

Infection Control Policy: Prevention & Management of Multi-Resistant Organisms (MRO)

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Summary Public Health Organisations must develop management and accountability approaches for infection control that align with patient safety initiatives and activities to reduce the transmission of multi-resistant organisms.

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Applies to Area Health Services/Chief Executive Governed Statutory Health Corporation, Board Governed Statutory Health Corporations, Affiliated Health Organisations - Non Declared, Affiliated Health Organisations - Declared, Public Health System Support Division, Community Health Centres, Dental Schools and Clinics, Government Medical Officers, NSW Ambulance Service, Public Health Units, Public Hospitals

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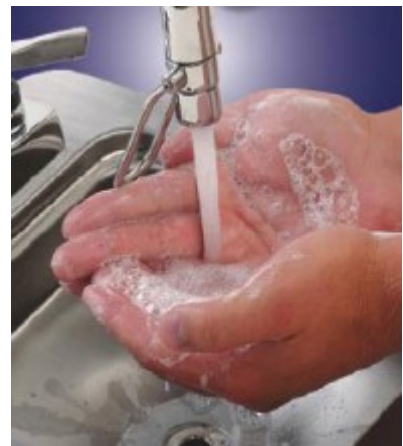
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Director-General

This Policy Directive may be varied, withdrawn or replaced at any time. Compliance with this directive is **mandatory** for NSW Health and is a condition of subsidy for public health organisations.

**Infection Control Policy:
Prevention and management of multi-resistant organisms (MRO)**



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INTRODUCTION

Healthcare associated infections (HAI) remain a major cause of morbidity, mortality and excess healthcare costs. HAI contribute a considerable cost to the health care system, as well as to patients and their families with prolonged hospital stays, readmissions and additional diagnostic tests and treatment.

Longer stays and higher costs result from infections caused by antibiotic resistant pathogens compared with infections due to antibiotic susceptible strains of the same species. Research indicates that more than 70% of the bacteria that cause HAI are resistant to at least one of the drugs most commonly used to treat these infections.

Measures to control the emergence and transmission of multi-resistant organisms (MROs) are necessary and beneficial to patients and healthcare facilities (HCF). Public Health Organisations (PHO) must ensure that appropriate infection prevention and management strategies are implemented, evaluated for effectiveness and modified to ensure that there is a consistent decrease in the incidence of all MROs, particularly methicillin-resistant *Staphylococcus aureus* (MRSA). The principles and practices can also be applied to the prevention and management of other MROs such as vancomycin resistant enterococci (VRE) and multi-resistant *Acinetobacter baumannii* (MRAB).

RATIONALE

MROs can cause serious illness and avoidable deaths in patients. Reservoirs of MROs include patients and occasionally healthcare workers (HCW) who are colonised or infected, and contaminated objects or surfaces in the environment. MROs are often inadvertently transmitted on the hands of HCW. There is no single factor to explain the high rates of MRO infections and colonisations, particularly MRSA.

The factors that have likely contributed to these high rates include:

- excessive and inappropriate use of antibiotics during the last four decades
- behavioural factors eg. poor compliance with hand hygiene
- an increased use of indwelling devices and medical interventions that breach a patient's normal bodily defences
- a higher proportion of vulnerable patients
- organisational factors eg. high bed occupancy, increased movement of patients across geographical areas
- structural issues within HCF eg. access to single rooms and hand basins
- environmental conditions eg. variable cleaning standards.

INTERVENTIONS

MRO prevention and management programs involve a combination of interventions rather than one single intervention.

These interventions can include:

- adequately resourcing HCF with dedicated infection control professionals (ICP)
- targeting MRO risk management strategies at high-risk patient groups
- ensuring and monitoring strict adherence to infection control precautions and practices
- increasing compliance with hand hygiene practices
- developing a framework for patient screening
- developing a framework for appropriate HCW screening
- defining decolonisation procedures and recommendations
- developing response protocols for outbreak management that are up-scaleable
- identifying and measuring patient management strategies for reducing MRO transmission
- ensuring environmental cleaning and risk management
- defining environmental controls eg. equipment decontamination, air quality
- developing and evaluating communication and education strategies for both patients and HCW
- developing and maintaining long term, consistent surveillance of selected HAI, review of cases to identify breaches of infection control and feedback of results to clinical units
- using standardised practices in high-risk situations eg. "device bundles" for procedures such as central line insertion in ICU/HDU.

ROLES AND RESPONSIBILITIES

PHO must develop management and accountability approaches for infection control that align with patient safety initiatives and activities to reduce the transmission of MRO. These should be sufficiently flexible to allow rapid response to local epidemiological changes, outbreaks or changes in the understanding of the spread and consequences of patients acquiring an MRO.

Chief Executive is responsible for:

- ensuring that resources are available to enable implementation of this policy.

Director of Clinical Governance is responsible for:

- ensuring implementation of this policy
- ensuring development of local policies and procedures to support this policy.

Infection Control Professional (ICP) is responsible for:

- tracking of MRO patients through effective screening and laboratory liaison
- ensuring attending medical officer and ward clinical staff are advised of a new isolate
- ensuring an Infection Control Plan is initiated for each MRO patient.

Infectious Diseases/Clinical Microbiology specialist is responsible for:

- ensuring ICP and ward clinical staff are notified of new isolates.

Head of Pharmacy is responsible for:

- ensuring that antibiotic utilisation data is collated and reported to relevant staff

Nurse Unit Manager is responsible for:

- ensuring compliance with this policy by staff on his/her ward/unit
- ensuring feedback to staff of compliance with the policy.

All HCW are responsible for:

- complying with hand hygiene and personal protective equipment requirements
- complying with prevention/management strategies for MRO infected/colonised patients.

GENERAL MEASURES

Infection control measures

Hand hygiene

Hand hygiene is the single most important practice to reduce the transmission of MRO in HCF.

Hand hygiene includes:

- handwashing with running water and either plain (non-active) or antiseptic-containing (active) liquid soap; or
- the use of water-free skin cleansers or antiseptics such as alcohol-based products.

HCW must have access to both handwashing sinks and water-free skin cleansers. Water-free skin cleansers must be placed in easy to access locations eg. near patient beds, near to the entry/exit of rooms, nursing stations, procedural trolleys, medication trolleys, diagnostic units, outpatient bays/rooms and treatment rooms. HCF may consider the provision of personal alcohol hand disinfectant dispensers for staff eg. in high risk areas.

