Management of multi-resistant organisms

1. Purpose

This Guideline provides recommendations regarding best practice for the management of patients colonised or infected with multi-resistant organisms (MROs). The management of these organisms requires a multi-faceted approach that incorporates the following strategies:

- Standard precautions
- Personal protective equipment (PPE)
- Antimicrobial stewardship
- Screening practices
- Cleaning practices
- Surveillance

In addition to the above strategies, facilities should have processes in place to clear patients of their MRO status utilising proven criteria.

2. Scope

This Guideline provides information for all employees, contractors and consultants within Queensland Health who are responsible for the management of multi-resistant organisms.

3. Guideline for the management of multi-resistant organisms

Transmission-based precautions

Transmission-based precautions are applied to patients suspected or confirmed to be infected or colonised with agents transmitted by the contact, droplet or airborne route. Transmission-based contact precautions are used when there is a risk of direct or indirect contact transmission of infectious agents.

In the acute care setting, the following measures should be utilised in addition to standard precautions:

- appropriate use of PPE (including gloves, aprons or gowns, masks and protective eye wear/face shield)
- patient dedicated equipment e.g. blood pressure cuff
- allocation of single rooms or cohorting of patients
enhanced cleaning and disinfecting of the patient environment and equipment
restricted transfer of patients within and between facilities
communication of patient status when patient’s care is transferred between service providers or facilities.

Isolation
The following recommendations are dependent on availability of rooms and the facility’s resources.

Acute settings:
A single-patient room is recommended for patients who require contact precautions. Rooms with ensuites are preferred. Other points relevant to patient placement include:
• keep patient notes outside the room
• keep patient bedside charts outside the room
• make sure rooms are clearly signed.
When a single-patient room is not available consultation with the facility’s infection control practitioner is recommended to assess the various risks associated with alternative accommodation options such as cohorting (see definition of terms).
Transmission-based precaution signage should identify the isolation room and include the necessary precautions to be adopted. Transmission-based signage is available from:

Sub-acute settings:
• patients should be permitted to participate in group meals and activities if draining wounds are covered, bodily fluids are contained, and the patients are directed to perform hand hygiene as per standard precautions.

Ambulatory therapy settings:
(for example, renal dialysis unit, oncology day therapy unit):
• patients do not require segregation in the waiting room
• the preferred placement of patients in these units is single room accommodation
• where single room accommodation is not available, provide patient treatment in an area with as few adjacent stations as possible (for example, at the end or corner of the unit)
• ensure alcohol based hand rub is available at the point of care
• clinical equipment and items such as examination couches/treatment chairs should be cleaned between patients as per the section: Environmental Cleaning
• remove excess stock from treatment areas prior to clinical care.

Outpatient clinics:
• Patients do not require segregation in the waiting room
• Contact precautions should only be required when physical examinations/procedures are being undertaken
• Clinical equipment and items such as examination couches/treatment chairs should be cleaned between patients as per the section: Environmental cleaning
• Remove excess stock from outpatient procedure rooms prior to clinical care.

Contacts:
• Screening the contacts of MRO patients should be undertaken in accordance with the section on screening, and one of the following options should be employed for the management of contacts, taking into account the availability of beds and isolation facilities and the risk of transmission:
  − isolate contacts in a single room with a dedicated ensuite until pathology results are available
  − cohort contacts in multi-bed bays with restriction of admission to unoccupied beds pending screening results.
• In facilities where the lack of availability of beds and isolation facilities makes compliance with the above options unachievable, infection control staff should undertake an assessment of the risk of transmission of MRO associated with not isolating contacts pending screening results.

