furthermore, there have been several reports of  
14 HCWs acquiring MRSA infection from colonised patients (3).

15 Though this guideline deals with MRSA, it is worth noting that methicillin-susceptible  
16 *Staphylococcus aureus* (MSSA) has similar characteristics and mechanisms of spread. It was  
17 established some time ago that nasal carriers of *S. aureus* who have concurrent respiratory tract  
18 infection can disperse bacteria into the air causing outbreaks (4,5). Known *S. aureus* shedders  
19 can reduce the risk of spread to patients by wearing a surgical mask while symptomatic from  
20 URTI (4). There is no reason to believe that staff colonised and/or infected with MRSA should  
21 present a transmission risk that is any different to spread of MSSA.

22 The role of OH is to protect, promote and maintain employee health in a healthy work  
23 environment. In the context of infection prevention and control the objective is to reduce the  
24 transmission of infection to or from the HCW in accordance with best practice and in a legally  
25 compliant manner. The employer's legal responsibility is defined in relevant workplace health  
26 and safety legislation (6,7) and the Employment Equality Act (8). Close collaboration between  
27 OH and the Infection Prevention & Control Team (ICPT) is essential in achieving this objective

1 as responsibilities can overlap especially in the area of education; during an outbreak situation; or  
2 when the HCW has duties in a high risk clinical area.

3 Professionals in OH should be familiar with the principles of good infection control practice (9)  
4 as well as the relevant occupational safety concepts within the industrial hygiene hierarchy of  
5 risk controls (10). The four components necessary for an effective OH programme targeting  
6 MRSA are risk assessment, risk control, education and evaluation (11). Risk assessment  
7 includes assessing the risk of transmission to HCWs as well as considering the risk of  
8 transmission to patients from infected or colonised HCWs.

9 All HCWs need to be aware of their responsibility to report relevant health conditions to their  
10 occupational health provider both at the pre-employment health assessment (PEHA) stage and  
11 thereafter as conditions arise. All healthcare workers in managerial positions need to be aware of  
12 their responsibility to be alert to the possibility that staff with relevant health complaints may  
13 have MRSA infection and should refer them promptly for OH assessment. Furthermore, all  
14 health professionals (including OH professionals) who provide clinical care to HCWs as patients  
15 need to be aware of the particular implications of MRSA infection / colonisation in HCWs.  
16 Poor infection control practices have been implicated in both acquisition and transmission of  
17 MRSA (and MSSA) by healthcare staff. However, good adherence to infection control practice  
18 does not entirely prevent transmission from heavily colonised staff to patients, since staff may  
19 unwittingly shed MRSA into the air, and/or contaminate surfaces, both of which may act as  
20 reservoirs within the healthcare environment (12).

21

## 22 **2.9.2 Risk control**

### 23 **Recommendations**

- 24 • Good management is the key to effective implementation of an MRSA control  
25 programme in any health care setting

**Grade D**



1 infection or colonisation is suspected or confirmed and the implementation of fitness for work  
2 recommendations in individual cases. Administration should also ensure that external service  
3 providers also comply with the workplace OH programmes and that this is outlined in contractual  
4 agreements.

5 *Work practices* include the support of the IPCT's endeavours to reduce the transmission of  
6 infection as outlined in its policies. Open and clear communication with the HCW is essential to  
7 minimise unnecessary anxiety. The role of the OH team is paramount here. In addition,  
8 communication with line managers in a way which facilitates good management decisions while  
9 protecting healthcare worker confidentiality is essential. The concept of work adjustment (rather  
10 than seeking to impose sickness absence) is recommended in cases where continuing in the  
11 current role is considered to pose a risk to HCW or patient.

12 *Personal protective equipment (PPE)* is considered the final and least effective step in the  
13 hierarchy of risk controls as it requires user compliance to achieve its goal.

14 Should these controls fail, OH must assess the HCW exposed to MRSA following direct or  
15 indirect contact of skin or mucous membrane with colonised or infected body sites, wound  
16 exudates or respiratory secretions. OH should also, in collaboration with IPCT, undertake  
17 assessment of the source of HCW exposure in order to assess the potential for transmission.

18 The number of healthcare staff who have direct contact with patients colonised or infected with  
19 MRSA should be kept to a minimum. Staff with persistent exfoliative skin lesions should be  
20 excluded from the care of patients colonised or infected with MRSA (13).

21

### 22 **2.9.3 MRSA colonisation and infection in HCWs and the need for laboratory support**

#### 23 **Recommendations**

- 24 • When investigating the involvement of HCW in outbreaks, or when HCW themselves are  
25 colonised or infected, there should be ready access to appropriate laboratory facilities

26

**Grade B**



1 occupational disease (20). The latter is particularly pertinent for patients colonised and/or  
2 infected with community-associated MRSA, since HCW acquisition of these strains is more  
3 likely to be clinically significant.

4

#### 5 **2.9.4 Screening of HCW for MRSA**

##### 6 **2.9.4.1.**

#### 7 **Recommendations**

- 8 • The screening of staff on a routine basis is not indicated. Staff screening may be  
9 considered for institutions without endemic MRSA, or for specific high-risk units, as  
10 determined by the local IPCT. **Grade C**
- 11 • If new MRSA cases are found among patients on a ward, staff should be asked about skin  
12 lesions. Staff with such lesions and staff with other potential positive sites, e.g. ears, skin  
13 should be referred for screening and for consideration of treatment by the relevant  
14 occupational health department. Topical clearance will not eradicate MRSA in HCWs if  
15 there is an underlying focus of infection **Grade C**
- 16 • HCW screening should take place before a shift to avoid detecting and decolonising  
17 transient carriers **Grade B**
- 18 • A swab from the anterior nares and from any abnormal or broken skin is usually  
19 sufficient when initially screening HCW for MRSA. Full screening is necessary after an  
20 initial MRSA positive site **Grade B**
- 21 • A minimum of three screens at least 72 hours apart, while not undergoing decolonisation,  
22 should be performed before a previously positive HCW can be considered to be clear of  
23 MRSA. However, they may require further screening a few months later. **Grade B**

24

## 1 **Rationale**

2 Whilst both symptomatic and asymptomatic HCWs have been implicated in the transmission of  
3 MRSA in the healthcare setting, and decolonisation as part of a multi-faceted approach has  
4 contributed to successful termination of outbreaks, there is some debate about when HCW  
5 screening should be undertaken. A systematic review suggests that asymptomatic HCWs are  
6 only rarely the likely source in nosocomial outbreaks (1.6%) and recommends that a more  
7 effective approach in this context is to identify infected HCWs (21).