The frequency, duration and type of hand hygiene is dependent upon the nature, intensity, duration and sequence of the work activity. If hands are not visibly soiled, an alcohol based hand rub should be considered for routine decontamination of hands, particularly after contact with patients who are infected or colonised with MRSA. When hands are visibly soiled, hands must be washed with soap and running water.

Other factors that have been shown to maximise the utilisation of alcohol-based handrubs include leadership by senior clinicians eg. VMOs and staff specialists.

All patients must be educated about, and provided with, the means to perform hand hygiene. Patients who are colonised or infected with an MRO and who do not perform hand hygiene are more likely to contaminate environmental surfaces and equipment. Patients' visitors and relatives must also be educated regarding the importance of hand hygiene before and after entering the patient's room.

Standard and Contact Precautions

Standard and Contact Precautions must be followed when in direct contact with a patient who is infected or colonised with an MRO. (Refer to [Infection Control Policy PD2007_036](#))

In circumstances where an MRO may be transmitted by another route, eg. patients with MRSA pneumonia, Droplet Precautions must be used to prevent the transmission of the organism.

Contact Precautions must be used when handling bodies that are known or suspected to have been infected or colonised with an MRO. Contact Precautions should be maintained until the body is completely "sealed" (wrapped or body bag) for transport.

Patient placement, cohorting and movement

Initial patient placement and bed management is an important factor in determining the likelihood of infection with an MRO. The movement and transport of patients with MRO infection or colonisation should be limited to essential purposes only. If the patient is transported out of the room or to another HCF, the receiving HCF must be notified before transfer and Contact Precautions maintained during transportation to minimise the risk of transmission of micro-organisms to other persons and contamination of environmental surfaces or equipment.

- Patient placement must be considered to limit the movement of MRO infected or colonised patients. A record should be kept that tracks the movement of each MRO infected or colonised patient in and out of wards/units.
- In HCF that have a sufficient number of single rooms with ensuites, MRO infected or colonised inpatients must be cared for in a single room with appropriate room signage. If there are no ensuite facilities, a toilet and bathroom should be dedicated for individual patient use.
- In ICUs/HDUs, single rooms (with an anteroom if available) should be used for patients infected or colonised with an MRO.
- Cohorting MRO patients in the one area must only occur with an MRO of the same microbiological species eg. MRSA with MRSA.
- Ambulatory care departments such as haemodialysis units, haematology/ oncology day treatment and emergency departments should provide separate areas for patients known to be either infected or colonised with an MRO.
- The transporting agency must be notified of the requirement for Standard and Contact Precautions. Transporting agencies such as NSW Ambulance Service must not transfer MRO patients with different microbiological species within the same vehicle eg MRSA with VRE.

Healthcare worker education

HCF must develop mandatory annual and regular ongoing infection control education for all levels of staff. Education must be conducted on orientation and/or induction of all new staff to the HCF. Education programs must be developed for the prevention and control of MRO transmission for both clinical and non-clinical HCW.

The inclusion of education programs for antibiotic prescribing regimes should be considered for medical staff during orientation/induction programs.

Use of antimicrobials

The overuse of broad spectrum antibiotics, including the third generation cephalosporins, has been linked to the emergence of MRO and an increase in the incidence of opportunistic pathogens eg. *Clostridium difficile*. In addition, broad-spectrum antibiotics, if not clinically indicated, are more expensive treatment options.

The key principles for judicious antimicrobial use include:

- protocols for antibiotic use must be consistent with the most recent version of Therapeutic Guidelines:Antibiotic. This requires access to the current edition of these Guidelines for clinical staff (via CIAP, electronic versions or provision of hard copies) and prescriber education programs.
- Access to specific broad spectrum antibiotic, antifungal and antiviral agents should be restricted at each site to prevent overuse, selection of resistant organisms and to mitigate the cost of therapy.
- An appropriate antibiotic prescribing policy should be established in each HCF under the direction of the facility or area Drug and Therapeutic Committee. The membership of the Committee should include relevant pharmacy, microbiology and infectious diseases experts. The policy should clearly specify those antibiotics subject to restricted access and the circumstances in which the restricted antibiotics may be used. The policy may also include protocols for antibiotic use where appropriate. Compliance with restrictions should be regularly monitored and managed by the Committee.
- Criteria for use of restricted agents should be reviewed at least annually by the facility or area Drug and Therapeutic Committee and communicated to all relevant staff. Criteria should take into account local bacterial susceptibility patterns (antibiograms) recorded by the microbiology laboratory servicing the facility.

Antibiotic usage

Usage of restricted antibiotic agents should be monitored regularly using defined-daily doses/1000 patient-days. Usage data should be stratified to identify areas of high (over) usage. ICU/HDU usage should be evaluated separately.

Proactive drug utilisation evaluation (DUE) studies of antibiotic use should be undertaken in areas of heavy antibiotic use. Information on DUE can be accessed at <http://www.ciap.health.nsw.gov.au/nswtag/index.html>.

Strategies for improving antibiotic prescribing

HCF must improve antibiotic prescribing by:

- strong leadership and dedicated individuals with responsibility for leadership in antibiotic usage
- education and training
- evidence-based clinical treatment protocols
- optimal empirical antibiotic choice, while at the same time minimising emergence of antibiotic resistance
- sound antibiotic use (use the Antibiotic Creed – M.I.N.D.M.E. described below)

- regular audit and feedback to clinicians about antibiotic usage and resistance data
- regular auditing of the use of key agents and surgical prophylaxis to identify opportunities for prescribing and practice improvement (drug utilisation reviews)
- streamlining therapy once culture results are available
- regular audit and feedback to clinicians about the choice, timeliness and duration of surgical antibiotic prophylaxis.

Microbiology guides therapy wherever possible
Indications should be evidence based
Narrowest spectrum required
Dosage appropriate to the site and type of injection
Minimise duration of therapy
Ensure monotherapy in most situations

Source: *Writing Group for Therapeutic Guidelines: Antibiotic* (2006). Therapeutic guidelines: Antibiotic (Version 13) p.3. Therapeutic Guidelines Limited, Melbourne)

Surgical prophylaxis

One-third to one-half of antibiotic usage in HCF is for surgical prophylaxis. Prophylaxis should be considered only where there is a significant risk of infection and evidence has shown it to be effective or where the consequences of infection would be disastrous for surgical patients eg. joint replacement surgery. Antibiotic prophylaxis cannot be relied upon to overcome poor surgical technique eg. inadequate haemostasis, excessive damage to tissues, inadequate debridement.