Isolation prioritisation
When there are limited facilities for isolation of patients with a significant organism that requires contact precautions, competing factors will need to be considered and a risk assessment undertaken to determine prioritisation. The following expert opinion was provided for isolation room prioritisation amongst MROs and should be used in conjunction with a risk assessment:
• Carbapenem resistant Enterobacteriaceae (CRE)
• Clostridium difficile infection with diarrhoea (CDI)
• Vancomycin resistant enterococcus (VRE)
• Multi-resistant gram negative (MRGN) Acinetobacter species, e.g. A. baumannii and Pseudomonas aeruginosa.
• Extended spectrum beta lactamase (ESBL) producing *Klebsiella sp.*
• Methicillin-resistant *Staphylococcus aureus* (MRSA).

Please Note:
• isolation of ESBL *E-Coli* is no longer recommended (see appendix 1)
• geographic separation of VRE and MRSA patients is desirable
• cohorts should be created based on clinical diagnosis, microbiologic confirmation when available, epidemiology, and mode of transmission of the infectious agent
• it is not always appropriate to cohort patients with the same MRO species if they have a different resistance mechanism or phenotype.

Prioritisation for MRO isolation should also consider:
• Risk factors of the patient
  - current or recent (within 48 hrs.) incontinence of faeces or urine
  - urinary catheter
  - open or draining wound/s
  - compromised hygiene practices
  - enterostomies
  - coincident respiratory infection (MRSA only).
• Risk factor of the Significant Organism
  - relative persistence of the organism on environmental surfaces
  - pathogenicity given other risk factors
  - outbreak situation.
• Risk assessment of healthcare area
  - relative vulnerability of patient population (e.g. ICU, transplant, renal, burns units).

**Personal protective equipment**

**Aprons:**
• aprons should only be used in the care of patients with an MRO for patient care activities involving minimal patient contact. For activities involving extensive patient contact, staff should wear a gown (see gowns section).
• Staff wearing long sleeved shirts, suit jackets and jumpers (wearing this type of clothing for direct patient contact is not advised, long sleeved clothing should be rolled up above the elbow so as not to interfere with effective hand hygiene) are unable to utilise an apron and should wear a gown for all patient contact.
Department of Health: Guideline for the management of multi-resistant organisms

- Aprons should be worn as single use items, for one procedure or episode of patient care and should be discarded into waste after use.
- Aprons should be removed in the area where the episode of care takes place.¹

Gowns:
- gowns should be worn as single use items, for one procedure or episode of patient care.
- gowns should be removed in the area where the episode of care takes place¹
- disposable gowns should be discarded into waste after use
- non-disposable gowns should be placed in a linen skip to be sent for laundering after use
- a gown is to be put on prior to entering the patient environment.
The gown should include full coverage of arms and body front, from neck to mid-thigh or below if staff will be performing patient care activities involving extensive patient contact. (Extensive patient contact is described as direct contact with the areas not covered by the apron, for example, contact with staff forearms. Examples of extensive patient contact are providing cares such as dressing large or complex wounds; hygiene cares for incontinent patients; hygiene cares or pressure area care when a patient is fully dependant; urinary catheter cares).

Gloves:
- perform hand hygiene and wear clean non-sterile gloves prior to entering the patient’s environment
- gloves should be worn as single use items
- gloves should be changed and hand hygiene performed between different care/treatment activities for the same patient
- remove gloves and perform hand hygiene upon exiting the patient’s environment.

Visitors of patients on contact precautions:
- all visitors should be directed to perform hand hygiene prior to contact with the patient’s environment and upon exiting the patient’s environment
- PPE is not required unless the visitor is providing direct care⁵
- visitors intending on visiting more than one patient should be directed to visit the patient with an MRO last or to wear a plastic apron in the patient’s environment
- during outbreaks/periods of increased prevalence, local procedures should be reviewed and visitor precautions altered as necessary by the infection control practitioner.
Antimicrobial stewardship

Inappropriate use of antibiotics provides favourable conditions for resistant bacteria to emerge, multiply and persist, therefore there is a need to optimise the way antibiotics are used and prescribed. As resistance is increasing the development of new antimicrobial agents is declining so it is critical that the antimicrobials that are still effective are used wisely and judiciously. Facilities should ensure that they have a local antimicrobial stewardship program in place to encourage appropriate prescribing and prudent use of antibiotics.