8 By contrast, another paper identified 44 studies with either proven or likely transmission to  
9 patients from HCWs who were not clinically infected with MRSA (1). They suggest that  
10 screening should not be restricted to outbreaks because there is a trend for higher colonisation  
11 rates in settings with endemic MRSA.

12 Screening of staff on a routine basis is not indicated. It may be considered for institutions  
13 without endemic MRSA, or for specific high-risk units, as determined by the local infection  
14 control team. Ironically, though colonisation rates tend to be higher where MRSA is endemic,  
15 the benefit of more regular HCW screening is greater where MRSA prevalence is lower. Thus, it  
16 may be expected that if prevalence rates go down, more widespread staff screening will be  
17 advocated.

18 Regardless of whether units have endemic MRSA, the identification of new patient carriers on a  
19 ward should prompt local IPCTs and managers to remind staff of their responsibility to report  
20 skin lesions or indeed, any other low-grade infections. Such staff should be referred for  
21 evaluation and screening to the OH department. Staff with persistent carriage at sites other than  
22 the nose (e.g. pharynx, perineum, ear and/or skin) should be referred for appropriate specialist  
23 management and follow-up screening (17).

24 Staff screening is indicated if transmission continues on a unit despite active control measures; if  
25 epidemiological aspects of an outbreak are unusual; if there is suspicion of persistent carriage of  
26 MRSA by staff; if one or more patients demonstrate severe infection; or if a particularly

1 pathogenic or resistant strain is found from either one or more patients and staff in a specific  
2 clinical area (16).

3 HCWs must be fully informed of the context in which screening is taking place and be reassured  
4 that regardless of the outcome, they are in no way at fault. The anterior nares are considered the  
5 most appropriate sampling site for initial staff screening along with swabbing of any areas of  
6 abnormal or broken skin (13,17). Screening of other body sites (e.g. throat, hairline, groin,  
7 perineum) should be considered in those found to be MRSA positive. The perineum contributes  
8 superior detection of MRSA than the groin but problems with obtaining perineal swabs in  
9 generally fit and mobile staff can be surmounted by asking the HCW to take the swab themselves  
10 in appropriate facilities.

11 It is recommended that a minimum of three screens at least 72 hours apart, while not receiving  
12 antimicrobial therapy, should be performed before a previously positive staff member can be  
13 considered to be clear of MRSA (17)

14

#### 15 **2.9.4.2 Pre-employment health (PEHA) screening**

##### 16 **Recommendations**

- 17 • Pre employment screening of healthcare staff is not routinely recommended. It may be  
18 considered where MRSA is not endemic or for specific units on the basis of local risk  
19 assessment **Grade C**
- 20 • Pre employment screening may be deemed necessary depending upon the location (unit;  
21 hospital; country) of prior workplace if relevant, if this location is recognized to have  
22 specific problems with high rates of MRSA, or unusually pathogenic or resistant strains  
23 of MRSA. (E.g. CA-MRSA; VISA, etc.)
- 24 • Healthcare worker risk factors identified at PEHA should be used by occupational health  
25 professionals to determine whether clinical HCWs deployed in certain high risk areas  
26 should be screened **Grade D**



1 **2.9.4.4 Screening, surveillance and decolonisation where MRSA is endemic**

2 **Recommendations**

- 3 • Those involved in decisions regarding the decolonisation of HCWs must understand its  
4 limitations and all decisions should be based on a comprehensive risk assessment

5 **Grade D**

- 6 • Clinicians (including GPs) involved in the treatment or decolonisation of healthcare  
7 workers should inform their local OH service to ensure that local protocols are adhered to  
8 and they should also seek advice on fitness for work **Grade D**

- 9 • The decolonisation protocol used for patients is also recommended for HCWs. However,  
10 particular care should be taken in prescribing any treatment which might compromise  
11 skin integrity. **Grade A**

- 12 • Specialist advice from a consultant microbiologist or infection disease physician should  
13 be sought for HCW with MRSA infection depending on the site of infection.

14 Decolonisation therapy will usually be required along with treatment

15 **Grade D**

16 **Rationale**

17 Screening of healthcare workers is not routinely recommended in settings where MRSA is  
18 endemic unless they have been epidemiologically linked to new cases.

19 Decolonisation of HCWs is complex and must be handled with great sensitivity by all concerned.  
20 Screening itself has limitations. It is far from being a perfect ‘diagnostic test’ and false negatives  
21 may occur. It is advised that those involved in making decisions to prescribe decolonisation  
22 therapy for HCWs familiarise themselves with Section 2.6. This emphasises the limitations of  
23 decolonisation which must also be borne in mind when treating colonised HCWs.

24 While it may be appropriate at times to decide against treating decolonising patients in certain  
25 settings it is virtually always the case that a colonised healthcare worker will be decolonised.  
26 Indeed, to do otherwise would undermine the effort of screening and question its legitimacy.