As a general principle, the first dose(s) of surgical prophylaxis should be given at a time that ensures adequate plasma and tissue drug levels are achieved at the start of the procedure (for a parenteral agent, generally within one hour of commencement of the operation). Repeat intra-operative doses are recommended for procedures that last more than three hours. "Prophylaxis" continuing for more than twenty four hours postoperatively is unnecessary and potentially dangerous.

Environmental cleaning

There is robust evidence that a patient's clinical environment may act as a reservoir of MRO and contribute to an ongoing problem with MRO acquisition within the HCF. Patient care items, bedside equipment, and frequently touched surfaces within the patient's own environment must receive daily cleaning.

Cleaning service delivery procedures

Many micro-organisms live on environmental surfaces for days to months. Environmental contamination with MRO may reach considerable levels, resulting in contamination or colonisation of patient equipment, personnel, or other patients in the vicinity.

The areas within a HCF to be cleaned should be broken down into generic functional areas, based on the risk assessment criteria (Refer to Risk categorisation of patient care areas). The higher the risk category for functional areas, the greater the frequency, intensity and auditing of the environmental cleaning program.

Outbreaks of MRO may occur in any functional area of a HCF, therefore, any functional area may be re-categorised for the period of the outbreak and specific project cleaning programs implemented to reduce the environmental contamination to prevent further transmission of the MRO.

Minimum cleaning requirements

- All MRO rooms/areas must be cleaned daily with neutral detergent with special attention paid to surfaces that are frequently touched by patients and staff including horizontal surfaces and dust collecting areas eg. ledges, beds, tables, trolleys, ventilators, sinks, doorknobs, telephones and computer keyboards.
- A second clean with a disinfectant may be warranted depending on the organism. The HCF's ICP or Infectious Diseases/Clinical Microbiology specialist should make the decision on whether a disinfectant is needed for a second clean.
- Sinks and hand basins are potential reservoirs of MRO. In high risk areas, eg. ICU/HDU, they should be dismantled and cleaned at regular intervals so that any sludge that has accumulated in the U-bend can be removed.
- Pillows, mattress covers and mattresses must be cleaned then checked for damage. If damaged they must be replaced or repaired in a manner consistent with the original product.
- All MRO rooms and bathrooms must be cleaned upon discharge or transfer of the patient. This clean should include wall surfaces. Curtains must be changed. All bed surfaces and furnishings must be cleaned. All unused disposable items should be discarded.
- Consumable stocks must be kept to a minimum in patient room(s) to prevent contamination.
- Use dedicated patient care equipment and other assessment items (eg. stethoscope, glucometer, sphygmomanometer) in isolation rooms.
- Computer keyboards and frequently touched electronic devices can become contaminated with MRO and require routine cleaning on a regular basis. They can be disinfected between uses by using alcohol impregnated wipes.

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- HCW should pay special attention to personal items eg. pagers, stethoscopes, pens, mobile phones. These items should be cleaned after contact with an MRO patient. They should be disinfected between uses by using alcohol impregnated wipes. HCF should phase out the use of lanyards.

Refer to NSW Health Cleaning Service Standards, Guidelines and Policy for NSW Health Facilities, 1996 at <http://www.health.nsw.gov.au/audit/manuals/cleaning.pdf>.

SPECIFIC MEASURES

Surveillance of MRO

Surveillance data for MRO are important to characterise and determine the current epidemiology of an MRO, particularly MRSA. HCF should perform both active and passive surveillance that should be consistent and continuous.

Active Surveillance

HCF must conduct active surveillance of MRO (MRSA, VRE, MRAB, VISA)

Active surveillance aims to:

- collect comparable and validated data
- analyse trends over time
- identify HAI risks related to specific clinical practices or non-compliance with recommended infection prevention and control processes
- implement changes to clinical care practices and processes that may reduce HAI risks
- evaluate the impact of implemented changes on HAI rates
- reduce the incidence of HAIs and MRO colonisations
- provide data to inform state and local policy.

Passive surveillance - antibiograms

Antibiograms can assist in the selection of more appropriate antibiotics, delay the increase of antibiotic resistance and provide accurate information to enable the implementation of precautions to prevent the spread of resistant organisms.

The simplest form of passive surveillance is the monitoring of clinical microbiology isolates. This surveillance can be used to detect the emergence of new MRO and guide empiric therapy.

Aggregating existing HCF antibiograms is a simple and relatively accurate way to estimate local prevalence of susceptible pathogens, however, antibiograms offer limited data on isolates with intermediate and high level antibiotic resistance.

Laboratory periodic reports should be used to document trends and determine what infection control and antibiotic interventions may be needed.

Screening patients for MRO

The goals of MRO screening are to:

- prevent colonisation from becoming the source of an infection in an individual patient
- prevent the transmission of MROs between patients.

Each HCF must develop a system for laboratory identification, detection and notification of MRO colonisations and infections to the relevant patient management teams. The HCF should consider adoption of rapid testing for MRSA when suitable testing is available.

Microbiology laboratories should store the initial isolate from each

- newly identified MRSA carrier for at least 3 months
- incident of sepsis for at least 12 months

.... for later analysis/typing either in the event of an outbreak situation or in case it is necessary to examine transmission more closely in a particular clinical unit.

HCF must perform MRSA screening for:

- patients undergoing elective joint replacements or cardiovascular surgery (preoperative and preferably before admission)
- all ICU/HDU patients.

The following table shows recommended screening approaches.