Screening of MROs

As a minimum standard to reduce the risk of transmission of MROs, the approach to screening outlined in Table 1 is recommended.


<table>
<thead>
<tr>
<th>Organism</th>
<th>Suggested Targeted Screening</th>
<th>Frequency of Screening</th>
<th>Screening Sites</th>
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<tbody>
<tr>
<td>MRSA</td>
<td>• Interhospital transfers</td>
<td>Screen on admission</td>
<td>Nose and groin</td>
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<tr>
<td></td>
<td>• Transfers from long term care facilities</td>
<td></td>
<td>Clinical specimens (wounds, catheter urine, respiratory, other as clinically indicated)</td>
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<tr>
<td></td>
<td>• Patients who are known to have previously been infected or colonised with MRSA who meet the clearance criteria</td>
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<tr>
<td></td>
<td>• Patients with chronic wounds</td>
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<tr>
<td></td>
<td>• Patients from locales or populations where community-acquired strains of MRSA are prevalent(^1)</td>
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</table>
### VRE

<table>
<thead>
<tr>
<th>High risk units:</th>
<th>Screen on admission, weekly thereafter and on discharge¹</th>
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<tr>
<td>- Intensive care unit</td>
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<tr>
<td>- High dependency unit</td>
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<tr>
<td>- Spinal unit</td>
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<tr>
<td>- Burns unit</td>
<td></td>
</tr>
<tr>
<td>- Patients with planned prosthetic surgery (joint replacement, cardio-thoracic surgery).¹</td>
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</table>

In these high risk units or patient populations, screen on admission (whether this be admission from the emergency department / community, transfer from another unit within the facility, or inter-hospital transfer), weekly thereafter and then on discharge.¹

### In ambulatory haemodialysis units or ambulatory haematology/oncology units

Screen every 3 months.

For contacts of VRE positive patients, one swab should be collected.

Stool, rectal or perianal swabs are generally considered a sensitive method for detection of VRE.
| CRE | • All patients directly transferred from any overseas hospital  
• Any patients who have been admitted overnight to any overseas hospital or who have resided in an overseas residential aged care facility within the last 12 months  
• People who are identified as a CRE contact during their hospitalisation and have not been shown to have post-contact negative cultures. | On admission  
On admission  
For contacts of CRE positive patients, one swab should be collected | Faeces, rectal or perianal swabs*. Also consider screening open wounds and/or urine² |
|---|---|---|---|
| Multi Resistant Acinetobacter spp. and Multi-resistant Pseudomonas aeruginosa | • High risk units:  
- Intensive care unit  
- Solid-organ transplant unit  
- Specialty centres (e.g. burns, neurosurgery)¹ | Screen on admission, weekly thereafter and on discharge | Groin Clinical specimens (wounds, catheter urine, respiratory, other as clinically indicated) |
| ESBL | Not recommended unless an increase in clinical isolates is identified. In such instances, facilities may wish to consider the reinstitution of screening. | | |

* The Pathology Queensland website should be used to check the preferred screening sites for your local lab: [http://cassapps1.health.qld.gov.au/testlistpq/default.aspx](http://cassapps1.health.qld.gov.au/testlistpq/default.aspx)

# A contact is a patient who has shared the same room for more than 24 hours with a patient colonised or infected with an MRO.⁷
Clearance of MROs

A patient who has been cleared of MRO colonisation should only be re-screened if required as per the section on Screening. A patient who has been cleared of MRO colonisation who subsequently returns a positive culture from either a clinical isolate or a screening specimen should be considered to be MRO positive again. The process for clearance should then be recommenced as below.

