STANDARDS

- All patients admitted to acute care wards at BC Children’s Hospital, Sunny Hill Health Centre and BC Women’s Hospital will be assessed for Antibiotic-Resistant Organisms (ARO) including: Methicillin-Resistant *Staphylococcus aureus* (MRSA), Vancomycin-Resistant Enterococci (VRE), and Carbapenemase-Producing Organisms (CPO). Note: Neonatal and Pediatric Intensive Care units have program specific screening guidelines listed below.

- An Admission Form & Requisition for Antibiotic-Resistant Organisms (ARO) will be completed for all inpatients and will be kept on the patient record.

- The white front page of the screening form is kept on the patient’s record. The yellow copy of the form serves as a requisition for ARO screening and will accompany the swabs to the laboratory.

- Nursing staff will take the appropriate screening swabs based on the Risk Factor Assessment and the instructions located on the front and on the back of the form.

- Nursing staff will send the yellow copy of the screening form and screening swabs to the laboratory, noting the date and time. Swabs should be collected within 12 hours of patient admission.

- The Infection Prevention and Control Service (IPACS) will be notified of patients who self-report MRSA, VRE or CPO.

- Contact Precautions will be initiated:
  - For patients known to have MRSA, VRE or CPO
  - For patients with a household member known to have MRSA, VRE, or CPO
  - If the patient or a household member is known to have received healthcare outside Canada within 12 months

- Consult IPACS before discontinuing Contact Precautions.

DESCRIPTION OF THE DISEASE

**MRSA**

- *Staphylococcus aureus* (*S. aureus*) is Gram-positive bacteria, which lives on the skin or in the nose of up to 30% of healthy people. It can cause a range of illnesses from minor skin infections, such as pimples, impetigo, boils, cellulitis and abscesses, to life-threatening diseases, such as pneumonia, meningitis, endocarditis, Toxic Shock Syndrome (TSS), and septicemia. MRSA is a strain of *S. aureus* that is resistant to methicillin, oxacillin and cloxacillin. It also has the ability to survive treatment with beta-lactam antibiotics, including all penicillins and cephalosporins. MRSA is an important cause of nosocomial infections worldwide.

**VRE**

- Enterococci are Gram-positive bacteria, which live in the gastrointestinal tract of most individuals. There are 2 commonly encountered species: *E. faecalis* (90-95%) and *E. faecium* (5-10%). Enterococci are hardy micro-organisms, able to survive on environmental surfaces for extended periods. VRE are strains of *E. faecium* and *E. faecalis* that have become resistant to the antibiotic vancomycin. VRE may be found in the bowel without causing disease. VRE colonization is much more common than infection. Intestinal colonization can last from several months to many years, serving as a reservoir for the spread of VRE to other patients.
CPO
- Carbapenemases are enzymes produced by a number of Gram negative bacilli that hydrolyse penicillins, cephalosporins and carbapenems. In other words, these organisms are resistant to all beta-lactam antibiotics. Since they typically also carry resistant genes for aminoglycosides, fluoroquinolones, and other drugs, they are usually resistant to all available antibiotics except colistin and tigecycline. Infections with such organisms carry a high mortality. Cases have been reported in British Columbia, with health care outside of Canada being the main risk factor.

Route of Transmission:
Patients may be asymptomatic carriers of these organisms. If they are admitted to hospital without Additional Precautions there is a risk of spread to other patients. The prompt identification of such patients will diminish the risk of patient-to-patient transmission.

MRSA
- MRSA is most commonly spread via the transiently colonized hands of health care workers who acquire it from contact with colonized or infected patients, or after handling contaminated material or equipment. Contamination of environmental surfaces such as medical equipment, hospital furnishings, hydrotherapy tubs, linens, tourniquets, computer keyboards, faucets and nebulizers has been described. Hand hygiene and environmental surface cleaning are, therefore, important measures to prevent transmission.

VRE
- The major mode of transmission of VRE in health care settings is via transiently colonized hands of health care workers who acquire it from contact with colonized or infected patients, or after handling contaminated material or equipment. Contamination of the environment with VRE is more likely when a patient has diarrhea, is incontinent, and/or has poor hygiene. Once VRE is outside of the body, it can survive on surfaces for days or weeks. It has been found on stethoscopes, bed rails, blood pressure cuffs, call buttons and toilets.

CPO
- Transmission of CPO is likely via direct and indirect contact. The site of colonization is the lower gastrointestinal tract. Sinks and other environmental surfaces have been implicated in the transmission of multi-drug resistant *Klebsiella* and *Pseudomonas* spp. Acquisition of resistance may also occur by transmission of the mobile genetic element carrying the carbapenemase between different bacterial strains and species. Preventing transmission of CPO is crucially important as the options for antibiotic treatment of CPO infections are extremely limited.