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Organism	HCF-wide admission approach	ICU/HDU and other specific unit approach	Nursing home, long term care HCF
MRSA	<p>Patients with chronic wounds or indwelling medical devices (not previously documented to have MRSA)</p> <p>Readmissions within 6 months of previous episode of inpatient care regardless of the diagnosis at that time</p> <p>Pre-operative patients:</p> <ul style="list-style-type: none"> • Cardiovascular surgery • Elective joint replacement surgery • Vascular surgery where a prosthetic graft is used <p>Transfers from other acute or long term HCF or readmission after recent prolonged inpatient care</p> <p>Admission screening in locales where CA-MRSA is prevalent</p>	<p>All patients on admission and discharge. For units with endemic MRSA or evidence of recent transmission, screening should also be repeated at least weekly</p> <p>Selected pre-operative patients:</p> <ul style="list-style-type: none"> • Cardiovascular surgery • Elective joint replacement surgery • Vascular surgery where a prosthetic graft is used • Solid organ or bone marrow transplantation • Inpatients > 5 days who are to undergo major surgery (who will be admitted to endemic MRSA units) <p>Screening of transfers from other HCF is important in localities where MRSA is prevalent in transferred patients who do not have chronic wounds or indwelling medical devices</p>	<p>Not recommended unless an outbreak or a history of MRSA transmission within the HCF</p>
VRE MRGN eg. MRAB	<p>Not recommended</p>	<p>Optional</p> <p>The decision to introduce routine admission and interval VRE or MRAB screening for ICU/HDU and other non-ICU clinical services eg. renal dialysis, organ transplant, haematology or oncology should be made after consideration of whether healthcare associated MRO morbidity has been documented in unit patients.</p> <p>Screening may be prudent, if there is a known VRE or MRGN problem at a nearby HCF</p> <p>If haemodialysis patients are travelling between AHS or interstate and require dialysis, VRE screening may be a requirement prior to acceptance at another HCF</p>	<p>Not recommended</p>

A mechanism should be established for providing expert infection control advice regarding screening of patients who are not included in HCF specific screening policies. Screening policies must be linked to a targeted approach including the use of isolation, cohorting, environmental cleaning programs and infection control precautions. The targeted approach must consider the reason for the admission of the patient, the risk status of the unit to which they are admitted and the local prevalence of the MRO.

Where screening identifies an elective surgery patient as colonised or infected with an MRO, the patient should undergo assessment, appropriate treatment and decolonisation prior to being admitted for elective surgery. Institution specific protocols should be designed according to advice from Infectious Diseases/Clinical Microbiology specialists and ICP.

When a patient has been identified with an MRO and requires infection control precautions, the patient, the clinician and ward/unit staff involved must be informed and the appropriate infection control precautions instituted.

Readmission screening for previous MRO colonised or infected patients

A large proportion of MRO colonised patients eventually 'clear' themselves of carriage following treatment of the condition that required inpatient care.

A HCF admission policy should be developed to document:

- previously colonised patients who have cleared an MRO to reduce the pressure on isolation facilities
- screening criteria for previously MRO colonised or infected patients
- an action plan linked to known MRO colonised or infected patients to ensure isolation/cohorting and infection control contact precautions are initiated on admission.

Inter-healthcare facility transfer screening

Routine screening of patients transferred between HCF is not recommended. Screening is indicated when patients are transferred from a HCF experiencing an MRO outbreak or known prevalence.

Patients cannot be refused admission to acute care, nursing homes or long term care HCF on the basis of their MRO status. However, patients at risk of MRO infection or colonisation should **not** be nursed in the same rooms with high risk patient populations (eg. patients undergoing total hip prosthesis surgery).

Standard Precautions are sufficient for transferred patients being screened for MRO. Patients at high risk of an MRO may be isolated either physically or by the use of Contact Precautions while awaiting screening results.

Screening of organ donor patients

Patients who are to donate organs (prior to pronouncement of death) should be screened by the donor HCF in which they are located. This should be done so that results are available to the recipient HCF accepting the organs.

Blood cultures should also be collected if the patient is febrile.

Communication and feedback

A communication strategy must include a mechanism for informing the relevant HCW and visitors of a patient's MRO status, and the relevant infection control precautions required. Newly identified cases must be discussed with the patient management team.

Either the treating medical officer or their designate should advise the patient of the MRO acquisition. This will also provide an opportunity to discuss their clinical management plan and concerns that the patient or their relatives may have about the MRO infection/colonisation and its potential impact on the patient and his/her family.

Patients should be provided with an easy to understand written handout on their specific MRO when diagnosed that includes:

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- what is an MRO
- what is their specific MRO
- the difference between colonisation and infection
- how the MRO is transmitted
- infection control precautions required while an inpatient
- hand hygiene including location of hand hygiene facilities and demonstration of hand hygiene procedure
- instructions on Contact Precautions and the reason for restricted HCF movement
- visitor policies
- what will happen when they are discharged home.

Information should be provided to partners/relatives/friends of the patient (refer to [Privacy Manual \(Version 2\) – NSW Health PD2005_593](#)).

Rapid response communication and feedback should be provided to care providers in the event of an outbreak or increasing and decreasing endemicity.

MRO screening specimen collection sites

Assessment of clinical specimens for the presence of an MRO is an important part of the infection control measures taken to detect and control the transmission of MRO.

Detecting MRO should maximise the yield of organisms and isolate relevant pathogens from specimens obtained from different body sites.

Prior to microbiological screening, it must be established that the patient has not been administered an antibiotic(s) and/or antiseptic body wash/soap, that are active against MRO, in the past 2 weeks. The screening and detection procedure requires cessation of the antibiotic and/or antiseptic body wash/soap for at least 2 weeks prior to the sample being taken.

For collection of nasal, perineal, peri-anal and groin swabs, a transport swab should be moistened in the transport medium prior to swabbing the area.

MRO	Recommended screening sites for selected MROs	Comments
MRSA NORSA CA-MRSA VISA	Skin lesions and wounds Central venous line exit sites Anterior nares of the nose Peri-anal (preferred) or perineum or groin if this is not possible Sputum, if expectorated Urine (if a urinary catheter is present)	Moisten swab in the sterile swab transport medium, sterile H ₂ O or saline. Roll swab over area several times Where there are extensive wounds, ensure that smears are made properly from all wounds Control Cultures Only indicated once a decolonisation program has been completed
VRE MRGN (including MRAB)	Faeces or rectal swab.	In situations where maximum sensitivity is required from the screening process, consideration should be given to adding a throat swab for MRGN only

Microbiology laboratories should routinely culture for MRSA in all clinical specimens submitted from patient screening programs. Isolates of enterococci should be routinely tested for vancomycin resistance using an appropriate method. Clinically significant

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isolates of Gram-negative pathogens (*Acinetobacter* species, *Pseudomonas aeruginosa* and coliform bacteria) should be tested for gentamicin resistance, multi-resistance and extended spectrum beta lactamase (ESBL) presence by appropriate methods.