The following criteria should be satisfied prior to certifying that a patient has cleared an MRO:

**MRSA, MRGN and ESBL producing organisms:**

- more than three months elapsed time from the last positive specimen¹
- all wounds are healed, no indwelling medical devices present¹
- no exposure to any antibiotic or antiseptic body wash for at least two weeks prior to screening¹
- in the case of MRSA, no exposure to specific anti-MRSA antibiotic therapy in the past three months¹.

Consecutive negative screens from screening sites (refer to Table 1 for required screening sites) on two separate occasions. The screening swabs must be separated by a minimum period of one week. The period over which these swabs are collected should not be less than three weeks¹, but may be over a period of months.

Facilities may consider using the evaluation of a single set of screening swabs with a broth amplification technique for clearance of patients. This process should be based on local factors and agreements with local laboratories.

**VRE**

Some patients with VRE may appear to ‘clear’ VRE with time but may relapse with the use of antibiotic therapy.¹ In instances when clearance of VRE is to be undertaken, an assessment of the risk should be performed. The following information should be used to inform the assessment of risk. Patient groups with the highest risk of infection with VRE are:

- Haemodialysis patients
- Oncology/haematology patients
- Solid organ transplant patients
- Intensive care unit patients.
Patient groups with the highest risk of long-term carriage of VRE and recurrence/relapse of carriage of VRE are:

- renal/haemodialysis patients and long-term acute care patients
- those that have had antimicrobial therapy administered recently, particularly if administered within one month.

The following strategies may assist in managing the risk:

- exclude renal/haemodialysis patients and long-term acute care patients from clearance of VRE
- exclude patients being housed in high risk units from clearance screening.

In addition to an assessment of the risk, the following criteria should be fulfilled prior to commencing the process of VRE clearance:

- at least 6 months since the last positive VRE specimen
- a period (at least 6 months) free from the following:
  - hospitalisation (acute episode)
  - antimicrobial therapy
  - invasive devices.

Clearance screening should be undertaken according to the following:

- three consecutive negative stool, rectal or perianal swabs separated by a minimum period of one week per negative specimen.

CRE

The following guidance is provided by the Australian Commission on Safety and Quality in Healthcare: Recommendations for the control of Multi-drug resistant Enterobacteriaceae available from:


- In the absence of high quality evidence to show that clearance of colonisation will occur, many recommend a cautious approach that requires contact precautions for all future inpatient care for patients with a history of CRE colonisation or infection.
- Some health services may elect to assess and screen low-risk patients with previous CRE infection or colonisation upon readmission, with the aim of ‘clearing’ a patient of CRE colonisation. Any patient that is deemed ‘cleared’ should be monitored to identify any relapse in detectable CRE colonisation. Assessment of CRE ‘clearance’ should only be done in consultation with the HHSs infection prevention and control service and a clinical microbiologist or infectious diseases physician.
Environmental cleaning

Following a review of the literature and on the advice of the CHRISP expert advisory group (CEAG) in September 2013, it is recommended that all cleaning of rooms and equipment of patients with an MRO is undertaken using a 1000 ppm available chlorine solution or impregnated wipe. The process should involve either:

- a physical clean using a combined detergent and 1000ppm available chlorine solution or impregnated wipe (2-in-1 clean) i.e. a combined detergent/available chlorine solution or impregnated wipe could be used if this process involves mechanical/manual cleaning
- a physical clean using detergent followed by a chemical disinfectant (2-step clean) i.e. clean with detergent, then clean with 1000ppm available chlorine solution or impregnated wipe.

Daily cleaning of a patient's room

Minimum frequencies for routine cleaning are outlined in the Queensland Health – Cleaning Services Operational Guidelines. All patient surrounds and frequently touched surfaces (such as, bedrails, trolleys, bedside commodes, doorknobs, light switches, tap handles and ensuite facilities) should be cleaned daily as a minimum.