1 The decision to decolonise a HCW must be taken by a specialist occupational physician in  
2 consultation with a consultant microbiologist or infectious disease physician. The risk  
3 assessment on which treatment decisions are based should be recorded. This must consider the  
4 individual HCW (and their risk factors), their occupation / role and the patient care context.  
5 Awareness of HCW risk factors (both personal and occupational) may help to identify those at  
6 risk of failed decolonisation. Where HCWs are identified as being colonised (or infected) with  
7 MRSA by their general practitioner, they should notify their occupational health service to  
8 ensure that local decolonisation and treatment protocols are adhered to.

9 The decolonisation protocol for HCWs is identical to that used for patients although  
10 chlorhexidine bathing has not been well studied in the context of HCWs (see section 2.6).  
11 Healthcare workers who are infected with MRSA require particularly careful management and it  
12 is advised that specialist advice be sought (e.g. dermatological, ENT etc) depending on the  
13 infection site. Decolonisation therapy will usually be required along with treatment.

14

## 15 **2.9.5 Fitness for work**

### 16 **Recommendations**

- 17 • OH should exclude clinical HCWs and food handlers from work (having obtained  
18 appropriate cultures) if they have dermatitis, chronic skin condition, a draining lesion on  
19 hand(s), or other exposed site suspected to be caused by MRSA, until the infection has  
20 been ruled out or they have received adequate therapy and their infection has resolved.

21 **Grade C**

- 22 • OH should exclude clinical HCWs with MRSA if they are found to be epidemiologically  
23 linked to patient transmission until antibiotic treatment and medical assessments are  
24 complete and appropriate control measures and / or work restrictions have been agreed

25 **Grade C**



1 are clinically unwell or who have draining lesions should be certified unfit for work by their GP  
2 and be reviewed by the OH team prior to returning to clinical or food handling duties (19).  
3 Appropriate cultures and susceptibility sensitivity testing should inform treatment protocols (21).

4 Those with MRSA infections who are clinically well and able for work (e.g. skin infections,  
5 furuncles, otitis externa etc.) should be excluded from all clinical work and food handling until  
6 they have been fully treated. Their resumption of clinical and food handling duties should be  
7 dictated by the OH team who will liaise closely with the IPCT. Every effort should be made to  
8 keep them at work undertaking alternative duties (e.g. non clinical administrative duties) for the  
9 duration of their infectivity.

10 Decisions regarding fitness for work of HCWs colonised with MRSA are more challenging and  
11 can only be made following risk assessment by the OH team in consultation with the IPCT.  
12 Those with nasal carriage and normal skin are likely to decolonise easily while those with risk  
13 factors may take longer. Occasionally, a HCW may prove impossible to decolonise.

14 Unless staff identified as carrying MRSA work in high-risk wards, i.e. intensive care units,  
15 neonatal units, orthopaedic units, haematology units, solid organ or bone marrow transplant unit  
16 etc., they should not be excluded from work. Staff working in these areas should be excluded  
17 from work, or reassigned to a low-risk area, for 48 hours only from the start of decolonisation  
18 therapy (13). It may be prudent to delay their return to regular duties until the results of the first  
19 post treatment screening is available to obviate the need for further restrictions if the result does  
20 not confirm clearance.

21 While it is possible to provide general guidance on work restrictions in a range of scenarios of  
22 HCW / patient contact (Appendix IV)) this should not be interpreted as prescriptive. Decisions  
23 on complex cases require close collaboration between OH, microbiology and the IPCT, with the  
24 involvement of the individual HCW and responsible treating clinician, if there is one. The  
25 decisions and their rationale should be recorded carefully in the employee's OH file and  
26 reviewed as further information unfolds.

27

1 **2.9.6 Sick Pay Entitlements**

2 **Recommendation**

- 3 • Standard sick pay entitlements apply to those who are too ill to work, for the duration of  
4 the illness and incapacity **Grade D**
- 5 • It is desirable that those required to be absent from work on ‘infection control’ grounds be  
6 able to access payment without resorting to use of the sick pay scheme provided that  
7 alternative work (accommodation) is not available **Grade D**

8

9 **Rationale**

10 In general, HCWs who become colonised or infected with MRSA will not become clinically  
11 septic, and as such, may well present themselves for work. For those who are not ill, but who  
12 may pose a risk to others (i.e. patients) because of their MRSA colonisation or infection, there  
13 should normally be no need to invoke the sick pay scheme since every effort should be made to  
14 accommodate individuals in a non – clinical (or non food-handling) work area pending clearance  
15 of the organism. This approach encompasses the principles of employment equality legislation  
16 (8). In the unlikely event that this proves impossible, and where absence from work is imposed  
17 on ‘infection control’ grounds, the employee should not be penalised financially as this might  
18 make them less likely to report health conditions and submit to treatment in the future.

19 However, there is currently no facility within the HSE whereby an individual may be paid for  
20 ‘infection control’ leave through any mechanism other than by invoking the sick pay scheme. In  
21 practical terms, this is unlikely to affect most employees, and certainly not those who have made  
22 little or no use of their sick pay entitlements. For those who have already exhausted such  
23 entitlements, the management of absence imposed on ‘infection control’ grounds is likely to be  
24 challenging.

25

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5  
6

## 7 **2.10 Reference laboratory facilities**

### 8 **Recommendations**

9 The National MRSA Reference Laboratory (NMRSARL) currently provides the following  
10 services and these should continue:

11 • Communicating with users, e.g. referring laboratories, state agencies and the public, on the  
12 work of NMRSARL through annual reports scientific papers, symposia etc(1).