Refer to [Appendix 1 – Specimen Collection](#).

Screening healthcare workers for MRO

HCF should establish appropriate mechanisms/expert group to define selective HCW screening programs. HCF should not pursue HCW screening programs until basic infection control efforts have been maximised and the rates of infection or outbreak sources have been investigated. In general HCW should be screened only when epidemiological investigations have excluded other sources of MRO transmission (eg. colonised patients or the environment).

HCF should develop a contingency plan and protocols for:

- a decision and accountability sequence plan for selective HCW screening
- criteria for HCW screening based on clinical risk category
- assessment of transient carriage of the MRO prior to treatment decisions
- referral of HCW to an infectious disease physician, clinical microbiologist or dermatologist (if HCW hands have evidence of MRO carriage)
- decolonisation program(s)
- the management and deployment of HCW found to be positive for an MRO.

Risk categorisation of patients for MRSA

It is important to assess each patient's risk, particularly for MRSA. The following MRSA risk stratification model provides a framework to categorise patient risk factors. This should enable HCF to adjust clinical decisions to individual patients, determine infection control precautions required, MRSA screening approaches and facilitate bed management priorities.

Risk category	Patient risk criteria
Proven MRSA carriage	<ul style="list-style-type: none"> • Patients demonstrated to have MRSA carriage.
High risk of MRSA carriage	<ul style="list-style-type: none"> • Readmission within 6 months of acute inpatient care in a HCF in which MRSA was endemic or there was an outbreak at the time • Transfer from a HCF experiencing an outbreak or where MRSA is endemic • Patients with demonstrated risk factors for CA-MRSA (a recent history of skin/soft tissue infection) or from areas where CA-MRSA is prevalent • Treated in an overseas HCF, where MRSA is endemic, for more 48 hours within the past 2 months • Patient cared for in a room with a MRSA colonised or infected patient • "Proven MRSA carriage" patients, after MRSA decolonisation, who have not yet met the criteria for clearing a patient of MRSA • Any patient admitted with an indwelling medical device (eg. wound drain, urinary catheter), skin lesions, wounds or possible sources of infection (eg. abscess, boil)
Low or moderately increased risk of MRSA carriage and/or potentially serious consequences of acquisition	<ul style="list-style-type: none"> • All patients admitted to ICU/HDU • Preoperative surgery patients where a prosthetic device will be used eg. cardiac bypass graft, joint replacement • Solid organ transplantation patients • Patients who will be inpatients for greater than 5 days and who are to have major open abdominal surgery • Patients in the first year following MRSA decolonisation programs with negative control cultures • Patients admitted to another HCF 2 months previously and who still have persistent skin lesions and/or risk factors eg. chronic respiratory, urinary tract infections • Frequent, prolonged use of broad spectrum antibiotics during inpatient care and treatment
Minimal risk of MRSA carriage	<ul style="list-style-type: none"> • Patients admitted to another HCF 2 months previously and who have no persistent skin lesions and/or risk factors eg. chronic respiratory, urinary tract infections • Patients admitted to another HCF and did not have surgery, did not receive a drain or a catheter, were not intubated, had no skin lesions or possible sources of infection eg. abscess, boil • Patients cared for in a unit where one or more patients with MRSA are being treated, where Contact Precautions have been used routinely • Patients treated for colonisation whose control cultures have remained negative for a year

Risk categorisation of healthcare workers for MRSA

It is important to assess HCW's risk for MRSA carriage. The following MRSA risk stratification model provides a framework to categorise HCW risk factors and suggested screening and management of the HCW by an Infectious Diseases/Clinical Microbiology specialist.

Risk category	HCW risk criteria	Suggested screening and management
Proven MRSA carriage	HCW demonstrated to have MRSA carriage	<ul style="list-style-type: none"> • HCW must be referred to either an infectious diseases/clinical microbiology specialist • MRSA culture samples should be taken from the throat, nose and any skin lesions prior to treatment and/or decolonisation • HCW diagnosed with MRSA and with skin lesions must be deployed to a non-clinical area if they usually work in a clinical area/provide direct patient contact • decolonisation should be initiated on the same day, consisting of skin, hair and nose treatment • control cultures should be taken on the 10th, 15th and 20th days • HCW may not resume work in a clinical area until all 3 sets of control cultures are negative
High risk of MRSA carriage	HCW admitted to an overseas or local HCF where MRSA has high endemicity less than 2 months previously, who had surgery, were given a drain or catheter, were intubated, have skin lesions or possible sources of infection eg. abscess or boil	<ul style="list-style-type: none"> • HCW must only work in the one unit/department until screening cultures confirm that they are not MRSA colonised or infected • Culture samples can be taken on their first day of work
Moderately increased risk of MRSA carriage	<ul style="list-style-type: none"> • HCW who have had unprotected contact with MRSA colonised or infected persons • Worked in a HCF where MRSA has high endemicity for greater than 48 hours less than 2 months previously • Previously worked without appropriate precautions in a HCF with endemic MRSA or in area where there was an MRSA outbreak in the area worked • Have been MRSA colonised and whose control cultures are negative for 1 year after the control samples are cultured • Staff with non healing wounds 	<ul style="list-style-type: none"> • Consider screening if the staff member is to work in a ward/unit, eg. elective orthopaedics, where all patients have been screened and are known to be negative for MRSA
No increased risk of MRSA carriage	<ul style="list-style-type: none"> • Protected contact with MRSA colonised persons • HCW successfully treated for colonisation greater than 1 year ago and whose cultures have remained negative for a year • HCW whose cultures were negative following the last protected contact with an MRSA colonised person (samples should be cultured during the first 3 weeks of isolation) 	<ul style="list-style-type: none"> • No special measures are required

Decolonisation and clearing a patient of MRSA

MRSA decolonisation

The efficacy of a decolonising regimen will be dependant on the number of patient sites colonised with MRSA, presence of wounds, extensive skin lesions, gastrointestinal colonisation, foreign bodies eg. urinary catheters, percutaneous gastrostomy (PEG) tubes, haemodialysis lines.

Eradication of MRSA carriage is not always successful and it may persist for weeks or months after discharge. It is more difficult to clear patients with MRSA carriage in the throat, surgical wounds, intestinal and extensive skin lesion colonisation.

For MRSA decolonisation regimes, the Infectious Diseases/Clinical Microbiology specialist may prescribe a decolonisation program.