Patient care equipment

Patient-care devices (e.g. electronic thermometers, sphygmomanometers, glucometers, hoists, pat slides) may transmit MROs if devices are shared between patients. To reduce the risk of transmission, disposable or patient dedicated equipment is preferred. Equipment that is unable to be dedicated should be cleaned and disinfected after use, allowed to dry and stored clean.

Discharge cleaning of inpatient rooms

Cleaning should not commence until all the patient’s personal effects have been removed from the room. Privacy curtains and window curtains if present should be removed for laundering prior to cleaning commencing.

The room and all patient care equipment remaining in the room should be physically cleaned. All furniture, patient equipment items, horizontal surfaces, frequently touched surfaces (e.g. light switches and call buttons) and bathroom / toilet / shower area should be thoroughly cleaned. All consumables that are unable to be cleaned should be discarded.
Cleaning of ambulatory areas

All patient care equipment items that the patient comes into contact with should be cleaned with a combined detergent and 1000ppm available chlorine solution.

If patients with an MRO have used the waiting areas of renal dialysis and day therapy areas, these areas do not require cleaning in addition to the routine cleaning practices for the area.

Surveillance and outbreak management


Infection control staff should review surveillance data on a regular basis to determine if there has been an increase in cases, or transmission between cases. If an increase in cases or transmission is identified, infection control staff should consider outbreak control measures including intensifying active screening. Infection control staff in smaller facilities that see a small number of cases should consider one clinical isolate or infection significant enough to warrant further investigation.


Colonised staff

Routine or outbreak screening of staff should not be undertaken. There may be circumstances when a healthcare worker has been identified as being colonised or infected with an MRO in the course of receiving health care, either at their own facility or elsewhere. If a healthcare worker is identified as colonised with a MRO, advice should be sought from an appropriate infection control or infectious diseases professional, on an individual basis, to assess the risk of transmission to patients when the healthcare worker returns to work.

References


Appendix 1: ESBL Escherichia coli literature

World-wide there has been an increasing emergence of antibiotic resistant organisms. The increasing numbers of these have resulted in additional demand for resources particularly isolation rooms. Many facilities do not have the resources available to isolate all multi-resistant organisms (MROs) and cohorting patients is not always possible if organism or strains are not the same. In addition, isolating patients has been associated with adverse patient outcomes such as depression and reduced contact with attending physicians, it also may not be cost effective and should be avoided where possible. Most of the evidence that supports the use of contact precautions for Extended-Spectrum Beta-Lactamase (ESBL) producing enterobacteriaceae comes from studies of ESBL Klebsiella pneumoniae (K. pneumoniae) and therefore may not be necessary for ESBL producing Escherichia coli (E-coli) outside of outbreak situations.

The CHRISP Expert Advisory Group (CEAG) discussed ESBL E-coli at the 4 September 2013 meeting and determined that there is sufficient evidence in the literature to warrant the recommendation to cease the routine isolation of patients with this organism. This advice applies only to ESBL E-coli, therefore patients with other ESBL-producing enterobacteriaceae including K. pneumoniae should continue to be isolated.

The following outlines some of the literature that is available regarding this recommendation:

An 11 year observational cohort study undertaken by Tschudin-Sutter et al aimed to estimate the rate of spread of ESBL-producing Enterobacteriaceae in a tertiary care-centre. The most commonly identified ESBL producing Enterobacteriaceae in index patients was E-coli (73.1%). Screening was undertaken on patients who had contact with the index cases for greater than 24 hours prior to identification of colonisation or infection. Specimens from these contact patients that identified ESBL producing Enterobacteriaceae underwent further testing using pulsed-field gel electrophoresis (PFGE), this testing confirmed definite transmission of ESBL E-coli in 2/133 contact patients (1.5%). In both of these cases the contact patients had no signs of clinical infection and were determined to be colonised. The findings therefore demonstrate that exposure to an ESBL E-coli index patient did not lead to a single infection in more than 300 000 patients during a greater than 10 year period. Having screened contact patients, the outcome also demonstrates low levels of transmission when using standard precautions only. The authors suggest that applying a policy of standard precautions for managing ESBL E-coli is a reasonable step to balance the risk of transmission and allocation of resources.