13 **Grade D**

14 • Assisting in the confirmation of *S. aureus* identification and methicillin resistance

15 **Grade D**

16 • Epidemiological typing of MRSA strains, especially those from the bloodstream,

17 • in order to monitor different types of MRSA circulating in Ireland, and for the

18 • investigation of outbreaks

19 • Investigating and confirming antimicrobial resistance among MRSA **Grade D**

20 • Detection of virulence factors of staphylococci, e.g. PVL **Grade D**

21 • Advising on the treatment of patients with MRSA infections **Grade D**

22 • Advising on infection prevention and control aspects **Grade D**

23 • Providing support on laboratory aspects of MRSA such as the use of selective

24 • media and other laboratory aspects of MRSA

25 • Providing education on aspects of MRSA **Grade D**

26 • Conducting research on aspects of MRSA with local, national and international partners

27 **Grade D**

- 1 • Collaborating with international colleagues (e.g. European Centre for Disease Control) in the  
2 study of the epidemiology, virulence and antimicrobial resistance of MRSA, especially  
3 within the EU **Grade D**
- 4 • Developing and providing typing methodologies consistent with international best practice  
5 within a European context **Grade D**
- 6 • Introducing further services for users including the typing of methicillin-susceptible *S. aureus*  
7 consistent with clinical need and within the resources provided **Grade D**
- 8 • Introduce further assays for the detection of virulence factors as these become relevant and  
9 readily available **Grade D**

10

## 11 **Rationale**

12 The NMRSARL was established in 2001 and is located at St. James's Hospital. The laboratory  
13 was established to provide a resource for hospitals and microbiology laboratories around the  
14 country in their efforts to investigate and control MRSA. It is now internationally accepted that  
15 there is a requirement for a resource to provide specialist laboratory support (2).

16

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23 [Strategy\\_ECDC\\_Cooperation\\_withLab.pdf](http://europa.eu/en/activities/microbiology/Microbiology%20Documents/0711_MIC_General))

24

## 1 **2.11 Reduced susceptibility to glycopeptides - hGISA, GISA and VRSA**

### 2 **2.11.1 Introduction**

3 Glycopeptide resistance among *Staphylococcus aureus* is an area of potential concern and  
4 complexity. Isolates with reduced susceptibility to glycopeptides may be categorised as follows:

#### 5 **1. Vancomycin resistant *S. aureus* (VRSA)**

6 These isolates exhibit vancomycin MICs that are >8 mg/L and resistance is usually  
7 mediated by the *vanA* gene from enterococci that codes for an altered binding site (1).

#### 8 **2. Vancomycin-intermediate or glycopeptide-intermediate resistant *Staphylococcus*** 9 ***aureus* (VISA or GISA)**

10 These isolates exhibit lower MICs, usually between 4 and 8 mg/L, and reduced  
11 susceptibility is probably caused by vancomycin binding or trapping in the cell wall (2).

#### 12 **3. Hetero-glycopeptide intermediate resistant *Staphylococcus aureus* (hGISA)**

13 These isolates exhibit vancomycin MICs of 1-2 mg/L but have a resistant sub-population  
14 occurring at frequencies of  $10^{-6}$  following selection with vancomycin (3).

15 Detection of isolates with reduced susceptibility to glycopeptides may be problematic especially  
16 isolates exhibiting MICs of 4-8 mg/L.

17

### 18 **Definitions**

19 Both US and European bodies define a strain as having reduced susceptibility to vancomycin if  
20 the MIC is >2 mg/L.(4,5) The USA has an intermediate category where the MIC is between 4 or  
21 8 mg/L whereas Europe does not have an intermediate category. Both organisations stress that  
22 reference broth microdilution is the most appropriate test to confirm an MIC as Etests® tend to  
23 produce MICs of about 0.5 to 1 mg/L higher than broth dilution.

24

25

1 **2.11.2 Recommendations regarding laboratory detection**

- 2
- 3 • An agar screening plate (BHI V6) is recommended for the detection of reduced
- 4 susceptibility to glycopeptides in addition to standard method; the standard method is
- 5 one of the following:

- 6 a) Disc diffusion
- 7 b) Automated method

8 If possible, laboratories should incorporate the vancomycin agar screen plate for testing

9 all *S. aureus*. Alternatively, the screening may be limited to MRSA isolates, since nearly

10 all VISA and all VRSA are MRSA. **Grade D**

11 An MIC method should be used to check the MIC on all serious infections caused by *S.*

12 *aureus* where a glycopeptide is used for treatment. **Grade D**

13

- 14 • If clinical failure is suspected with glycopeptide therapy;
- 15 a. An MIC should be performed and any isolate with an MIC of >2 mg/L referred.
- 16 b. A macro-method using both vancomycin and teicoplanin should be performed.

17 **Grade D**

18 **Rationale:**

19 Disc diffusion and some of the automated systems do not reliably detect isolates with reduced

20 susceptibility to vancomycin, i.e. MICs of 4-8 mg/L (6). Hence it is prudent to include a

21 screening plate if any of these methods are routinely used. In the USA, the use of BHIV6 (i.e.

22 brain heart infusion agar containing 6 mg/L of vancomycin is recommended. This screening

23 plate may miss up to 30% of isolates with MICs of 4 mg/L and further work is being undertaken

24 to determine the most appropriate screening methodology.

25

26 There is much discussion regarding the correct breakpoint for glycopeptides and *S. aureus*; a

27 number of studies suggest that isolates with an MIC of >1 mg/L have a poorer outcome than

1 isolates where the MIC is < 1 mg/L (5, 7, 8). It is therefore prudent to check the MIC for all  
2 serious infections caused by *S. aureus* where glycopeptides are used as therapy. An Etest® is  
3 acceptable but all suspected VISA should be confirmed by reference broth microdilution  
4 methodology.

