PICNet
PROVINCIAL INFECTION CONTROL NETWORK OF BRITISH COLUMBIA
A program of the Provincial Health Services Authority

Antibiotic Resistant Organisms
Prevention and Control Guidelines for Healthcare Facilities

Reference Document for use by Health Care Organizations
for Internal Policy/Protocol Development

Revised from Provincial Infection Control Network Antibiotic Resistant Organisms Prevention and Control Guidelines 2008

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Acronyms

ABHR	Alcohol based hand rub
ARO	Antibiotic Resistant Organism
BCCDC	British Columbia Centre for Disease Control
CADTH	Canadian Agency for Drugs and Technologies in Health
CHICA	Community and Hospital Infection Control Association, Canada
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CRE	Carbapenem Resistant *Enterobacteriaceae*
DIN	Drug Identification Number
ESBL	Extended Spectrum Beta Lactamase
HCP	Healthcare provider
ICP	Infection Control Practitioner/Professional
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
MRSA	Methicillin Resistant *Staphylococcus aureus*
NICU	Neonatal Intensive Care Unit
OR	Operating Room
PACU	Post Anaesthetic Care Unit
PIDAC	Provincial Infectious Disease Advisory Committee, Ontario
PHAC	Public Health Agency of Canada
PICNet	Provincial Infection Control Network of British Columbia
PPE	Personal Protective Equipment
RCF	Residential Care Facility
VRE	Vancomycin Resistant *Enterococcus*
WH&S	Workplace Health and Safety

1 Introduction

The prevalence of antibiotic resistant organisms (ARO) has been increasing, and new organisms are developing resistance while known resistant organisms are changing. Some of these organisms have the ability to cause serious health issues, while others rarely seem to cause infections. Infections caused by AROs are often difficult to resolve[1]. Antibiotic resistant organisms lead to higher costs for the healthcare system and increased suffering for affected individuals [2-6].

2 Purpose

These guidelines are intended as a framework for managing individuals colonized or infected with AROs in healthcare settings. The guidelines may be modified to accommodate the specific needs of the various patient/resident/client populations and services provided in BC healthcare facilities. We recommend that these guidelines be used to harmonize infection control practices throughout BC. Because patients often utilize more than one facility within a health authority, or cross health authority boundaries, a consistent approach will reduce confusion and promote a better understanding by all of the required practices. A provincially harmonious approach to the control of AROs across BC is attainable if each healthcare region develops its own ARO infection control policies and procedures based on these guidelines.

These guidelines are not regulatory, and the recommendations are not fixed protocols that must be followed. Responsible clinicians' judgment on the management of patients remains paramount. Individual treatment plans should be developed that are tailored to the specific needs and circumstances of the patient/resident/client while protecting other patients/residents/clients and staff.

While direct care staff are welcome to read and use this document, it is not intended to supersede direction given by their local Infection Control Practitioner or their Health Authority Infection Prevention and Control program.

3 Scope

The scope of these guidelines is to address measures that prevent acquisition and control transmission of antibiotic resistant organisms in healthcare settings. Since antibiotic resistance is a dynamic topic and knowledge will change over time as new information emerges, this document will be updated to reflect these changes. These guidelines deal specifically with Methicillin Resistant *Staphylococcus aureus* (MRSA), Vancomycin Resistant *Enterococcus* (VRE), Extended Spectrum Beta Lactamase (ESBL) - producing organisms, and Carbapenem Resistant *Enterobacteriaceae*(CRE) as they are the most epidemiologically important AROs at this time. Specific treatments for ARO infections are not within the scope of this document.

4 Literature Search Strategy

A very extensive search of the literature published over the past seven years was undertaken. To enhance this process, two organizations assisted PICNet.

The Canadian Agency for Drugs and Technologies in Health (CADTH) performed an extensive literature search, summary, and critical appraisal of clinical evidence of screening, isolation, and decolonization strategies for MRSA organisms. CADTH also agreed to perform an extensive literature search and systematic review of the clinical evidence on screening, isolation, and decolonization strategies for VRE- and ESBL-producing organisms as well as on health services impact. A detailed summary of their processes can be found in their reports on the PICNet web page http://www.picnet.ca/picnet-publications/2/reports-from-other-organizations.

The College of Registered Nurses of British Columbia health librarians performed an extensive literature search on other multi-drug resistant organisms, including *Pseudomonas aeruginosa, Acinetobacter baumannii,* and *Stenotrophomonas maltophilia* using EBSCO's CINAHL Plus with Full-Text database (which includes indexing for the Cochrane Database of Systematic Reviews), with additional searches in EBSCO's DynaMed point-of-care database, and the National Library of Medicine's PubMed database. Using the same search strategy, they also performed a literature search for research questions not taken on by CADTH (e.g. risk factors for carriage, length of carriage, risk of infection for those colonized) for all antibiotic resistant organisms. Lists of abstracts were sent to PICNet for review. A total of 388 abstracts were reviewed, leading to a full review of 309 articles read from these sources.

PICNet is also alerted to new electronically published articles related to Infection Prevention and Control. These were continually scanned for recent studies and included when appropriate.

5 Methods

The revisions working group, in collaboration with CADTH, developed four main key questions and fifteen specific questions for the literature search and development of this document. Selected articles were organized onto key question spreadsheet, reviewed, and evidence -weighed by the revisions working group. The recommendations made within this guideline are graded based on the level of supporting evidence available, using the Public Health Agency of Canada (PHAC) rating scale for strength and quality of evidence (Appendix 1). The grading level assigned does not relate to the importance of the recommendation, but to the strength of the supporting evidence.

6 Background

6.1 Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Methicillin-Resistant *Staphylococcus aureus* (MRSA) are strains of *S. aureus* resistant to oxacillin, cloxacillin, and other semisynthetic antibiotics related to penicillin. They may also be resistant to tetracyclines, clindamycin, cephalosporins, macrolides, quinolones, and other antibiotics. MRSA causes a range of infections from mild/moderate skin abscesses and post-operative wound infections to more invasive diseases such as bacteremia and pneumonia. Treatment options for MRSA strains are both

clinically and economically challenging. Methicillin-resistant *Staphylococcus aureus* (MRSA) strains are the most clinically important ARO among the *staphylococci* species [7-9].

MRSA infections were historically associated with healthcare settings (HA-MRSA). However, community-associated MRSA (CA-MRSA) strains have emerged in recent years. These strains contain unique clones of *S. aureus* that often produce a toxin called Panton Valentine Leukocidin (PVL). CA-MRSA strains are genetically and clinically distinct from HA-MRSA, and have different resistance profiles [10]. This document refers to CA-MRSA as particular strains of MRSA that could be acquired either in the community or the hospital setting. In recent years these lines have blurred, and HA-MRSA and CA-MRSA strains are seen in both settings.

According to a BCCDC report (2010), MRSA has increased In British Columbia (BC) since 2008. In 2010, more than a quarter (27.8%) of *Staphylococcus aureus* isolates tested by laboratories that submitted data were Methicillin resistant. However, an overall decrease in their resistance to antibiotics other than beta-lactams was noted, which reflects an increase in CA-MRSA strains [11].