Similar findings were also identified by Hilty et al in a prospective, longitudinal study that evaluated the transmission rates of ESBL E-coli and ESBL K. pneumoniae from hospital index patients to hospital contacts and to household persons. During the study period the overall transmission rate for ESBL E-coli was 4.5% corresponding to an incidence of transmission of 5.6 cases per 1000 exposure days.

A further prospective cohort study was undertaken by Gardam et al in a multi-organ transplant unit over an 18 month period. The study found that about one quarter of the patient population of transplant recipients were colonised with a multi-drug resistant Enterobacteriaceae (MDRE). Despite the substantial reservoir, transmission among patients was minimal, and infection secondary to transmission was non-existent despite
the absence of barrier precautions beyond what is recommended for standard precautions. 66/69 strains of the colonising MDRE were unique according to PFGE analysis, one E-coli was common to two patients. The findings support the concept that the resistant strains predominately arose from the patient’s own flora because of selective antibiotic pressure rather than through patient-to-patient transmission.

The use of contact precautions including isolation is based on the assumption that environmental surfaces play a role in transmission\(^1\), therefore the role that the environment plays in regards to transmission of ESBL E-coli to patients was also reviewed. A retrospective cohort study was undertaken by Ajao et al to quantify the association between admission to an ICU room most recently occupied by a patient positive for ESBL producing gram negative bacteria and the acquisition of infection or colonisation with that pathogen. Ajao et al found an absolute risk difference of only 2% and after adjusting for other variables the association between the prior room occupant’s ESBL status and acquisition of an ESBL-producing bacteria was attenuated and was found to be no longer statistically significant\(^5\). Ajao et al indicated that these findings were consistent with a similar but smaller study conducted in France.

The findings of Ajao et al is further supported by a prospective cohort study undertaken by Freeman et al to determine whether rates of contamination of the hospital environment are correspondingly higher for ESBL K. pneumoniae than ESBL E-Coli. During the study period samples were taken on weekdays from 8 surfaces in the room and bathroom of adult patients colonised or infected with ESBL E-coli or ESBL K. pneumoniae. The findings identified that patients with ESBL K. pneumoniae were more likely to contaminate their hospital room with viable ESBL organism than those patients colonised or infected with ESBL E-coli. The rate of environmental recovery for ESBL K. pneumoniae was 37/688 (5.4%) versus ESBL E-coli which was 2/456 (0.4%).

The results of these studies in relation to both patient-to-patient and environmental transmission of ESBL producing E-coli in non-outbreak situations within the hospital setting demonstrate that neither contributes significantly to patient acquisition of ESBL E-coli. Routine isolation of patients infected or colonised with this organism is no longer recommended. It is important however that these findings are only applied to ESBL-E-coli as other ESBL producing enterobacteriaceae may behave differently. The role of standard precautions remains important particularly hand hygiene and the use of personal protective equipment for procedures involving contact with body fluids.

References:

1. Freeman JT, Williamson DA, Anderson DJ. When should contact precautions and active surveillance be used to manage patients with multidrug-resistant Enterobacteriaceae? Infection control and hospital epidemiology. 2012; 33(7): 753-756.


Appendix 2: Chlorhexidine bathing of ICU patients

The CHRISP expert advisory group (CEAG) in September 2013 determined following a review of recent evidence that bathing intensive care unit (ICU) patients with chlorhexidine can reduce the incidence of both blood stream infections (BSI) and multi resistant organism (MRO) acquisition. The group determined that the practice does offer potential benefits.