5  
6 The clinical relevance of the hGISA phenotype is uncertain but there are studies that suggest that  
7 patients infected with these isolates have a poorer outcome compared to vancomycin susceptible  
8 isolates (9-12). Detection of hGISA is difficult. The reference method is to use population  
9 analysis profiling area under the curve (PAP-AUC) to determine the proportion of cells with  
10 reduced susceptibility compared to reference strains. This method is not suitable for the routine  
11 laboratory. A number of screening methods have been suggested but none are in routine use.  
12 The most established method is to perform an Etest® ‘macro method’ i.e. use a 2 McFarland  
13 turbidity standard and refer any isolate with a reading of  $\geq 8$  mg/L for vancomycin and  
14 teicoplanin or  $\geq 12$  mg/L for teicoplanin alone for further investigation.

### 15 **2.11.3 Treatment of isolates with reduced susceptibility to glycopeptides**

16 Please refer to the treatment section of the guidelines (Section 2.8).

### 17 **2.11.4 Infection Control precautions of patients infected or colonised with *S. aureus*** 18 **exhibiting reduced susceptibility to glycopeptides**

19 Details can be found elsewhere (13)

20

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28

29

30

## 2.12 MRSA surveillance and key performance indicators

### Recommendations

- Outbreaks of infection (see Appendix V for definitions) caused by MRSA must be reported to the Director of Public Health. (*statutory requirement*)
- Individual cases of CA-MRSA (see Appendix V for definitions) infection under the categories listed below should be reported to the local Department of Public Health:
  1. Severe invasive disease (See appendix for definition) or cases resulting in death
  2. Cases in high risk groups, i.e. healthcare workers working in the community or in hospitals, those involved in gym or close contact sports and teachers
  3. Cases in a closed community where there may be potential for onward transmission e.g. prison, military camps, nursing home, etc **Grade C**
- *Staphylococcus aureus* bloodstream infections must be reported to the HPSC on a quarterly basis, based on EARS-Net case definitions (*statutory requirement*)
- All healthcare facilities should maintain a line list of new cases of MRSA colonisation and infection. Where possible, this should be maintained in an electronic format. The list should include the following details or core data:
  1. Patient identification
  2. Specimen site
  3. Whether MRSA was isolated from a screening or clinical specimen
  4. Date of first positive result
  5. Hospital/facility location at time of specimen collection (e.g. ward name)
  6. Date of admission **Grade C**
- All acute hospitals must participate in the *S. aureus* component of the EARS-Net enhanced bloodstream infection surveillance system. Cases must be classified using the clinical case definitions detailed in Appendix V. **Grade C**
- All acute hospitals should report rates of new cases of hospital-onset and community-onset MRSA colonisation/infection at least twice per year to hospital management, clinical directors, clinicians and ward/unit managers, using the temporal surveillance

1 definitions detailed in Appendix V. Rates should be expressed as new cases per 100 bed-  
2 days used. **Grade C**

3 • All acute hospitals should carry out local surveillance of process indicators related to the  
4 control and prevention of MRSA, as detailed in Appendix V. **Grade B**

5 • All acute hospitals should carry out local surveillance of invasive infections caused by *S.*  
6 *aureus*, including root cause analysis of hospital-acquired cases.

7 **Grade C**

8

### 9 **Rationale**

10 Surveillance is often defined as “information for action”. MRSA surveillance is required at local  
11 level to:

- 12 1. Inform and assess local MRSA policies for prevention and control
- 13 2. Identify potential clusters and outbreaks

14

15 At national level MRSA surveillance is required to:

- 16 1. Inform and assess national strategies for the control and prevention of MRSA
- 17 2. Identify potential regional and national outbreaks
- 18 3. Identify emerging patterns of resistance and changes in MRSA epidemiology

19

20 National surveillance of MRSA in Ireland is based on EARS-Net (formerly known as the  
21 European Antimicrobial Resistance Surveillance System (EARSS)), which collects data on the  
22 first invasive isolate of a given pathogen per patient per quarter. EARS-Net provides reliable  
23 national-level data on MRSA bloodstream infections, but has limitations when applied to  
24 regional or individual hospital-level data. Notification of *S. aureus* bloodstream infections to  
25 EARS-Net, via HPSC, has been mandatory, under Infectious Diseases legislation, since 2004. A  
26 number of acute hospitals in Ireland also report additional demographic, clinical and outcome  
27 data on *S. aureus* bloodstream infections reported to EARS-Net, as part of a voluntary enhanced  
28 bloodstream infection surveillance system.

29

1 The simplest method of surveillance of MRSA in healthcare facilities is maintaining a line listing  
2 of new cases of MRSA colonisation/infection. The line list provides identification of patients  
3 with a history of infection or colonisation, for calculating prevalence or incidence rates, and can  
4 be used to trigger and follow outbreak investigations. An increase in the number of cases in a  
5 healthcare facility may signify a growing problem and may require the additional collection of  
6 data to confirm a rise in incidence or incidence density (1).

7  
8 With the increasing shift towards outpatient management, the blurring of the distinction between  
9 acute and non-acute healthcare institutions and the emergence of CA-MRSA, the traditional  
10 division between hospital and community acquisition has become less valid. Nevertheless, it is  
11 important to be able to identify cases of MRSA colonisation/infection that may be related to care  
12 in a given institution, and therefore a potential target for local infection prevention and control  
13 interventions. Likewise, it is important to be able to identify cases of MRSA  
14 colonisation/infection that are not related to healthcare exposure. For surveillance purposes, cases  
15 of MRSA colonisation/infection may be classified using temporal (i.e. the timing of MRSA-  
16 positive samples relative to the hospital/institution admission date) or clinical definitions (i.e.  
17 combining the timing of specimen collection with an assessment of whether or not the patient has  
18 had recent significant healthcare exposure).