6.2 Vancomycin-Resistant *Enterococci* (VRE)

Enterococci have always had inherent resistance to many antibiotics, and can readily acquire resistance to others. VRE are *Enterococci* that have acquired resistance to Vancomycin (the drug of choice for treating multi-drug resistant *Enterococci* infections). The incidence of infections caused by VRE is very low [12, 13] and most common are wound infections and bacteremias. VRE is neither more pathogenic nor more virulent than susceptible *Enterococci* (i.e., it is not more likely to cause infection), nor does it cause more serious infections than other *Enterococci*. However, as with MRSA therapy, treatment of VRE infection is much more problematic due to the limited options [14].

6.3 Extended Spectrum Beta-Lactamase (ESBL)

ESBL is a bacterial enzyme with the ability to break down specific beta-lactam antibiotics (cephalosporins, penicillins). Furthermore, organisms producing this enzyme tend to harbour resistance to other antibiotics on plasmids, rendering treatment more complicated. ESBL may be produced by any Gram-negative bacteria that has acquired an ESBL containing plasmid, but is most commonly produced by *Escherichia coli* (otherwise known as *E. coli*) and *Klebsiella pneumoniae*. Bacteria producing an ESBL are resistant to antibiotic therapy with specific beta-lactams and any other antibiotics for which there is a resistance gene on the plasmid. These organisms usually live in a person's intestines; however, they can also live in moist wounds and in urine, and can cause infections. In most cases, a person's immune system is able to successfully resist infection with an ESBL -producing bacteria. However, people who become infected and have weak immune systems are at risk of antibiotic treatment failure. This includes neonates, children, the elderly, and people with chronic health conditions [15, 16].

6.4 Carbapenem Resistant *Enterobacteriaceae* (CRE)

The carbapenem group of antimicrobials provide an effective treatment option for severe Gram-negative bacterial infections when causative organisms are resistant to other classes of antimicrobials. Carbapenem resistance develops as a result of changes in the outer membrane of the organism or the

production of carbapenem-hydrolysing enzymes (carbapenemase). These enzymes are encoded by genes carried on mobile genetic elements such as plasmids, which can rapidly spread amongst related bacterial genera. Some organisms carry them in their genome, and are considered intrinsically resistant to carbapenems. To date, carbapenemases are most commonly found in *Escherichia coli* and *Klebsiella pneumonia*, but have been found in almost all members of the *enterobacteriaceae*. Identifying carbapenem resistance and distinguishing between these different mechanisms of resistance can be challenging for clinical microbiology laboratories. These organisms can cause a variety of infections, such as wound/surgical site, bacteremias, pneumonias, and urinary tract infections [17]. As with ESBL - producing organisms, most CRE also carry genes for resistance to multiple other classes of antibiotics, leaving few, if any, effective treatment options.

6.5 Other Multi-Drug Resistant Organisms

Carbapenemases, as well as other resistance factors, have also been identified in several species of Gram-negative bacilli commonly encountered in healthcare, such as *Pseudomonas aeruginosa, Acinetobacter spp.* and *Stenotrophomonas maltophilia.* Since some of these organisms are already ubiquitous in our environment, it is difficult to know whether transmission primarily occurs via environmental sources (e.g. inadequately cleaned equipment; water sources such as sinks) or on the hands of healthcare providers (HCPs). Current evidence suggests that both modes are possible. These organisms cause a variety of infections, including bacteremia, pneumonia, wound, and urinary tract infections [18-28].

6.6 Vancomycin Resistant *Staphylococcus aureus* (VRSA)

The first report of a VRSA isolate was in 2002. Since then, there have been only 12 such isolates reported in the USA, and a handful of individual cases reported around the world (Iran, India, France). Of the cases in which the details are known (n=13), two of the infections were serious (necrotizing fasciitis and osteomyelitis) and the remainders were skin and soft tissue, with one case of urinary colonization. None of the patients became critically ill. To date, there has been no evidence of intra-hospital spread, although all of the settings had infection control processes in place [29-31].

6.7 Colonization versus Infection

Colonization is the presence, growth, and multiplication of an organism in or on a body site, without signs and symptoms of infection. Infection refers to tissue invasion by an organism with multiplication, damage to the host, and overt signs and symptoms of infection (fever, increased white blood cell count, purulence, inflammation etc.). Individuals who are immunosuppressed may not exhibit overt signs such as fever.

7 General Principles for the Prevention and Control of Antibiotic Resistant Organisms

7.1 General Control Measures

It is recommended that each facility/region develop a comprehensive, strategic plan to detect, prevent and control infection and colonization with AROs. **A11** The following guidelines address general screening, precautions, and other measures used for the control of AROs when caring for colonized or infected patients in acute, long term, home, and community care settings.

Each health authority should utilize an active antibiotic stewardship program that monitors and ensures the appropriate use of antibiotics. **A11** Judicious use of antibiotics should also be emphasized in order to limit the increase and spread of antibiotic resistant microorganisms [32-35].

It is expected that there will be significant differences in infection prevention and control (IPC) approaches between acute care, residential, and home/community care settings with regard to AROs. It is impractical and unnecessary to implement the same degree of control measures in every setting across the continuum of care. There are significant differences in the types of care provided, the degree of patient risk associated with the setting, and what is currently known about the epidemiology of these organisms. Control measures need to be tailored to fit the particular setting.

7.1.1 Screening of Admitted Patients to Acute Care for ARO Risk Factors

It is recommended that acute care hospitals have a program of active screening for specific AROs for all admitted patients, which includes a screening questionnaire for risk factors, followed by cultures if indicated. **B11** [36, 37]The main goal for admission screening for AROs is to identify those patients who are colonized in order to prevent transmission of the organism to other patients. In several countries where MRSA is well controlled, admission screening is a key component of their control strategy [38, 39]. Ideally, this screening is completed as a part of the initial patient admission history and assessment or at least within 24 hours of admission.

Different regions of BC may have unique population demographics and environmental conditions that affect the epidemiology of ARO transmission. It is therefore at the discretion of each health authority to determine which patient populations are deemed higher risk and require screening cultures for specific AROs. Specific organisms or individual circumstances may also influence patient care decisions made related to controlling AROs. A transmission risk assessment is important, and includes:

- the patient's potential risk of transmission to others:
    - their symptoms (e.g. incontinence, ability to comply with hand hygiene, presence of open wounds, respiratory secretions)
    - amount of hands-on nursing care required
- area of hospital and services provided (e.g. general medical unit, ICU, burn unit, transplant unit).

7.1.2 Screening for MRSA in Acute Care Facilities

Each health authority should determine which of these risk factors are most relevant for the patient population they serve, and with the use of local data, determine which patients should be screened. Any or all risk factors should be considered for a screening program:

- history of previous MRSA colonization[40-43]
- any patient with a previous admission to an acute care facility. There is no conclusive evidence on exactly how long a hospital stay is necessary to acquire colonization; however, more recent studies suggest that it may be longer than previously believed (range 4-21 days)[40, 42, 44, 45]. The length of carriage is also highly variable, although the majority of recent literature found has studied a 12-month time frame [41-43, 46, 47].
- number of co-morbidities (e.g. COPD, HIV, CTD, diabetes, dialysis)[43, 46-48].
- previous antibiotics use (e.g. quinolones, cephalosporin, carbapenems)[44, 45, 49-51]
- patients who have recently (within the past year) been incarcerated, or live in shelters, dormitories or other group settings (e.g. work camp) where they live in close quarters **and** share bathrooms and/or personal items[52]
- elderly and/or functionally dependent on others to provide care[42, 43]
- patients who have participated in sports where there has been close contact (e.g. wrestling) or where equipment has been shared[53-55]
- individuals or household members of those who have a history within the past 6 months of non-healing skin infections such as cellulitis, wounds or boils[56-60]
- patients from long-term care settings, especially those with known risk factors (e.g. hemodialysis, chronic ventilation, skin breakdown, or history of antibiotic use)[41-43, 46, 47, 49].