A decision to implement chlorhexidine bathing should include a multi-modal approach that considers:

- cost per patient bed day
- MRO rates in ICU
- BSI rates in ICU
- hand hygiene rates in ICU
- use of the I-Care bundle for the management of particular CVLs.

Appendix 2 provides a summary of some of the literature that supports this recommendation and provides evidence that the strategy of daily chlorhexidine bathing of patients can reduce the incidence of healthcare associated BSI and MRO acquisition.

A multicentre, before-after interventional design study was undertaken by Climo et al (2009), in 6 ICUs. The study reviewed methicillin resistant Staphylococcus aureus (MRSA), Vancomycin resistant enterococcus (VRE) and BSI rates following the introduction of daily chlorhexidine bathing of patients. The results of this intervention demonstrated a 32% reduction in MRSA acquisition, a 50% reduction in VRE acquisition and a 73% reduction in VRE bacteraemias. A subsequent multicentre, cluster-randomized, cross over study undertaken by Climo et al (2013), involving daily bathing of patients with chlorhexidine wash cloths or a non-antimicrobial wash cloth provides further evidence to support the use of daily chlorhexidine bathing. The study undertaken in 9 ICUs and bone marrow transplant units in 6 hospitals found that during the intervention period the overall rate of MRSA and VRE acquisition was 23% lower than in the non-intervention period and that hospital acquired bloodstream infection rates were 28% lower. In addition the rate of central catheter associated BSIs was 53% lower.

Another before and after study was undertaken by Evans et al (2010) in a trauma ICU over a 12 month period. One of the main outcome measures used was rates of ventilator associated pneumonia (VAP), while the findings of this study demonstrated no reduction in the incidence of VAP there was a change identified in the microbiology from resistant to non-resistant organisms. There were fewer cases of VAP caused by multi-drug resistant organisms with a significant reduction in VAP caused by MRSA, with a trend towards reduced Acinetobacter baumannii. The authors also observed a significant change in MRSA colonisation during the chlorhexidine bathing period with a reduction from 69.3 to 23.3 cases per 1000 patient days.

In order to determine if the findings of studies in relation to benefits of daily chlorhexidine bathing in adults was also applicable to children a study was undertaken by Milstone et al (2013) in 10 ICUs in 5 children’s hospitals. The study was a cluster-randomised, two period crossover trial. It found that using 2% chlorhexidine impregnated cloths for daily
bathing reduced the children’s risk of bacteraemia by 36% when compared to the non-interventional group. It was also observed that 89% of bacteraemia’s in this group occurred in patients with central venous catheters, and of this group; those who were bathed with chlorhexidine had a 34% lower risk of bacteraemia. These findings are consistent with evidence that is available in regards to the benefits of daily chlorhexidine bathing of adult patients in ICUs.

In addition to these benefits several of the studies were also able to identify from their data that the effect of chlorhexidine use was greater with a longer length of patient stay in the unit. Climo et al (2013) not only identified that the risk of acquiring a primary BSI was significantly lower amongst patients bathed with chlorhexidine than those bathed with non-antimicrobial cloths but that the effect was greater amongst patients with a longer length of stay in the unit. This was also supported by the findings in a previous study by Climo et al (2009) who found that significant reductions in the acquisition of MRSA for patients with longer ICU stays were noted.

Concerns have been raised in regards to the potential for chlorhexidine to cause skin reactions amongst patients. The previously discussed studies found that this was not a serious issue in their populations. Climo et al (2013) found that the incidence of reactions among patients assigned to chlorhexidine bathing was 2.0% as compared with 3.4% among those assigned to bathing with the control product. Following investigation of these all of the skin reactions were considered to be unrelated to the bathing intervention. Further to this Evans et al (2010) identified only 2 rashes during the period of chlorhexidine use, both of which were attributed to antibiotic therapy and resolved without intervention. The study by Milstone et al (2013) regarding children also found that chlorhexidine bathing of patients was well tolerated in their patient group with a crude incidence of chlorhexidine related skin reactions of 1.12 per 1000 days exposed.