19  
20 *Temporal definitions* These classify MRSA cases as either hospital or community onset. These  
21 have the advantage that they are only dependant on data routinely available from diagnostic  
22 laboratories and do not require a detailed clinical or chart review of each case. They have the  
23 disadvantage that they may be less specific for identifying true nosocomial infections, because  
24 the assessment of recent healthcare exposures or of whether an infection may have been  
25 incubating at the time of admission, is lacking (1).

26  
27 *Clinical definitions* These classify MRSA cases by likely acquisition source, i.e. hospital-  
28 acquired, community-acquired or healthcare-associated. They have the advantage of providing  
29 more detailed information on the likely source of MRSA colonization/infection and, therefore,  
30 identifying potential targets for interventions (2). They have the disadvantage of being more

1 labour-intensive than temporal definitions, as they require clinical or chart review of every case,  
2 and of being more prone to variations in case classification between different observers.

3  
4 To ensure as many healthcare institutions as possible are able to carry out surveillance, using  
5 common surveillance definitions that minimise bias and are straight forward to apply temporal  
6 definitions should be used for routine MRSA surveillance. However, clinical definitions may still  
7 be used for targeted local surveillance, e.g. in specific high-risk units or during outbreak  
8 situations, and are also recommended for national enhanced surveillance of *S. aureus*  
9 bloodstream infection.

10  
11 Key performance indicators (KPIs) are specific and measurable elements of health and social  
12 care that can be used to assess the quality of care (3). According to the Joint Commission on  
13 Accreditation of Healthcare Organizations (JCAHO) in the United States, KPIs are not intended  
14 to be direct measures of quality but instead act as alerts to identify opportunities for  
15 improvements in the quality of patient care (4). The Health Information and Quality Authority  
16 have published guidance on developing KPIs for healthcare settings (5). KPIs are ideally based  
17 on standards determined through evidence-based academic literature or through the consensus of  
18 experts when evidence is unavailable. However, there is a paucity of high quality evidence for  
19 KPIs relating to MRSA and other multidrug-resistant organisms (1). Thus, the recommendations  
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21 guidelines.

22

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11

### Section 3 Appendices

#### 12 Appendix I - Committee membership & conflicts of interest

13 The following is a list of active members who contributed to the drafting and amendments of the  
14 guidelines.

- 15 • **Ms Patricia Coughlan**, Infection Prevention & Control Nurse, HSE South - Disability  
16 Services, St. Finbarrs Hospital, Cork

17 Conflicts of interest – Nothing to declare

18

- 19 • **Dr Robert Cunney**, Consultant Microbiologist, Health protection Surveillance Centre  
20 (HPSC) & The Children's University Hospital, Temple Street, Dublin

21 Conflicts of interest – Nothing to declare

22

- 23 • **Dr Fidelma Fitzpatrick**, Consultant Microbiologist, Health Protection Surveillance  
24 Centre (HPSC) & Beaumont Hospital, Dublin and National Clinical Lead in Healthcare-  
25 Associated Infection and Antimicrobial Resistance

26 Conflicts of interest – Nothing to declare

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- **Dr Blánaid Hayes**, Consultant Occupational Health Physician, Beaumont Hospital, Dublin

Conflicts of interest – Nothing to declare

- **Prof Hilary Humphreys**, Professor of Microbiology, Royal College of Surgeons in Ireland & Consultant Microbiologist, Beaumont Hospital, Dublin (Chair)

Conflicts of interest - Research funding from Steris Corporation, 3M, Inov8 Science, Pfizer & Cepheid in the last three years.

Lecture or consulting fees from 3M, Novartis & Astellas.

- **Dr Phil Jennings**, Director of Public Health - Midland Area HSE Area Office, Co. Offaly

Conflicts of interest – Nothing to declare

- **Dr Susan Knowles**, Consultant Microbiologist, The National Maternity and The Royal Eye and Ear Hospitals, Dublin

Conflicts of interest - Received sponsorship to attend medical meetings from Abbott Laboratories, GlaxoSmithKline and Pfizer

- **Ms Lenora Leonard**, Infection Prevention & Control Nurse Specialist, Beacon Hospital, Dublin

Conflicts of interest – Nothing to declare

- **Dr Olive Murphy**, Consultant Microbiologist, Bon Secours Hospital, Cork

Conflicts of interest – Nothing to declare

- 1       • **Dr Sinéad McNicholas**, Lecturer in Clinical Microbiology, Royal College of Surgeons in  
2       Ireland, Dublin

3       Conflicts of interest - Received research funding from Pfizer in the last two years.  
4       Received sponsorship to attend medical meetings from Novartis

- 5  
6       • **Dr Brian O'Connell**, Medical Director National MRSA Reference Laboratory &  
7       Consultant Microbiologist, St James Hospital, Dublin

8       Received research funding from Wyeth in the last three years. Received sponsorship to  
9       attend medical meetings from Novartis, Pfizer, Astellas and Wyeth

10

- 11       • **Ms Marie Tierney**, Antimicrobial Pharmacist, Galway University Hospital, Galway

12       Conflicts of interest - Received sponsorship to attend medical meetings from Novartis  
13       and Pfizer

14

15       **Others:**

16       **Dr Patrick Gavin**, Consultant Infectious Diseases Physician, Mater Misericordiae Hospital,  
17       Dublin

18       **Ms Mary Kelleher**, Surveillance Scientist, St James Hospital, Dublin

19       **Dr Karina O'Connell**, Specialist Registrar, The Children's University Hospital, Dublin

20

21       **Appendix II – Consultation process**

22       The draft document was placed on the HSE and HPSC websites for general consultation in June  
23       2011. In addition, a draft of this document was sent to the following groups for consultation:

- 1 Academy of Medical Laboratory Science
- 2 Cystic Fibrosis Registry of Ireland
- 3 HSE HCAI Governance Group
- 4 HSE Nurse Practice Development Units
- 5 HSE Directors of Nursing
- 6 Haematology Association of Ireland
- 7 Irish Antimicrobial Pharmacists Group
- 8 Irish Association of Critical Care Nurses
- 9 Irish Association for Emergency Medicine
- 10 Irish Association for Nurses in Oncology
- 11 Irish Association for Paediatric Nursing
- 12 Intensive Care Society of Ireland
- 13 Irish College of General Practitioners
- 14 Infectious Diseases Society of Ireland
- 15 Irish Nephrology Association
- 16 Irish Nephrology Nurses Association
- 17 Irish Society of Clinical Microbiologists
- 18 Irish Society of Medical Oncology
- 19 Irish Patients Association
- 20 Infection Prevention Society
- 21 Public Health Medicine Communicable Disease Group
- 22 Royal College of Physicians of Ireland (RCPI)

- 1 RCPI Faculty of Pathology
- 2 RCPI Faculty of Paediatrics
- 3 Royal College of Surgeons in Ireland (RCSI)
- 4 RCSI Faculty of Radiologists
- 5 SARI National Committee
- 6 SARI Regional Committees
- 7 Surveillance Scientists Association of Ireland

8

9 Feedback was received from the following groups:

10 Feedback was received from the following individuals:

11

## 12 **Appendix III – How to obtain a nasal swab**

13 Gather together the equipment needed to obtain a nasal swab:

- 14 • Gloves
- 15 • Apron
- 16 • Swab/specimen collection device
- 17 • Appropriate documentation

18 *The procedure*

- 19 • Obtain informed consent from the patient. Answer any questions and allay any anxieties
- 20 that the patient may have.
- 21 • Wash hands thoroughly. Don gloves.
- 22 • Open swab packaging, checking expiry date

- 1 • Remove swab from packaging, moisten with sterile water if required (to prevent any
- 2 discomfort to the patient
- 3 • Insert the swab into the anterior naris by about 2 cm (nostril)
- 4 • Rotate for about three seconds
- 5 • Repeat the procedure with the same swab in the other naris.
- 6 • Without contaminating swab, place in the culture medium provided

7 **Appendix IV - Matrix for work restrictions in colonised healthcare workers**

<b>HCW X Axis</b> <b>Patient Y Axis</b>	<b>Level 1</b> <b>Nasal colonisation</b>	<b>Level 2</b> <b>Nasal and skin colonisation</b>	<b>Level 3</b> <b>Nasal and throat colonisation</b>	<b>Level 4</b> <b>Multiple sites of colonisation (&gt;2)</b>	<b>Level 5</b> <b>Multiple sites of colonisation (&gt;2) with individual risk factors</b>
<b>Level 1</b> <b>Casual contact with low risk patients</b>					
<b>Level 2</b> <b>Clinical contact with short stay patients (e.g. elective surgical)</b>					
<b>Level 3</b> <b>Clinical contact with long stay patients</b>					

<p><b>Level 4</b></p> <p><b>Clinical contact with immuno-compromised patients</b></p>					
<p><b>Level 5</b></p> <p><b>Repeated clinical contact with dependent patients in high risk units</b></p>					

1

2 The risk posed by healthcare workers is greatest for circumstances in red.

3

4 **Appendix V - MRSA surveillance definitions**

5 *An outbreak of infection*

6 This is defined as two or more linked cases of the same illness or the situation where the  
 7 observed number of cases exceeds the expected number, or a single case of disease caused by a  
 8 significant pathogen. For infections caused by MRSA, cases may be linked:

- 9 • In place, e.g. an increased number of cases on an individual ward/unit.
- 10 • In time, e.g. an increased number of cases in a number of wards/units, or an increased  
 11 number of cases presenting to the hospital, over a short time period.
- 12 • By clinical features, e.g. an increased number of cases in a specific patient risk group  
 13 such as in ICU.
- 14 • By other epidemiological link, e.g. cases presenting to the hospital with a common  
 15 exposure risk, such as members of the same sports team.
- 16 • By molecular or phenotypic typing, e.g. an increased number of cases caused by a similar  
 17 MRSA strain with an unusual phenotype.

1 A single case of infection caused by an unusual MRSA strain, such as a glycopeptide-resistant  
2 isolate, would constitute a “significant pathogen”. Therefore this would be considered an  
3 outbreak.

4

#### 5 *Severe invasive disease*

6 This includes:

- 7 • infection at a normally sterile site, e.g. blood, cerebrospinal fluid, joint fluid etc.
- 8 • necrotizing pneumonia
- 9 • community-acquired pneumonia with a CURB-65 score of 4 or 5
- 10 • Skin or soft tissue infection requiring ICU care or extensive surgical debridement

11

#### 12 *Local surveillance of invasive infections*

13 These should include any infection at a normally sterile site (e.g. bloodstream infection,  
14 meningitis, septic arthritis). Other invasive infections (e.g. deep surgical site infections) may also  
15 be included, but this should be determined by local risk assessment.

16

### 17 **Temporal surveillance definitions**

#### 18 *Hospital-onset*

19 The first MRSA-positive specimen was collected from the patient three or more days after  
20 admission to the hospital, where the first day is the date of admission (the “three midnight rule”).

21 For example, if a patient is admitted to the hospital at any time on a Monday, only specimens  
22 taken after midnight Wednesday night would be considered to represent hospital-onset infection.

23 All hospital-onset infections are considered healthcare-associated.

#### 24 *Community onset*

25 The MRSA-positive specimen was collected within three days of hospital admission. However, a  
26 subset of community-onset infections may be healthcare-associated.

27

### 28 **Clinical surveillance definitions**

29 The following are adapted from surveillance definitions currently in use in Australia, Canada and  
30 USA. Clinical case definitions should be applied in addition to temporal case definitions for

1 purposes of targeted local surveillance, e.g. surveillance in high-risk units or during outbreak  
2 situations. Clinical case definitions must be applied to cases of *S. aureus* bloodstream infection  
3 reported to the enhanced EARS-Net surveillance programme.