7.1.3 Screening for VRE in Acute Care Facilities

Current literature reveals no compelling evidence to confirm or refute the usefulness of screening or use of additional precautions beyond routine practices for individuals *colonized* with VRE.

Previously recommended screening and containment measures were a result of expert opinion and consensus using the precautionary principle, as this was an emerging organism that was not well understood. Although some studies have shown that additional precautions may limit the spread of VRE colonization[61-63], the cost/benefit of this approach is debatable when compared to increased adverse events and increased incidence of reported depression in patients under isolation[64, 65], the low incidence of infections caused by VRE, the cost of screening and personal protective equipment, impact on bed utilization and health services, and increased healthcare provider time[66].

The following is a list of risk factors for colonization or infection with VRE:

- antibiotic use (e.g. cephalosporins, vancomycin, fluoroquinolone, meropenem) [67-70]
- preterm birth [71]
- previous admission to acute care [67, 72]
- functionally dependent upon others to provide care [70-72]
- contact with other colonized patients [70, 72, 73]

- elderly, medical fragility [43, 70, 72, 73]
- transfers from other hospitals [43, 72, 73].

Currently, expert opinion diverges on the utility of screening and containment measures for VRE, and some facilities are discontinuing previous strategies for some or all of their patient populations.

It is recommended that any health authority or facility considering the discontinuation of screening and containment practices for VRE follow the recommendations contained in the position statement "VRE Screening and Contact Precautions from the Community and Hospital Infection Control Association of Canada (CHICA)". **C111** A copy of this position statement can be found in Appendix 2. The key points of this statement advise that the following are undertaken prior to any change in screening/containment policies:

- epidemiologic investigation and risk assessment for any VRE infection specific to the facility; consultation with staff and client groups including high -risk wards/clinics
- discussion with risk management and bioethics
- consultation with patient relations and public affairs
- consideration of legal consultation and review of existing practice guidelines and evidence-based studies
- discussion with external stakeholders, including the health region
- an enhanced communication strategy, including multiple contingencies and the possible need to alter strategy in the future.

A recent (August 2012) review and discussion of literature on the control of VRE with a response to the proposed discontinuation of VRE surveillance and containment was published by Public Health Ontario Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control (PIDAC-IPC).

Facilities that choose to continue with VRE screening and containment should be aware that patients transferred from a hospital that has discontinued VRE screening and containment practices may be an unrecognized VRE reservoir. **C111** PIDAC recommends the following in these situations. A copy of this page of the document can be found in Appendix 3. In summary,

- receiving hospitals should monitor VRE colonization/infection rates in patients returning from these hospitals
- consideration might be given to managing these patients with pre-emptive isolation, pending screening results
- if routine pre-emptive isolation is not feasible (e.g., insufficient numbers of single rooms) then pre-emptive isolation should be considered for patients at higher risk of having acquired VRE in the referral facility (e.g., those who have received care in an ICU setting or transplant unit; or have had a longer length of stay overall).

Also recently released is a "Response to the Provincial Infectious Diseases Advisory Committee Review of Literature for Evidence-based Best Practices for VRE Control" paper by Gardem et al.[74]. Below is their conclusion:

> *"Our position remains that VRE control is a grey area, and that no definitive data or literature exist to prove either side of the argument for control versus no control. After long and measured consideration, our own experiences with VRE have led us to the conclusion that there is more risk inherent in VRE control measures, in terms of patient safety, than there is benefit. We feel this is a highly complex issue that requires open and transparent debate and discussion, as well as study. We have chosen to take the initial step in questioning VRE control measures and to centrally collect robust prospective data so that we can rigorously evaluate the impacts of our decision. As stated previously, there are key Canadian opinion leaders on both sides of this argument, so we are not alone or irresponsible in our opinions. Respectfully, we feel that the PIDAC review has not been sufficiently robust, inclusive and open to substantiate its position on the issue of VRE control. The literature supports our position as equally as PIDAC argues it supports theirs and the debate remains an active one."*

A review of the literature and the impact of the changed approach on VRE infection rates in facilities that have chosen to discontinue screening and isolation should be completed within the next three to five years. Should any compelling evidence of harm be found, then a plan to re-institute screening and containment strategies will be required. **C111**

7.1.4 Screening for ESBL in Acute Care Facilities

There is no compelling evidence nor is there consensus among experts on admission screening for ESBLs. Decisions about admission screening should be based on local epidemiology and consideration of high-risk groups. If screening and isolation are not routine, they may be considered to address a temporary outbreak in a specific unit and discontinued once control is achieved.

The following is a list of patients that have been identified in the literature as having a higher risk of colonization or infection with ESBL:

- frequent admissions to acute care[75-77]
- length of hospital stay[77-80]
- numerous invasive devices (urinary catheter, endotracheal tubes, central venous lines)[76-78, 80]
- infants and small children [79, 81-83]
- elderly and/or functionally dependent on others to provide care[77, 78, 84]
- recurrent infections[75, 78]
- frequent antibiotic use[76, 78-80, 84]
- collective housing, unhygienic living conditions [84]
- chronic conditions, co-morbidities [75-77]
- travel to high -risk countries [85, 86]
- household contacts [87-89]
- some residential care facilities [78, 90].

7.1.5 Screening for CRE in Acute Care Facilities

In the interests of patient safety, and using the precautionary principle, it is recommended that high - risk individuals are screened for CRE upon admission to acute care facilities. **B111**

Current literature suggests that identifying patients who are at high risk of colonization or infection with CRE, through active screening by rectal swab on admission to healthcare settings, is prudent. Preventing transmission of these microorganisms in acute healthcare facilities is important, as CRE infections are associated with increased morbidity, mortality, length of hospitalization, and healthcare costs [91]. There is a scarcity of data available on the effectiveness of measures, and recommendations rely heavily on expert opinion. More recent studies and outbreak investigation reports do find evidence of intra-hospital spread, and support the use of a comprehensive infection control strategy that includes screening of high -risk individuals[92-95].

The following is a list of patients that have been identified in the literature as having a higher risk for colonization or infection with CRE:

- travel to countries/areas with high rates (USA, Indian Subcontinent, Greece, Israel)[91, 94, 96]
- Individuals who have received medical care abroad in areas with high rates of CRE, especially those with[91]:
    - prior antimicrobial use
    - extended length of stay (time at risk)
    - severe illness
    - admission to the ICU
    - high procedure score
    - presence of wounds
    - recent transplantation.