The introduction of daily chlorhexidine bathing of both adults and children in ICUs has been shown to be a simple, safe and effective strategy to reduce the risk of patient acquisition of MROs and BSIs. Furthermore there is some evidence to suggest that those patients who are longer term ICU patients may gain even greater benefit from this strategy. Implementation of this strategy should not however be considered a replacement for contact precautions and further research is required before this strategy can be recommended for routine patient management outside of the ICU area.

References:


Appendix 3: Additional resources

Healthcare associated infection consumer factsheet:

MRSA
Consumer factsheet:

VRE
Consumer factsheet:

CRE
Information sheet for patients and visitors:

Information sheet for clinicians:

USA Agency for Healthcare Research and Quality: CRE Control and Prevention Toolkit:
http://www.ahrq.gov/cretoolkit
4. **Review**

This Guideline is due for review on: 25/08/2016

**Date of Last Review:** 13/06/2012

**Supersedes:** Screening and clearance of multi-resistant organisms and Vancomycin resistant *Enterococcus* (VRE) guideline

5. **Business Area Contact**

Centre for Healthcare Related Infection Surveillance and Prevention (CHRISP).

6. **Definitions of terms used in the policy and supporting documents**

<table>
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<tr>
<th>Term</th>
<th>Definition / Explanation / Details</th>
<th>Source</th>
</tr>
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<tbody>
<tr>
<td>ESBL</td>
<td>ESBLs are Gram-negative bacteria that produce an enzyme; beta-lactamase that has the ability to break down commonly used antibiotics, such as penicillins and cephalosporin’s and render them ineffective for treatment.</td>
<td>Provincial Infection Control, Newfoundland Labrador. <em>Extended-spectrum Beta-Lactamase (ESBL) producing bacteria: Fact sheet for healthcare professionals.</em> Access date: 18/03/14</td>
</tr>
<tr>
<td>Multi-resistant Gram-Negative Organisms</td>
<td>These gram-negative bacteria are resistant to multiple drugs and are increasingly resistant to most available antibiotics.</td>
<td>Centres for Disease Control and Prevention (2010) <em>CDC Activities to Prevent Gram-Negative Bacterial Infections in Healthcare Settings</em> <a href="http://www.cdc.gov/ncidod/dhqp/gram-negativeBacterial.html">http://www.cdc.gov/ncidod/dhqp/gram-negativeBacterial.html</a>. Access date: 10/06/2011</td>
</tr>
<tr>
<td>Multi-resistant organisms</td>
<td>In general, bacteria that are resistant to one or more classes of antimicrobial agents and usually are resistant to all but one or two commercially available antimicrobial agents.</td>
<td>National Health and Medical Research Council (2010) Australian Guidelines for the Prevention and Control of Infection In Healthcare <a href="http://www.nhmrc.gov.au/glossary">http://www.nhmrc.gov.au/glossary</a>. Access date: 10/06/2011</td>
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</table>
Vancomycin Resistant Enterococci (VRE)

Enterococci are Gram-positive bacteria that are naturally present in the intestinal tract of all people. Vancomycin is an antibiotic to which some strains of enterococci have become resistant. These resistant strains are referred to as VRE and are frequently resistant to other antibiotics generally used to treat enterococcal infections.

Carbapenem resistant Enterobacteriaceae (CRE)

CRE, which stands for carbapenem-resistant Enterobacteriaceae, are a family of bacteria that are difficult to treat because they have high levels of resistance to antibiotics. Klebsiella species and Escherichia coli (E. coli) are examples of Enterobacteriaceae, a normal part of the human gut bacteria, that can become carbapenem-resistant.

### 7. Approval and Implementation

**Approving Officer:**
Dr Jeannette Young  
Chief Health Officer

**Approval date:** 08 September 2014  
**Effective from:** 08 September 2014

### Version Control

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