The decision to initiate a decolonisation regime will be based on:

- the susceptibility profile of the patient's isolates
- whether the patient is to undergo elective surgery or an invasive procedure
- whether the patient is to be, or has been, admitted to a high prevalence area
- whether the patient is to be, or has been, admitted to a very high risk or high risk functional area
- whether the patient will be an inpatient for more than two weeks
- whether the HCF can perform follow-up cultures on the patient to determine if the MRSA has been cleared.

Clearing a patient of a MRSA

Determining clearance of MRSA in a patient who was previously colonised or infected is a decision that should be done in consultation with either an Infectious Diseases/Clinical Microbiology specialist or ICP.

The following factors must all be identified and assessed prior to documenting that a patient is clear of a particular MRSA strain:

- there has been more than 3 months since the last positive MRSA specimen
- all the patient's wounds are healed ie. there are no signs or symptoms of a wound infection and there is no wound discharge
- the patient has no temporary invasive medical devices such as intravenous catheters or urinary catheters
- the patient has had consecutive negative screens from relevant screening sites on two separate occasions at least 3 days apart or two sets of screening swabs at least 3 days apart using a broth amplification technique
- the patient with MRSA colonisation has had no exposure to antiseptic body wash/soap for two weeks preceding the MRSA screening or to MRSA specific antibiotic(s) in the previous 3 months, including intranasal ointment
- the patient is no longer an inpatient in a very high risk or high risk functional area.

Risk categorisation of patient care areas

The complexity of services, staffing and casemix within each HCF is different. Risk factors for MROs are comparable within similar peer group HCF, however, some differences impact on MRO transmission and acquisition. These differences include ward design, availability of single rooms, accessibility of handwashing facilities, patient safety culture, number of immunocompromised patients, average length of stay.

The following table shows functional areas within a HCF categorised according to patient risk.

Very high risk	High risk	Moderate risk	Low/minimal risk
<ul style="list-style-type: none"> • ICU • HDU - if long stay patients • Neonatal ICU • Burns unit • Transplant units • Cardio-thoracic surgical unit • Orthopaedic surgical unit • Trauma (if a separate unit) • Haemodialysis unit • Haematology unit • Oncology unit • Major vascular surgery • Major abdominal surgery • Patients referred from HCF with endemic MRSA or high MRO colonisation rates • Patients transferred from nursing homes 	<ul style="list-style-type: none"> • General surgery unit • Urology unit • Neonatal nursery • Dermatology unit • Rehabilitation (Orthopaedic and Neurosurgical) 	<ul style="list-style-type: none"> • General medical unit • Paediatric unit • Rehabilitation • Gynaecology unit • Obstetric unit • Aged Care (some aged care HCF may be in a 'high risk' category) 	<ul style="list-style-type: none"> • Psychiatric HCF • Psychogeriatric unit • Developmentally Disabled Unit

Note: A 'functional area' has been defined as having a particular HAI or MRO colonisation risk associated with it within the HCF. Corresponding MRO prevention and control programs must be prioritised in either the highest risk functional areas or those patient care areas considered at-risk by the HCF.

Each HCF should perform a risk assessment for MRO infection and colonisation. The risk assessment should include:

- the number of 'at-risk' functional areas identified within the HCF
- admission trends for patients with risk factors for MRO infection and colonisation
- trends in MRO infection and colonisation rates/outbreaks
- accessibility of hand hygiene facilities and water-free skin hand solutions
- frequency, intensity and outcomes of environmental cleaning programs
- workforce issues eg, access to infectious diseases and microbiology expertise, staffing levels and HCW education programs

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- availability of antibiotic prescribing policies and adherence to those policies
- accountability and compliance with Contact Precautions
- facility design issues eg. availability of isolation areas/rooms with ensuite facilities
- information management issues eg. ability to track patient movement through a HCF, collection of patient details related to MRO colonisation or infection.

SENTINEL EVENTS AND OUTBREAKS

“Sentinel event” is used for those MRO infections and colonisations that occur infrequently and that may serve as a signal to investigate whether routine infection control practices and procedures that minimise occurrence of such infections and colonisations are in place and working adequately.

An “outbreak” occurs when the incidence of infections or colonisations is greater than the expected rate within a specific area over a defined period of time. The main goal of managing an outbreak is to prevent a further increase in the incidence of infection, and to identify factors, that may have contributed to the outbreak. This allows for the development and implementation of measures to prevent future outbreaks.

Examples of sentinel events and outbreaks that require investigation:

- an atypical cluster of MRO infections or colonisations eg. due to introduction of an new strain of MRSA (as shown by a different antibiogram or molecular type)
- death of a patient attributable to an MRO infection
- a healthcare associated MRO infection or colonisation in a HCF where MRO infections or colonisations occur rarely
- two or more patients in the same HCF with the same MRO typing (identified by microbiological typing)
- an increase in MRO rates at a HCF that are higher than the state average
- an increasing incidence of MRO infections or colonisations within a clinical area.

Sentinel events and outbreaks must be investigated to:

- determine the likely cause
- initiate corrective action
- feedback and communicate outcome
- evaluate interventions and strategies.

APPENDIX 1: SPECIMEN COLLECTION

The following information should be included with test requests

Patient information

- surname and given name(s) (or name code)
- gender
- date of birth
- address

Clinical details

Screening Program	Diagnostic Specimen
Clear identification as a 'screening swab'	Clinical signs and symptoms
Reason for screening	Date of onset of illness
Date of specimen	Date of specimen

Tests requested

- Culture and sensitivity (C&S)
- If screening for a specific MRO, clearly label, eg. 'MRSA screening', so that the appropriate culture techniques are applied
- Typing. If considered to be part of an outbreak, write '*outbreak – hold for typing*'

Swabbing technique

- Swabs should be moistened in the sterile swab transport medium, sterile water or saline
- Swabs should be rolled over the specimen area several times.

APPENDIX 2: EXAMPLE OF A DECOLONISATION PROTOCOL FOR MRSA

Relative contra-indications

The following clinical features make clearance procedures unlikely to succeed:

- active skin lesions or ulcers
- active skin infection eg. cellulitis or active boils
- repeated skin needling eg. insulin dependent diabetic, renal dialysis patient
- indwelling medical devices eg. urinary catheter, percutaneous endoscopic gastrostomy.