7.1.6 Screening of New Admissions to Residential Care Facilities (RCF)

Routine screening for AROs is not currently recommended for residents of RCFs in BC. Each facility should base its decisions regarding admission screening for AROs on an individual risk assessment of each resident for the presence or absence of risk factors. Admission should not be denied or delayed by a RCF on the basis of colonization or infection with an ARO. If a resident is known to be colonized with an ARO, it should be included in their health history and documentation, as this information may guide antibiotic or other treatment choices and is required should they require admission to acute care.

7.1.7 Screening of New Clients in Home Care

Routine screening for AROs in clients new to home care is not currently recommended. There is no evidence to suggest that these individuals pose an increased risk to other clients if diligent routine practices are followed. If the client is known to be colonized with an ARO, it should be included in their health history and documentation as this information may guide antibiotic or other treatment choices, and is required should they require admission to acute care.

7.1.8 Re-culture of Previously Positive Patients to Prove Decolonization

If the decision to re-culture is made, obtain at least two sets of swabs taken from the sites in Table 1 *(on page 15)* ***at separate time intervals (at least a week apart). The patient should have completed all antibiotics and, although there is no evidence, the greater the time passed since antibiotic use would theoretically ensure that the results are more reliable. Health authorities should provide clear direction to staff on when to re-culture patients and have an established procedure.*** **C111**

The absence of an ARO on surveillance swabs does not unequivocally mean that it is not present. The organism may be present in numbers too small to be detectable. The decision to re-culture previously positive patients should be made on a regional or local basis in consultation with laboratory services and Infection Prevention and Control. For MRSA, VRE, and ESBL, studies suggest that there are different types of carriers: transient carriers who rapidly decolonize, and chronic carriers who require months or years to clear the organism [69, 85, 97-101].

For individuals colonized with MRSA, studies have shown that anywhere from 25–50% of patients became decolonized within four months[97-99]. One factor associated with a decreased time for carriage was the use of systemic antibiotics for an active MRSA infection. Factors associated with increased length of carriage included colonization in two or more sites; household contacts who were also colonized; chronic skin lesions/pressure ulcers; and chronic disease. For patients who remain hospitalized for an extended period of time or who are re-admitted frequently into acute care, the decision to re-culture for MRSA following treatment may be warranted.

For individuals colonized with VRE; recent studies, albeit with small sample sizes, suggest that possibly about 35–40% become decolonized within six months [69, 100]. Antibiotic use was identified as a factor associated with prolonged or re-current colonization.

For individuals colonized with ESBL, recent studies, albeit with small sample sizes, suggest that possibly 25–70% decolonize within three to eight months [101, 102].

7.1.9 Screening Patients After Exposure to AROs

In high -risk areas of acute care, such as ICUs, burn units, transplantation units, or cardiothoracic units, patients who were roommates of, or had close contact with, a known ARO positive patient should be considered potentially exposed and should have screening cultures performed. **C111** In low risk areas, screening of contacts may not be practicable as there are limited possibilities to intervene based upon results, and there is no point in screening if no action would be taken as a result of the information; however, this may provide information for re-admission and is at the discretion of the institution. Screening of contacts may, however, be of value in an outbreak situation.

An ARO may not be detectable by current laboratory methods until the microbial population has reached a sufficient level. One study [103] found that, on average, MRSA in exposed roommates was not detectable until 9–10 weeks after exposure. If the decision is made to screen contacts (e.g. roommates), then at least two sets of swabs are required, with one taken a minimum of seven days after exposure

(e.g. day 3 and day 8)[104]. If the exposed individual remains in hospital for a prolonged period of time, a further set of screening swabs at week 10 is suggested. Screening should also be repeated upon next admission. Use a transmission risk assessment to determine whether additional precautions should be instituted while waiting for screening results.

7.1.10 Swab Sites

If it is determined that culture swabs are warranted for MRSA, VRE, and/or ESBL, the table below illustrates the sites that are commonly recommended for swab collection.

Table 1: Sites for screening swabs

VRE	MRSA	ESBL and CRE
Rectal/stool	Anterior nares and at least one of the following:	Rectal/stool
Ostomy sites (if present)	Axilla, peri-rectal area, groin, throat or umbilicus (for newborns)	Urine
Open wounds/areas of skin breakdown/lesions (if present)	All invasive device insertion sites (e.g. central lines)	Any open wounds
	Ostomy sites (if present)	Ostomy sites (if present)
	Areas of skin breakdown/skin lesions/wounds (if present)	

8 Routine Practices

"Routine practices" is the term used to describe the system of IPC practices recommended in Canada. The use of routine practices is fundamental to the provision of patient/resident/client care in any healthcare setting.

Close attention to routine practices is the key to preventing transmission of all microorganisms, including AROs, in all healthcare settings.

The full description of routine practices is contained in the Health Canada Infection Control Guidelines, "*Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare*"[105] or "*Routine Practices and Additional Precautions in all Healthcare Settings"* by the Ontario Agency for Health Protection and Promotion[106]. A brief summary has been provided in Appendix 4 of this document.

9 Additional Precautions When Caring for ARO Positive Patients in Acute Care

9.1 Transmission Risk Assessment

Patients at increased risk of disseminating MRSA include:

- individuals with colonized tracheostomy and uncontrolled respiratory secretions
- individuals with respiratory infections
- individuals with wound or stoma drainage that is not contained by a dressing or appliance
- individuals with desquamating skin conditions (e.g. psoriasis, burn patients)
- individuals who are cognitively impaired (unable to comply with instructions)
- individuals who have poor hygiene and are non-compliant with instructions.

Patients at increased risk of disseminating VRE include:

- individuals who are at a high risk of soiling their environment (e.g. diarrhea, fecal incontinence)[107]
- individuals who have poor hygiene and/or are non-compliant with hand and general hygiene.

Patients at increased risk of disseminating ESBL or CRE include:

- individuals with respiratory infections, especially those with uncontrolled secretions
- individuals with wound or stoma drainage that is not contained by a dressing or appliance
- individuals who are at high risk of soiling their environment (urinary or fecal incontinence).

9.1.1 Timing of Implementation of Precautions

Use a transmission risk assessment to determine whether additional precautions are required while awaiting screening culture results. Otherwise, institute contact precautions as described below when positive ARO status is confirmed.

9.2 MRSA

In addition to routine practices, use contact precautions when caring for individuals infected or colonized with MRSA. **B11** This will aid in preventing transmission to other patients [37, 108]. Contact precautions include:

- gloves upon entering the room or patients bed space for any contact with patient or their environment
- gowns when providing care to patient or if skin or clothing may come in to contact with their environment
- if possible, dedicate any equipment (e.g. blood pressure cuff, stethoscope) to that patient; otherwise, clean and disinfect with a hospital-grade disinfectant prior to using with another patient.

Gloves and gowns must be removed and hands cleaned upon leaving the room or patient's bed space.

Routine practices recommend the use of a mask when caring for individuals who have a febrile respiratory illness. As well, a small number of studies support the use of a fluid-resistant mask when caring for a patient who has respiratory symptoms or a tracheostomy, and has MRSA identified in their sputum [109, 110].

9.3 VRE

Health authorities that choose to continue with screening and containment strategies for individuals colonized or infected with VRE should use contact precautions in same manner as used for MRSA. **C111**

9.4 ESBL

The value of using contact precautions when caring for patients colonized or infected with an ESBL organism is not clear, although may be of value in high -risk areas such as NICU, transplant units, ICU, etc.[111, 112] Use a transmission risk assessment to determine which patients require additional precautions.