PROCEDURE

1. A nurse will initiate the screening form in the Emergency Department or on admission to the unit.

2. The nurse will assess the patient for risk factors by indicating “yes”, “no” or “don’t know” for each risk factor question on the screening form. *If a parent or guardian is unavailable at the time the patient arrives or requires an interpreter, please follow-up on any “don't know” sections within question 1-3 as soon as possible after admission or transfer to the patient unit e.g., within 12 hours.* The Admission Form & Requisition for Antibiotic-Resistant Organisms (ARO) is stocked on inpatient units and available via stores.

3. Risk factors included for assessment are:
   - Has the patient or a household member received healthcare outside Canada within the last 12 months?
   - Has the patient had an overnight hospital admission or an invasive procedure in the last 12 months (including our facility)?
   - Has the patient received dialysis within the last 12 months?
4. The nurse will ask if they are aware of the patient or a household member ever having had MRSA, VRE or CPO.

5. If the nurse checks yes to any of the risk factor questions, screening swabs are required. If risk factors are absent or unknown, screening swabs are not required. When complete, the nurse will sign and date the risk factor section of the screening form.

6. Contact Precautions are required in the following circumstances:
   - The patient has a history of MRSA, VRE, or CPO
   - The patient has a household member with a history of MRSA, VRE, or CPO
   - The patient or a household member has received health care outside of Canada within the last 12 months

7. The health care worker will ensure that the above information is communicated to the rest of the team and that IPACS is notified.

8. For patients who have risk factors, the nurse will obtain screening swabs within 12 hours of admission. Omit any that are contraindicated. Screening swabs for MRSA, VRE and CPO include:
   - Anterior nares (one swab, both nostrils)
   - Throat
   - Umbilicus (neonates, all patients in the NICU)
   - Groin (one swab, both sides)
   - Rectal (faecal-stained) or ostomy site. Stool swab or perianal swab is acceptable if rectal is contraindicated
   - Any open wounds (specify)
   - All entrance/exit sites of invasive devices (specify)
   - Any sites previously positive (specify)

9. The nurse will check the sites screened then sign and date the screening swab section when completed. The nurse will place the white copy of the form on the patient record. The nurse will send the yellow copy with the screening swabs to the laboratory. The yellow copy of the screening form will act as the lab requisition. Refrigerate specimens if they will be at room temperature for more than 2 hours.

10. Consult IPACS before discontinuing Contact Precautions. Refer to the “MRSA and VRE Discontinuation of Additional Precautions” standard in the infection control manual for patients with a known history of MRSA. Use Routine Practices in all other circumstances, unless the healthcare worker deems it necessary to implement Additional Precautions for other reasons.

   **PEDIATRIC INTENSIVE CARE UNIT (PICU) PROCEDURE**

   1. **PICU is only required to complete the risk factor section of the form if the patient’s initial admission is to PICU. If a parent or guardian is unavailable at the time the patient arrives or requires an interpreter, please follow-up on any “don't know” sections within question 1-3 as soon as possible after admission or transfer to the patient unit e.g., within 12 hours.** All patients admitted to the PICU will be tested for MRSA, VRE, and CPO regardless of the presence or absence of risk factors.

   2. Contact Precautions are required in the following circumstances:
The patient has a history of MRSA, VRE, or CPO
The patient has a household member with a history of MRSA, VRE, or CPO
The patient or a household member has received healthcare outside of Canada within the last 12 months

3. The health care worker will ensure that the above information is communicated to the rest of the team and that IPACS is notified.

4. The nurse will obtain screening swabs within 12 hours of admission. Omit any that are contraindicated. Screening swabs for MRSA, VRE and CPO include:
   - Anterior nares (one swab, both nostrils)
   - Throat
   - Umbilicus (neonates, all patients in the NICU)
   - Groin (one swab, both sides)
   - Rectal (faecal-stained) or ostomy site. Stool swab or perianal swab is acceptable if rectal is contraindicated
   - Any open wounds (specify)
   - Any entrance/exit sites of invasive devices (specify)
   - Any sites previously positive (specify)

5. The nurse will send the screening swabs to the laboratory with a lab requisition identifying the date, time and sites swabbed. **Note: the yellow copy of the Admission Form & Requisition for Antibiotic-Resistant Organisms (ARO) acts as the lab requisition.**

6. Consult IPACS before discontinuing Contact Precautions. Refer to the “**MRSA and VRE Discontinuation of Additional Precautions**” standard in the infection control manual for patients with a known history of MRSA. Use Routine Practices in all other circumstances, unless the healthcare worker deems it necessary to implement Additional Precautions for other reasons.