Consider prior to decolonisation

- antibiotic treatment for active staphylococcal infections
- suppressive prophylaxis for patients with frequent recurrent infection
- improving skin integrity, especially in areas of previous cellulitis through use of a skin care routine (see below)
- transmission from household contacts
- mupirocin resistance.

Decolonisation

Skin and hair

- Treat by washing with povidone iodine shampoo and 1% Triclosan or 2% chlorhexidine body wash every day for 5 days.

Nose

- Treat with mupirocin nasal ointment
 - apply 1cm on a cotton bud to the anterior nares, massaging gently around the inside of each nostril, not going too deep
 - ointment should be applied 3 times a day for 5 days only
 - application should then be discontinued and control cultures taken 48-96 hours afterwards
 - if cultures are still positive consult an Infectious Diseases/Clinical Microbiology specialist.

Throat carriage

- Consult Infectious Diseases/Clinical Microbiology specialist if a systemic antimicrobial therapy is chosen.

Relapsed cases

- increased risk of relapse if the patient has further antibiotics or a change in their condition
- check for compliance with treatment and skin care
- consider screening and treatment of asymptomatic household members
- re-screen and re-check mupirocin sensitivity.

Unsuccessful decolonisation

Decolonisation can be unsuccessful for a number of reasons, consult Infectious Diseases/Clinical Microbiology specialist.

After decolonisation treatment

- advise that there is around a 50% chance of clearance through one treatment
- assess microbiological clearance and symptoms
- arrange necessary follow up to assess clearance and need for re-treatment.

General information for patient following decolonisation

- avoid soap, soaking, scrubbing, rough toweling, baths
- reduce frequency of showering
- use a barrier cream on all abnormal skin areas prior to showering and immediately afterwards. Do not routinely use antiseptic soaps
- avoid other topical agents (cosmetics, antibacterials, creams other than prescribed steroid ones) entirely
- shaving - avoid razor shaving; use electric razor. At as minimum replace used razor and toothbrush.

APPENDIX 3: THE USE OF AN 'MRO FLAG' WITHIN ELECTRONIC PATIENT INFORMATION SYSTEMS

To facilitate the classification of MRO patients and to enable correct patient placement, ring fencing and implementation of Contact Precautions:

- a secure flagging system must be developed by each HCF for the identification of MRO patients. The flagging system can be either paper or electronic
- the classification system to be linked to specific infection control precautions and patient placement
- HCWs must be educated regarding the criteria used for the classification of MRO patients
- the ICP or designate is responsible for removing or maintaining the patient flagging system on those patients who have a history of, or cleared of, an MRO.

Example of MRO flag codes

Code	Description Acronym	MRO
E	ESBL	Extended Spectrum Beta Lactamase (ESBL) producing organisms.
EV	ESBL/VRE	Vancomycin-resistant Enterococcus
M	MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
ME	MRSA/ESBL	
MEV	MRSA/ESBL/VRE	
MR	MRSA/MRAB	Multi-resistant <i>Acinetobacter baumannii</i>
MV	MRSA/VRE	
R	MRAB	
RE	MRAB/ESBL	
REV	MRAB/ESBL/VRE	
RME	MRAB/MRSA/ESBL	
V	VRE	
VR	VRE/MRAB	
VRM	VRE/MRAB/MRSA	
Bc	<i>Burkholderia cepacia</i>	
Cd	<i>Clostridium difficile</i>	
O	Other MRO	

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- NSW MRO Expert Group
- NSW Health Committee Infection Prevention and Control (CHIPC)
- NSW Infection Control Coordinators Network (ICCN)
- NSW Sterilising and Disinfection Network (NSWSDN)
- Infection Control Professionals and Microbiologists/Infectious Diseases Physicians from all Area Health Services
- NSW Infection Control Association Inc

ACRONYMS

CA - MRSA	Community acquired methicillin-resistant <i>Staphylococcus aureus</i>
ESBL	Extended Spectrum Beta Lactamase
HAI	Healthcare associated infection
HCF	Healthcare facilities
HDU	High Dependency Unit
ICP	Infection Control Professional
ICU	Intensive Care Unit (Adult, Paediatric and Neonatal)
MRAB	Multi-resistant <i>Acinetobacter baumannii</i>
MRGN	Multi-resistant Gram-negative (bacteria)
MRO	Multi-resistant organism
MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
NORSA	Non-multiresistant oxacillin (methicillin)-resistant <i>Staphylococcus aureus</i>
VISA	Vancomycin Intermediate <i>Staphylococcus aureus</i>
VRE	Vancomycin resistant Enterococci

GLOSSARY

Antibiogram	The result of laboratory testing for the susceptibility of an isolated bacterial strain to different antibiotics
Antibiotic	A prescribed medication used to treat or prevent infection from bacteria
Antibiotic resistance	A property of bacteria that confers the capacity to grow in the presence of antibiotic levels that would normally suppress growth or kill susceptible bacteria. An organism is said to have become resistant to an antibiotic when the minimum inhibitory concentration (MIC) is significantly higher (> 4 times) than the susceptible parent strain or than the range of MICs found in the same species not previously exposed to that antibiotic.
Antimicrobial	A chemical agent that, on application to living tissue or by systemic administration, will selectively kill or prevent or inhibit growth of susceptible organisms. This definition includes antibacterials (including ionophores), antiprotozoals, antifungals, antiseptics and disinfectants, but excludes antineoplastics, antivirals, immunologicals, direct-fed microbials and enzyme substances.
Broad-spectrum antibiotic	An antibiotic effective against a large number of bacterial species; generally describes antibiotics effective against both Gram-positive and Gram-negative bacteria.
CA-MRSA	<p>Methicillin resistant <i>Staphylococcus aureus</i> (MRSA) infections acquired by persons who have not been recently hospitalised or had a medical procedure are known as community acquired MRSA (CA-MRSA) infections. CA-MRSA infections usually manifest as skin infections, eg. carbuncles and boils (but can also cause life-threatening pneumoniae and septicaemia) and they generally occur in previously healthy people</p> <p>CA-MRSA strains are generally susceptible to a wider range of antibiotics eg. they are usually susceptible to fluoroquinolones and trimethoprim/sulfamethoxazole. Some CA-MRSA isolates carry genes encoding toxins and other virulence factors (eg. Pantone-Valentine leukocidin) that predispose people to severe skin and soft-tissue infections and necrotizing pneumonia</p>
Carrier	A person who harbours a specific infectious agent (whether infected or colonised) and is a potential source of that infection. A carrier can be a source of infection for themselves and/or others
Carriage	A state of carriage (or colonisation) refers to the presence of a potential pathogenic organism without symptoms, or evidence of inflammation at a superficial site eg. anterior nares, rectum or skin, between skin folds (such as in the perineum or axilla)
Colonisation	Used interchangeably with carriage
Decolonisation	Decolonisation refers to treatment of colonised persons with topical and/or systemic antibiotics and/or other measures to eradicate the colonising organism
First, second, third generation cephalosporins	Structurally related subgroups of cephalosporin antibiotics that were developed sequentially in response to the development of resistance and consequently have increasingly broad spectra of activity
Gram-negative bacteria	<p>Bacteria that stain pink when undergoing the Gram staining process. These bacteria have a secondary outer membrane that prevents the dye from penetrating the cell. Common Gram-negative organisms are the enteric organisms eg. <i>Escherichia coli</i> and <i>Salmonella</i> species</p> <p>Gram-negative bacteria are commonly more resistant to antibiotics because their outer membrane impedes entry of drugs</p>