9.5 CRE

There is a scarcity of data available on the effectiveness of measures for controlling CRE, and recommendations rely heavily on expert opinion. CRE infections are associated with increased morbidity, mortality, length of hospitalization, and healthcare costs [91], and recent studies and outbreak investigation reports do find evidence of intra-hospital spread [92-95, 113]. ***In the interests of patient safety and using the precautionary principle, it is recommended that contact precautions be used when caring for any patient known or suspected to be colonized or infected with CRE.*** **B111**

9.6 Other Multi-Drug Resistant Organisms Including VRSA

There is a scarcity of information regarding the ability of these organisms to spread; the mode of transmission; and the evolution of these organisms over time. It is recommended that each health authority, in consultation with Medical Microbiology and IPC, have a process for surveillance and containment when highly resistant isolates are identified. ***Use the precautionary principle and a***

transmission risk assessment to determine which patients, situations (e.g. one versus multiple patients), or care areas (e.g. ICU, burn units) are best served by additional strategies. This process may include use of contact precautions, screening of roommates, and conducting point prevalence studies if it appears that transmission is likely to have occurred. **B111**

9.6 Accommodation in Acute Care

Single rooms are preferred in the accommodation of ARO positive patients. New construction plans should comply with CSA standards regarding the number of single rooms in proportion to the size of facility. If there is a shortage of single rooms, then accommodation should be based on an individual transmission risk assessment of the patient.

If a single room is not available, patients known to be colonized or infected with MRSA or VRE may be cohorted with other patients after consultation with IPC. The following order of preference for cohorting should be used:

- patients with MRSA should be cohorted with other MRSA positive patients, and patients with VRE should be cohorted with other patients with VRE
- if clients/residents cannot be cohorted, they may, based on a case by case review, be placed with low-risk roommates and spatially separated as much as possible.

Patients with AROs should not share a room with:

- individuals who are immunosuppressed
- individuals who have open wounds or decubitus ulcers
- individuals who have urinary catheters, feeding tubes or other invasive devices
- individuals whose hygiene is compromised
- individuals who have debilitative or bed-bound conditions that require extensive “hands- on” care.

Patients with CRE should only be cohorted with those who have the same organism or plasmid (consult IPC or Medical Microbiology).

Information shared with the patient’s family or selected visitors should be done only with the patient’s permission. ARO status of any patient should not be shared with roommates.

If cohorting patients with AROs with patients that do not have AROs is unavoidable, there should be increased attention to effective environmental cleaning throughout the duration of the cohort [114]**.** **B111**

Each health authority should develop an algorithm for prioritizing the use of single rooms. **C111**

9.7 Operating Rooms and Post Anaesthesia Care Unit (PACU)

In short stay/daycare areas, additional practices should be implemented based upon a transmission risk assessment. An extensive literature search by the Canadian Agency for Drugs and Technologies in Health (CADTH) found no literature regarding the effectiveness of additional precautions in the operating room or post-anaesthesia recovery care unit for disease transmission by patients colonized with MRSA, VRE, or ESBL-producing organisms [36]. There are no additional practices required beyond the usual sterile techniques and personal protective equipment in operating rooms, unless a transmission risk assessment indicates a high risk.

In PACU, individuals known to be colonized or infected with an ARO should be cared for using contact precautions. **B11**

9.8 Accommodation in Residential Care

A patient's ARO status should have no bearing on whether they are admitted to a residential care facility. Patients should be admitted to the appropriate care setting based on their care needs. All facilities should have protocols in place to accommodate patients based on an individual transmission risk assessment.The decision for room placement for residents with AROs should take into consideration cognition, compliance, continence, and site(s) of colonization for all individuals in the room. Room placement should not use the specific ARO as criteria, but the resident's risk of transmission. If possible, patient or resident placement decisions should be made before the patient or resident arrives.

Placement choices for individuals with AROs include a single room, or sharing a multi-bed room with other residents also with the same or other AROs (cohorting), or sharing a multi-bed room with other persons not colonized. Regardless of room selection, adherence to routine practices is essential.
Placement decision should include the following considerations:

- the resident's room door does not need to be closed
- roommates and their families do not need to be advised of the resident's ARO status
- if a decision is made that a resident who is known to be colonized with an ARO is to share a multi-bed room with residents not known to be colonized, roommates should not have factors that increase the risk for acquiring infections (see list below)
- bed location within the room may reduce the risk of transmission of known and unknown AROs. Preferably beds should be located where there is easy access to the bed from all directions, without having to touch a neighbouring bed
- temporary relocation may be necessary if the status of patients or residents colonized with AROs changes in a way that increases the risk of shedding or transferring their bacteria.

Factors that increase the risk that a long term care resident may become infected with an ARO include:

- the presence of a surgical wound, decubitus ulcer, or other chronic wound
- debilitated and/or bed bound, and requires extensive hands on care
- the presence of invasive indwelling devices (intravascular lines, urinary catheter, endotracheal or tracheostomy tube, gastrostomy (feeding tube)
- recent antimicrobial therapy.

Circumstances that might lead to relocation include conditions that increase the risk of transmission of any pathogen such as desquamating skin conditions, uncontrolled diarrhea, uncontrollable wound exudate, or any condition that requires contact or contact/droplet precautions. Admission to a single room, or provision of one-to-one care, or other strategies solely for purposes of infection control, should only be considered after consultation with infection prevention and control.

9.9 Management in Home Health Care Services, Assisted Living Sites, and Group Homes

Routine practices, including regular hand hygiene and environmental cleaning, are the essential and primary infection control measures for all Home and Community Care clients at all times, including persons colonized or infected with an ARO. Any additional precautions should only be considered if a risk assessment indicates a high risk of transmission. Clients colonized or infected with an ARO may participate in all recreational and social activities, if well enough to do so. Open wounds or lesions should be covered with clean, dry dressings.

Teach, encourage, and remind clients who are able to participate in self-care the importance of hand hygiene, especially after using the toilet and before eating or preparing food. Clients who have difficulty in self-care should be assisted in washing their hands or using alcohol based hand rub (ABHR). Emphasize the importance of proper hand hygiene technique and the importance of hand hygiene for other household members of clients who are colonized or infected with an ARO.

In group home settings, there is no need to disrupt housing arrangements if a household member becomes colonized or infected with an ARO. Their ARO status is confidential information. Residents colonized or infected with an ARO may participate in all recreational and social activities. All residents of the household should be taught good hand hygiene technique and the importance of good personal hygiene.

10 Decolonization

10.1 Decolonization for MRSA

Decolonization therapy is the use of topical or oral antibiotics (topical mupirocin alone or in combination with oral antibiotics) plus or minus antimicrobial soap body washes to treat MRSA colonized patients for the purpose of reducing their bioburden. Decisions whether to treat MRSA colonized individuals with a decolonization protocol in an effort to eradicate MRSA are not straight forward. There are differing opinions and approaches towards policies and procedures regarding decolonization. The decision regarding decolonization must be individualized for each situation and each patient. Studies have reported up to 40% recurrence rates, and repeated therapy has resulted in the emergence of mupirocin -resistant strains [115].