7. **Cardiology clinic** will screen patients within 7 days of an admission for cardio-thoracic surgery. If this screen has occurred and is documented in the patient record, it is not necessary to repeat the screen on the day of admission to Surgical Daycare or PICU. **Note: If surgery is delayed or occurs more than 7 days after the initial swabs were taken, the swabs for MRSA, VRE, and CPO must be repeated on admission to PICU.**

**NEONATAL INTENSIVE CARE UNIT/ NICU & INTERMEDIATE NURSERY/IN PROCEDURE**

1. **NICU & IN are only required to complete the risk factor section of the form when the patient is initially admitted.** If a parent or guardian is unavailable at the time the patient arrives or requires an interpreter, please follow-up on any “don’t know” sections within question 1-3 as soon as possible after admission or transfer to the patient unit e.g., within 12 hours.

2. All patients admitted to the neonatal intensive care unit (NICU) and the intermediate nursery (IN) will be tested for MRSA, VRE, and CPO regardless of the presence or absence of risk factors.

3. Contact Precautions are required in the following circumstances:
   - The patient has a history of MRSA, VRE, or CPO
   - The patient has a household member with a history of MRSA, VRE, or CPO
   - The patient or a household member has received healthcare outside of Canada within the last 12 months

4. The health care worker will ensure that the above information is communicated to the rest of the team and that IPACS is notified.
5. The nurse will obtain screening swabs within 12 hours of admission. Omit any that are contraindicated. Screening swabs for MRSA, VRE and CPO include:
   - Anterior nares (one swab, both nostrils)
   - Throat
   - Umbilicus (neonates, all patients in the NICU)
   - Groin (one swab, both sides)
   - Rectal (faecal-stained) or ostomy site. Stool swab or perianal swab is acceptable if rectal is contraindicated
   - Any open wounds (specify)
   - Any entrance/exit sites of invasive devices (specify)
   - Any sites previously positive (specify)

6. The nurse will send the screening swabs to the laboratory with a microbiology lab requisition identifying the date, time and sites swabbed. **Note: the yellow copy of the Admission Form & Requisition for Antibiotic-Resistant Organisms (ARO) acts as the lab requisition.**

7. Consult IPACS before discontinuing Contact Precautions. Refer to the “MRSA and VRE Discontinuation of Additional Precautions” standard in the infection control manual for patients with a known history of MRSA. Use Routine Practices in all other circumstances, unless the healthcare worker deems it necessary to implement Additional Precautions for other reasons.

8. In addition to admission screening swabs, all patients admitted to NICU and IN will be swabbed for MRSA, VRE and CPO on a biweekly basis (every two weeks) and more frequently (on a weekly basis) when a patient/mother is admitted to the unit with a known history of MRSA, VRE or CPO and as directed by IPACS. Biweekly and weekly screens will occur on Sunday evenings. If the Monday is a statutory holiday, the biweekly/weekly screen will occur on Monday evening to accommodate laboratory staffing.

Other AROs and Multi-Drug Resistant Organisms (MDRO):
   - Patients infected or colonized with other antibiotic-resistant organisms (ARO, MDRO) must be cared for using Routine Practices and additional Contact Precautions. Refer to the “Table of Recommended Precautions Selected Infectious Diseases, Conditions &/or Microorganisms” in the infection control manual for organism-specific information. Please consult IPACS.

Documentation:
   - The white copy of the Admission Form & Requisition for Antibiotic-Resistant Organisms (ARO) will remain on the patient record to document the patient’s risk factors, admission screening, and specimens collected.
   - Document in the patient record date and time that Additional Precautions were started and discontinued. Specify type of Additional Precautions implemented, e.g., Contact Precautions.

Education and Resources:
   - Explain to the patient and/or the family the reason for obtaining the screening swabs.
   - Explain the rationale for implementing Additional Precautions when applicable.
   - Explain the importance of good hand hygiene.
   - Report back to the patient/family regarding the results of the swabs.
   - “What Methicillin Resistant *Staphylococcus aureus* (MRSA) means to me and my family” patient and family information pamphlet.
   - “Vancomycin Resistant Enterococci (VRE) Information Sheet for Patients and Families”.
   - “Carbapenemase-Producing Organisms (CPO) Information Sheet for Patients and Families”
   - “CPO Information Sheet for Staff”.
REFERENCES

5. Kumarasamay et al., Lancet Infectious Diseases 2010, 10:597-602
6. Akova et al., Clinical Microbiology and Infection 2012, 18:439-448
7. Mulvey et al., Emerging Infectious Diseases 2011, 17:103-106

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