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Gram-positive bacteria	Bacteria that stain deep purple when undergoing the Gram staining process. These bacteria do not have a secondary outer membrane thus allowing the dye to penetrate and stain the cell. Common Gram-positive organisms eg. <i>Staphylococcus</i> and <i>Streptococcus</i> species
Gram stain	Gram staining is a practical method of differentiating bacterial species into two large groups based on the chemical and physical properties of their cell walls
Healthcare workers (HCW)	Both employees and other personnel affiliated with HCF
Healthcare associated infections (HAI)	Any infection that occurs during or after a healthcare encounter that was not present or incubating at the time of the patient's admission
Infection	<p>The results of the presence of harmful micro-organisms (eg. bacterium, fungus or virus), in the body. Infections can be acute or chronic</p> <p>Patients who are given empirical therapy for an MRO on the basis of clinical suspicion with no other evidence should not be classified as "infected"</p>
Infection Control Professionals	A HCW who is employed to be responsible for work within the infection control program. This program may include: policy development; infection control quality management; HAI surveillance; risk management; sentinel event and outbreak management; infection control education
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	Any <i>Staphylococcus aureus</i> isolate that is resistant to methicillin (and by inference also resistant to flucloxacillin, dicloxacillin and cephalosporins)
Multi-resistant organism (MRO)	A bacterium that is resistant to two or more commonly used antibiotics from different classes (to which it would not be expected to be susceptible)
 Multi-resistant Gram negative bacteria (MRGN)	
a) ESBL - producing <i>Enterobacteriaceae</i>	An organism identified as a member of the family <i>Enterobacteriaceae</i> (most commonly <i>Klebsiella</i> spp), which is resistant to third generation cephalosporins because of production of an extended spectrum beta-lactamase (ESBL) enzyme
b) Multi-resistant <i>Pseudomonas aeruginosa</i>	<i>Pseudomonas aeruginosa</i> isolates resistant to one or more aminoglycoside antibiotics and one or more anti-pseudomonal β -lactam
Non-multiresistant oxacillin (methicillin) - resistant <i>Staphylococcus aureus</i> (NORSA)	A MRSA isolate that is resistant to less than three members of the following classes of antibiotics: aminoglycosides, macrolides/lincosamines, tetracyclines
Other personnel	"Other personnel" are persons who are not permanently or temporarily employed by Public Health Organisations but may be contracted to work or be on clinical placement (agency HCWs, students and self-employed contractors, including Visiting Medical Officers)
Public Health Organisations (PHO)	An area health service, statutory health corporation or an affiliated health organisation in respect of its recognised establishments and recognised services as defined in the Health Services Act 1997

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"Ring fencing"	<p>The process of centralising a target patient population and the implementation of rigorous infection control measures for the prevention and control of MRO acquisition. Eg. All elective joint replacement surgery patients are admitted and cared for in a dedicated stand alone orthopaedic unit and patients with a known MRO such as MRSA may not be admitted to that area.</p> <p>The target population is 'protected' from MRO acquisition by ensuring that MRO infected or colonised patients are identified prior to admission and decolonised or nursed in another appropriate area of the HCF. New MRO cases within the unit are also identified through screening and are either isolated or transferred to another location</p>
Selection (of resistant bacteria)	<p>The process whereby exposure to an antibiotic kills or inhibits sensitive bacteria, thus allowing resistant bacteria to continue dividing and increase in number (amplify) relative to the sensitive bacteria (enrichment)</p>
Vancomycin intermediate <i>Staphylococcus aureus</i> (VISA)	<p>Strains of <i>Staphylococcus aureus</i> that have intermediate susceptibility to vancomycin</p> <p>While most staphylococci, including MRSA, are susceptible to vancomycin, some have developed reduced susceptibility. VISA cannot be successfully treated with vancomycin because it has a thickened cell wall that is believed to deplete the vancomycin available to kill the bacteria, but does not alter susceptibility to other drugs</p>
Vancomycin resistant <i>Staphylococcus aureus</i> (VRSA)	<p>Strains of <i>Staphylococcus aureus</i> that are resistant to vancomycin</p> <p>Vancomycin resistance is still a rare occurrence and has not been identified in any Australian patient</p>
Vancomycin resistant <i>Enterococci</i> species (VRE)	<p>Any <i>Enterococcus faecalis</i> or <i>Enterococcus faecium</i> isolate (not other <i>Enterococcus</i> spp.) that is resistant to vancomycin</p>

RELEVANT NSW HEALTH DOCUMENTS

This Policy should be read in conjunction with the following NSW Department of Health documents.

[Animals as Patients in Health Organisations – Infection Control Policy PD2007_033](#)

[Cleaning Services – Standards Guidelines and Policy for NSW Public Hospital](#)

[Infection Control Policy PD2007_036](#)

[Infection Control Program Quality Monitoring PD2005_414](#)

[Latex Allergy - Policy Framework and Guidelines for Prevention and Management PD2005_490](#)

[Lookback PD2007_075](#)

[Management of Reportable Infection Control Incidents PD2005_203](#)

[Oral Healthcare Settings – Infection Control Guidelines GL2005_037](#)

[Waste Management Guidelines for Health Care Facilities PD2005_132](#)

FURTHER READING

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