There may be circumstances in which decolonization for a particular patient will be beneficial. There is emerging evidence that decolonization prior to surgery or other invasive procedures reduces the risk of

post-operative infection. Current studies support the use of screening and pre-operative decolonization for cardiac surgery [116, 117], major gastrointestinal surgery [118], and joint replacement surgery [119-121]. Facilities are encouraged to follow this literature and implement decolonization policies as appropriate for their activities.

10.2 Decolonization for VRE, ESBL & CRE

There is no clinically proven decolonization regimen to eradicate colonization with VRE, ESBL-producing organisms, or CRE. Infections with any of these organisms require treatment with the appropriate antimicrobial agent.

11 Environmental Cleaning

Resistance to antibiotics is not an indication for using more concentrated solutions of disinfectants for inactivation of AROs. Current disinfection protocols will be effective if they are diligently carried out and properly performed using friction (scrubbing) and conscientious cleaning of patient-care surfaces (e.g. bed rails), and frequently touched surfaces (e.g. hallway handrails), at least once daily. Processes for cleaning and disinfection should include selection of hospital appropriate solutions (DIN#); correct technique to remove soil; sufficient contact time for disinfectants; appropriate concentration of solutions used; use of damp dusting; working from clean to dirty areas; and eliminating the practice of re-dipping a cloth into the cleaning solution after use and using it on another surface. In addition, decluttering facilitates thorough cleaning. When any individual, regardless of colonization status, is transferred or discharged, all surfaces in their room should be cleaned and disinfected.

12 Linen and Garbage Disposal

Regular linen hampers may be used and soiled items may be treated as regular laundry. Double bagging is not required. Garbage from rooms with patients colonized or infected with an ARO does not require special precautions. Garbage should be handled in accordance with the facility's regular waste disposal policies.

13 Dishes and Utensils

An automated washing process (60 ^{o}C) or hand washing with water temperature of 44^{o}C [122] with regular dish detergent will effectively remove pathogens. Therefore, these items are not considered sources of infections and no special precautions are needed. It is not necessary to use disposable dishes for patients colonized or infected with an ARO.

14 Education

14.1 Education for Healthcare Personnel

Education for healthcare personnel regarding the epidemiology and specific precautions pertaining to ARO prevention and control should be developed to ensure that staff are educated appropriately and understand their responsibilities.

14.2 Patient Education

Patient education should cover routine hygienic practices for preventing the transmission of infections, such as hand hygiene, not sharing personal items, and cough etiquette.

Education should include an explanation of colonization/infection, the causative organism, what it means for their health status, the precautions being used, the rationale behind their use, and what their rights and responsibilities are. Patients should be encouraged to ask questions and have a process to express their concerns. Written information should also be provided.

14.3 Visitors

In the acute care setting, visitors should be instructed to use personal protective equipment if they are providing personal care to a patient on contact precautions. **C111** All visitors are expected to comply with hand hygiene and nurses' instructions. Instructions need to ensure that patient confidentiality is respected. An education pamphlet should be available for visitors.

15 Employment

Employment in any field or setting should not be denied on the basis of colonization or infection with an ARO. Routine pre-employment screening for AROs is not recommended.

15.1 Healthcare Providers

Healthcare providers (HCPs) who are carriers of antibiotic resistant bacteria are rarely implicated as the "cause" of an outbreak[123]. Colonization of HCWs is often transient, but may be ongoing [124]. Diligent attention to routine practices, especially hand hygiene, will significantly reduce any risk of transmission to others.

HCPs who are colonized with an ARO are generally asymptomatic carriers. If acute illness develops – for example, draining boils – the person should be managed according to current medical management recommendations and hospital policy specific to the illness. HCPs with open or draining wounds that cannot be covered (regardless of colonization status) should not work in direct patient care.

15.1.1 Screening Healthcare Providers

Identifying colonized HCPs through screening as part of an outbreak investigation should only be done at the direction of IPC and Workplace Health and Safety (WH&S), and in conjunction with the investigation of other possible sources of transmission. **C111**

Routine screening of healthcare providers is not recommended. Diligent use of routine practices is sufficient to minimize the risk of transmission. Screening cultures of HCPs, including students, physicians, and volunteers, should be considered only if specific HCPs have been epidemiologically implicated in the transmission of AROs [123]. Prior to proceeding with any HCP screening, a discussion between WH&S, IPC, diagnostic laboratories, and public health is recommended.

15.1.2 Work Restrictions

The need for work restrictions or removal from patient care duties while on treatment should be decided according to hospital IPC policy on a case-by-case basis with consultation with WH&S.

16 Pets

Policies regarding visiting pets should be made individually by each facility. It is not the sole jurisdiction of infection prevention and control as there are many other equally important elements that a pet policy needs to address (e.g. safety, allergies, etc.). A useful reference document regarding guidelines for animal-assisted interventions in healthcare facilities was recently published in the American Journal of Infection Control[125] by a collaborative North American expert group.

MRSA is emerging in pet populations throughout the world. The role of pets in transmission of MRSA is still unclear; however, recent evidence suggests that MRSA can be transmitted between persons and their pets. Reports of MRSA infection and colonization in pets have indicated that pets tend to be colonized with isolates that are consistent with clones that are predominant in the human population in their area. The similarity between pet and human isolates has led to speculation that pet MRSA is closely linked to human MRSA, and that the source of MRSA in pets may often be colonized humans [126, 127].

17 Discontinuing Precautions

It should be noted that the absence of MRSA/VRE/ESBL positive cultures from screening cultures does not unequivocally mean that the organism has been eradicated from the patient. The decision to discontinue precautions on “swab negative” patients who were previously positive should be made based on individual patient characteristics, transmission risk assessment, and institutional policies. Experience has taught us that patients may become re-colonized when exposed to antibiotics, or if their health condition worsens.[69, 85, 97-101] If precautions are discontinued, patients should continue to be monitored for any change in clinical status or treatment with antibiotics while they remain in the institution. Any change in clinical status or antibiotic therapy may warrant re-culturing. The room or patient’s bed area should be thoroughly cleaned when precautions are discontinued, even if the patient remains in the hospital.[122,123]

18 Surveillance

Surveillance is a critically important component of an infection prevention and control program. Surveillance identifies newly emerging pathogens, allows for the monitoring of epidemiologic trends (including detection of outbreaks), and is useful for measuring the effectiveness of interventions. Surveillance of AROs at the unit, facility, and health authority level should be based on local needs with the support of epidemiologists and IPC practitioners.

18.1 Surveillance Data

Surveillance data are used to set priorities and benchmarks, and to evaluate the effectiveness of IPC efforts. Specific local and regional objectives for ARO surveillance should be determined by each of the health authorities based on sound methodology.

19 Outbreak Management

An outbreak of an ARO should be suspected when rates of new cases of infection exceed expected baseline rates, or if a cluster of infections is identified. A cluster may be defined as more than one new case related to an existing case (index case) by time, location, or by an epidemiological link to the index case. The IPC practitioner, unit or facility manager, and facility Medical Director should be notified anytime an outbreak of infections caused by an ARO is suspected. Outbreaks of infections are reportable to the Medical Health Officer under the Public Health Act.

Consult Infection Prevention and Control and the Medical Health Officer regarding appropriate control measures and the need for further epidemiological investigations.