4  
5 *Healthcare-associated MRSA*

6 This is a newly identified MRSA infection or colonisation with MRSA that satisfies at least one  
7 of the following criteria:

- 8 • Acquired during hospitalisation and not present or incubating on admission: i.e. occurring  
9 three or more days after admission. For patients admitted to hospital via the emergency  
10 department (ED), the date of attendance at the ED should be counted as the date of  
11 admission, even if this includes one or more overnight stays in the ED.
- 12 • MRSA-positive specimens taken within three days of hospital admission or admitted via  
13 the ED (see first bullet point) in a patient who was admitted from a long term care  
14 facility, e.g. skilled nursing home, hospice or non-acute hospital, or from another acute  
15 hospital.
- 16 • A complication of the presence of an indwelling medical device, e.g. intravascular  
17 catheter, urinary catheter.
- 18 • A surgical site infection, or related bloodstream infection, within 30 days of a surgical  
19 procedure.
- 20 • Instrumentation or incision related to the infection was performed within 48 hours before  
21 onset of the infection. If the time interval was longer than 48 hours, there must be  
22 compelling evidence that the infection was related to the invasive device or procedure.
- 23 • Associated with neutropenia ( $<1000$  neutrophils  $\times 10^6/L$ ) contributed to by cytotoxic  
24 therapy.

25 Healthcare-associated MRSA infection or colonisation should be subdivided into:

- 26 a. Associated with care at this hospital/facility
- 27 b. Associated with care at another hospital/facility

28

1 *Community-associated MRSA (CA-MRSA) infection*

2 For the purposes of epidemiological investigation and public health interventions, CA-MRSA  
3 infections are defined as MRSA infections occurring in persons where all of the following apply:

- 4 • Diagnosis of MRSA was made in the outpatient setting or by an MRSA-positive  
5 specimen taken within three days of admission to the hospital/ED (see above)
- 6 • No medical history of MRSA infection or colonisation.
- 7 • No medical history in the past year of:
  - 8 • Hospitalisation
  - 9 • Admission to a nursing home, skilled nursing facility, or hospice
  - 10 • Dialysis
  - 11 • Surgery
- 12 • No permanent indwelling catheters or medical devices that pass through the skin into the  
13 body

14

15 *Undetermined source*

16 Cases of MRSA infection or colonisation that do not fit the above criteria, or where the relevant  
17 clinical data is unavailable, should be classified as “undetermined source of MRSA”.

18

19 **Appendix VI MRSA- related process indicators**

20 The following process indicators for control and prevention of MRSA have been adapted from  
21 recommendations produced by the US Society for Healthcare Epidemiology.

22

23 *Compliance with hand-hygiene guidelines*

24 Monitor healthcare personnel compliance with hand hygiene guidelines both before and after  
25 contact with the patient or environment, using a standardised hand hygiene observation tool. A  
26 standardised hand hygiene observation tool has been developed by the HPSC and may be  
27 downloaded from [www.hpsc.ie](http://www.hpsc.ie). Note that HSE-funded acute hospitals are required to use this  
28 tool for six-monthly national reporting of hand hygiene compliance. Compliance is calculated by:

- 1       • Numerator, number of observed adequate hand hygiene episodes performed by  
2       healthcare personnel
- 3       • Denominator, number of observed opportunities for hand hygiene
- 4       • Multiply by 100 so that the measure is expressed as a percentage

5       *Compliance with contact precautions*

6       This assessment should be performed only as an internal measure within acute hospitals, as this  
7       measure has not been validated for, and should not be used for, inter-hospital comparisons. This  
8       is calculated by,

- 9       • Numerator, number of observed patient care episodes in which contact precautions are  
10       appropriately implemented.
- 11       • Denominator, number of observed patient care episodes in which contact precautions are  
12       indicated.
- 13       • Multiply by 100 so that the measure is expressed as a percentage.

14

15       *Compliance with MRSA active surveillance screening*

16       This assessment should be performed only as an internal measure within acute hospitals, as this  
17       measure has not been validated for, and should not be used for, inter-hospital comparisons. This  
18       is calculated by:

- 19       • Numerator, number of persons from whom surveillance specimens were appropriately  
20       collected.
- 21       • Denominator, number of persons meeting the selected criteria for surveillance testing.
- 22       • Multiply by 100 so that the measure is expressed as a percentage.

23

24

1 **Appendix VII – Template for letter to general practitioner**

2 Hospital Name & Address.

3 Date:

4

5 GP name:

6 GP address:

7

8 **Patient name:**

9 **DOB:**

10 **Address:**

11

12 Dear Dr (name),

13

14 The above named patient was an in-patient in this hospital on (date).....

15 MRSA was isolated from the (state location) .....

16 The patient was discharge home on (date) .....

17

**Tick as appropriate**

The patient was prescribed a 5 day regimen of chlorhexidine washes and Bactroban (mupirocin) nasal ointment. MRSA was not isolated from 3 consecutive swabs post treatment.

The patient was prescribed a 5 day regimen of chlorhexidine washes and Bactroban (mupirocin) nasal ointment. MRSA was not isolated from the 1<sup>st</sup> repeat swab post treatment. The patient was discharged home prior to repeat swabs after treatment.

The patient was prescribed a 5 day regimen of chlorhexidine washes and Bactroban (mupirocin) nasal ointment. No repeat swabs after treatment were taken as the patient was discharged home before the recommended follow up period.

No treatment was commenced as we received these positive results after the patient's discharge.

1

2

3 This information will be important for screening in the event of any future hospital admissions.

4

5 Please contact me if you have any queries.

6

7

8 Regards,

9

10 .....

11

12