Activities that contribute to effective outbreak investigation and control include:

- evaluate system factors (e.g. occupancy level, antibiotic use, staffing of HCPs and housekeeping levels, etc.) to determine their role in transmission
- evaluate availability of resources: hand hygiene facilities and products, equipment dedicated to infected/colonized patients
- spatially separate patients known to be positive for an ARO from those not known to be positive for an ARO
- emphasize adherence to IPC practices, especially hand hygiene and the use of contact precautions
- provide “just in time” education in-services for staff on affected units and other departments
- review environmental cleaning, and increase frequency of cleaning of highly touched surfaces
- obtain environmental swabs **only under the direction of IPC and Medical Microbiology**. These activities should also be coordinated with laboratory services.
- consider cohort staffing strategies to decrease the risk of transmission to unaffected patients on the same unit
- in consultation with the MHO, consider closing the unit to new admissions until the outbreak is under control.

Glossary

Acute Care Facility: A hospital where lengths of stay average < 30 days, and where a variety of services are provided, including surgery and intensive care.

Additional Precautions: interventions implemented for certain pathogens or clinical presentations in addition to routine infection control practices, to reduce the risk of transmission of microorganisms from patient to patient, patient to HCP, and HCP to patient.

Assisted Living: Assisted living residences provide housing, hospitality, and personalized assistance services for adults who can live independently but require regular assistance with daily activities, usually because of age, illness, or disabilities.

CHICA-Canada: the Community and Hospital Infection Control Association (CHICA) of Canada, a professional organization of persons engaged in infection prevention and control activities in health care settings. CHICA- Canada members include infection prevention and control professionals from a number of related specialties including nurses, epidemiologists, physicians, microbiology technologists, public health, and industry.

Cleaning: the physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms). Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents, and mechanical action.

Cohorting: The sharing of a room or ward by two or more clients/patients/residents who are either colonized or infected with the same microorganism; or the sharing of a room or ward by colonized or infected clients/patients/residents who have been assessed and found to be at low risk of dissemination, with roommates who are considered to be at low risk for acquisition.

Contact: Refers to an individual who is exposed to a person colonized or infected with an antibiotic resistant microorganism in a manner that allows transmission to occur (e.g., a roommate).

Cost/Benefit Analysis: a numerical evaluation of the actual or proposed value of specific process, including calculating the cost of the program and comparing this to the financial outcomes in the form of savings that can be expected from the program.

Drug Identification number (DIN): In Canada, disinfectants are regulated under the Food and Drugs Act and Regulations. Disinfectants must have a drug identification number (DIN) from Health Canada prior to marketing. This ensures that labelling and supportive data have been provided and that the Therapeutic Drugs Directorate has established that the product is effective and safe for its intended use.

Healthcare Provider (HCP): individual providing or supporting health care services that will bring them into contact with patients/clients/ residents. This includes, but is not limited to, emergency service

providers, physicians, pastors, dentists, chiropractors, nurses, podiatrists, respiratory therapists and other allied health professionals, students, support services (e.g. housekeeping, dietary, maintenance, hairdressers), and volunteers.

Home and Community Care: Home care is defined as a wide-range of medical, nursing, rehabilitation, hospice, and social services delivered to patients in their place of residence (e.g., private residence, senior living center, assisted living facility). Home healthcare services include care provided by home health aides and skilled nurses, respiratory therapists, dieticians, physicians, chaplains, and volunteers; provision of durable medical equipment; home infusion therapy; and physical, speech, and occupational therapy.

Hospital-grade Disinfectant: a disinfectant that has a drug identification number (DIN) from Health Canada indicating its approval for use in Canadian hospitals.

Infection Prevention and Control Professional(s) (ICP): trained individual(s) responsible for a health care setting's infection prevention and control activities, such as the designated infection prevention and control expert in the facility, or individuals with specific infection prevention and control training and expertise from the Regional Infection Control Network or Public Health.

Precautions: interventions to reduce the risk of transmission of microorganisms from patient to patient, patient to health care provider, and health care provider to patient.

Precautionary Principle: The precautionary principle is an approach to risk management that has been developed in circumstances of scientific uncertainty, reflecting the need by decision -makers to anticipate harm and to take prudent action in the face of potentially serious risk without having to wait for scientific research to confirm the likelihood or the level of harm that could occur.

Residential Care: Residential care facilities provide 24-hour professional nursing care and supervision in a protective, supportive environment for people who have complex care needs and can no longer be cared for in their own homes.

Summary of Recommendations

It is recommended that each facility/region develop a comprehensive, strategic plan to detect, prevent and control infection and colonization with AROs. A11 (page 9)

Each health authority should utilize an active antibiotic stewardship program that monitors and ensures the appropriate use of antibiotics. A11 (page 9)

It is recommended that acute care hospitals have a program of active screening for specific AROs for all admitted patients, which includes a screening questionnaire for risk factors, followed by cultures if indicated. B11 (page 9)

It is recommended that any health authority or facility considering the discontinuation of screening and containment practices for VRE follow the recommendations contained in the position statement "VRE Screening and Contact Precautions from the Community and Hospital Infection Control Association of Canada (CHICA)". C111 (page 11)

Facilities that choose to continue with VRE screening and containment should be aware that patients transferred from a hospital that has discontinued VRE screening and containment practices may be an unrecognized VRE reservoir. C111 (page 11)

A review of the literature and the impact of the changed approach on VRE infection rates in facilities that have chosen to discontinue screening and isolation should be completed within the next three to five years. Should any compelling evidence of harm be found, then a plan to re-institute screening and containment strategies will be required. C111 (page 12)

In the interests of patient safety and using the precautionary principle, it is recommended that high-risk individuals are screened for CRE upon admission to acute care facilities. B111 (page 13)

If the decision to re-culture is made, obtain at least two sets of swabs taken from the sites in Table 1 at separate time intervals (at least a week apart). The patient should have completed all antibiotics and, although there is no evidence, the greater the time passed since antibiotic use would theoretically ensure that the results are more reliable. Health authorities should provide clear direction to staff on when to re-culture patients, and have an established procedure. C111 (page 14)

In high-risk areas of acute care, such as ICUs, burn units, transplantation units, or cardiothoracic units, patients who were roommates of or had close contact with a known ARO positive patient should be considered potentially exposed, and should have screening cultures performed. C111 (page 14)

In addition to routine practices, use contact precautions when caring for individuals infected or colonized with MRSA. B11 (page 17)

Health authorities that choose to continue with screening and containment strategies for individuals colonized or infected with VRE should use contact precautions in same manner as used for MRSA. C11 (page 17)

In the interests of patient safety, and using the precautionary principle, it is recommended that contact precautions be used when caring for any patient known or suspected to be colonized or infected with CRE. B111 (page 17)

Use the precautionary principle and a transmission risk assessment to determine which patients, situations (e.g. one versus multiple patients), or care areas (e.g. ICU, burn units) are best served by additional strategies. This process may include use of contact precautions, screening of roommates, and conducting point prevalence studies if it appears that transmission is likely to have occurred. B111 (page 17)

If cohorting patients with AROs with patients that do not have AROs is unavoidable, there should be increased attention to effective environmental cleaning throughout the duration of the cohort. B111 (page 18)

Each health authority should develop an algorithm for prioritizing the use of single rooms. C111 (page 18)

In PACU, individuals known to be colonized or infected with an ARO should be cared for using contact precautions. B11 (page 19)

In the acute care setting, visitors should be instructed not to visit other patients on the same day, nor should they use common areas such as the nutrition area or patient lounge. C111 (page 22)

Identifying colonized HCPs through screening as part of an outbreak investigation should only be done at the direction of IPC and Occupational Health and Safety (OHS), and in conjunction with the investigation of other possible sources of transmission. C111 (page 22)

Appendix 1: Definitions of the Strength of Recommendations and the Quality of Supporting Evidence

Strength of recommendation	Definition
A	Good evidence to support a recommendation for or against use
B	Moderate evidence to support a recommendation for or against use
C	Poor evidence to support a recommendation
Quality of evidence	
1	Evidence from at least 1 properly randomized, controlled trial
11	Evidence from at least 1 well-designed clinical trial without randomization, from cohort or case-controlled analytic studies (preferably from more than 1 centre) from multiple time-series, or from dramatic results from uncontrolled experiments
111	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Adapted and reproduced from the Canada Communicable Disease Report[131] (1994).

Appendix 2: CHICA-Canada Position Statement

POSITION STATEMENT – VRE SCREENING AND CONTACT PRECAUTIONS

In the past year, some Canadian healthcare facilities have decided to reduce or stop the screening for Vancomycin Resistant Enterococci (VRE) as well as the use of contact precautions as a VRE control strategy, while others continue to support current guideline recommendations for VRE surveillance and the use of additional precautions.[1]

Recognizing that there are two bodies of expert opinion on VRE control, CHICA-Canada takes no position on the specific strategy of decreasing or stopping screening or contact precautions for VRE. The following recommendations should not be interpreted as an endorsement of this practice by CHICA-Canada. However, CHICA-Canada does recommend that any changes to practice should be motivated by a desire to improve patient care, and should only be considered in the context of an infection control program already meeting or exceeding best practices.

For those healthcare facilities that are considering a change in VRE control strategy, CHICA-Canada recommends a considered approach including:

- epidemiologic investigation and risk assessment for any VRE infection specific to their facility;
- consultation with staff and client groups including high -risk wards/clinics;
- discussion with risk management and bioethics;
- consultation with patient relations and public affairs;
- consideration of legal consultation and review of existing practices guidelines and evidence-based studies;
- discussion with external stakeholders, including the health region;
- an enhanced communication strategy, including multiple contingencies and the possible need to alter strategy in the future.

Further, CHICA-Canada recommends that any savings incurred from decreased screening and contact precautions should be reinvested in the following activities (as determined by the risk assessment above):

- environmental cleaning;
- quality promotion and assessment of environmental cleaning and application of routine practices and additional precautions;
- hand hygiene;

- antimicrobial stewardship;
- monitoring of health care-associated infections (HAIs).

Finally, any such changes should be accompanied by close monitoring of VRE culture-positive HAIs following the changes, to assure that undue harm is not incurred as a result of any changes in policy. In the event that harm is found, facilities should be prepared to return to previous policies. It is also highly recommended that those facilities that choose to change their strategy should communicate their experiences to other members of the infection control community for future policy making.

Appendix 3: Review of Literature for Best Practices for VRE Control, – Page 9

IV. Conclusions

Based on the foregoing evidence, PIDAC concludes that, for both patient safety and cost-effectiveness reasons, Ontario health care facilities should continue to carry out screening, surveillance and containment measures for cases of VRE colonization and infection until the results of an evaluation by PHO of the change of VRE control measures at four hospitals in Ontario are available.

V. Recommendations

PIDAC recommends the following:

1. Continue VRE control measures as recommended in *Annex A*:
   a) active surveillance screening for VRE;
   b) containment of identified VRE cases through use of Additional Precautions; and
   c) enhanced environmental cleaning for rooms of, and equipment used by, patients with VRE.

2. Management of patients transferred from a hospital that has discontinued VRE containment practices:
   a) Receiving hospitals should monitor VRE colonization/ infection rates in patients returning from these hospitals. Expect colonization levels to increase with time, with subsequent increases in rates of VRE infections, including bacteremia. With most current screening methods, results may not be available for 3-4 days depending on local laboratory turnaround time, delaying detection of colonization.
   b) Consideration might be given to managing these patients in the same manner as patients who have been in a hospital in another country where VRE rates are high, i.e., pre-emptive isolation pending screening.
   c) If routine pre-emptive isolation is not feasible (e.g., insufficient numbers of single rooms) then pre-emptive isolation should be considered for patients at higher risk of having acquired VRE in the referral facility (e.g., those who have received care in an ICU setting; have been in a transplant unit; have had a longer LOS overall and/or in an ICU setting). Medical patients are at more risk than surgical patients; obstetrical and psychiatric patients are at lowest risk for VRE.
   d) If the transferring hospital is aware that a patient has VRE, the receiving facility should be notified. Close collaboration by regional centres and clear communication with receiving facilities is crucial.

3. Health care facilities should await the results of evaluation before changing current practice.

4. Four hospitals in Ontario have discontinued VRE control measures. The impact of this change of infection control practice will be evaluated in real-time. PHO will work with these and other hospitals in Ontario to measure VRE infection rates and patient outcomes. The results of this study will be reported back to the field when data becomes available.

Provincial Infectious Diseases Advisory Group, December 2012

Appendix 4: Summary of Routine Practices

Hand Hygiene

Hand hygiene is the most important and effective IPC measure to prevent the spread of health care-associated infections. Hand hygiene must be practiced:

- before initial patient or patient environment contact (e.g., before coming into the client/patient/resident room or bed space); before any aseptic procedure
- after patient or patient environment contact; after exposure with blood and body fluids

Use alcohol based hand rub (ABHR) or soap and water to clean hands.

Point of Care Risk Assessment

Each HCW has a responsibility to perform a risk assessment before every interaction with a patient and/or the patient's environment to ensure that appropriate control measures are in place to prevent transmission.

Source control

- Spatially separate potentially infectious patient from other patients
- Respiratory etiquette: contain secretions during coughing or sneezing by covering mouth and nose with a tissue or sleeve, wearing a mask, and turning away from others.
- Environmental controls: measures that are built into the infrastructure of the health care setting that have been shown to reduce the risk of infection, such as hand washing sinks, point-of-care sharps containers, and sufficient air changes per hour appropriate to the care setting.
- Cleaning of non-critical equipment and the patient environment.

Patient placement

Single rooms with dedicated bathroom are preferred for placement of all patients. When availability of single rooms is limited, a priority for placement of patients in single rooms is indicated by the risk assessment.

Use of PPE

Personal protective equipment is used to prevent contact with blood, body fluids, secretions, excretions, non- intact skin, or mucous membranes, and includes:

- gloves when there is a risk of hand contact with blood, body fluids, secretions or excretions, or items contaminated with these
- gown if contamination of uniform or clothing is anticipated (e.g., cleaning bed of incontinent patient/resident)
- mask and eye protection or face shield where appropriate to protect the mucous membranes of the eyes, nose, and mouth during activities involving close contact (i.e., within two metres) with clients/ patients/ residents likely to generate splashes or sprays of secretions (e.g., coughing, sneezing).

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