1. CARBAPENEMASE-PRODUCING ENTEROBACTERIACEAE (CPE) Protocol

Carbapenems (e.g., imipenem, meropenem) are broad spectrum antimicrobials, with in vitro activity against a diverse array of gram positive and gram negative bacteria. They are slowly hydrolyzed by most ß-lactamases. Because of this, they have been the last line of defense against multi-drug resistant gram-negative organisms since introduced in the early 1980s. Beta-lactamase enzymes capable of hydrolyzing carbapenems (carbapenemase enzymes) are being described in the literature with increasing frequency. Carbapenemase-producing Enterobacteriaceae (CPE) are gram-negative bacteria in the Enterobacteriaceae family that produce a carbapenemase enzyme. The most frequently identified of these enzymes are VIM, KPC and OXA-48.

The first report of a Carbapenem-Resistant Klebsiella pneumoniae isolate producing a Klebsiella pneumoniae carbapenemase (KPC) was published in 2001. In 2004 investigators from England’s Health Protection Agency, together with colleagues from Tisch Hospital (New York City), reported a KPC-producing K. pneumoniae outbreak in 2000-2001 affecting 24 patients with a case fatality rate of 33%. The National Healthcare Safety Network reported during 2006-2007, 10-11% of all nosocomial K. pneumoniae isolates causing central line associated bloodstream infections or urinary tract infection were resistant to carbapenems. Since 2005, reports of spread of KPC-producing strains have appeared in multiple countries, with nationwide outbreaks in Israel, Greece, and Italy.

Spread of KPC and VIM producers was followed by spread of Enterobacteriaceae with the NDM enzyme, primarily originating in the Indian subcontinent and by the spread of OXA-48 around the eastern and southern parts of the Mediterranean basin. Spread of these four enzymes resulted in high endemicity of CPE in many regions. Countries with endemic KPC producers include China, Israel, Greece, Italy, Poland, Colombia, Argentina, Brazil, and some states in the United States. Other carbapenemases are endemic in India (NDM) and Turkey (OXA-48).

CPE, like other Enterobacteriaceae, may cause a variety of infections including urinary tract infections; intra-abdominal infections; bloodstream infections; pneumonias (ventilator associated or not); and skin and soft tissue infections (including surgical site). The high mortality associated with CPE infections is likely not due to virulence of the pathogen but because adequate treatment is delayed or unavailable. Further, the antimicrobials currently used for treatment of infections caused by CPE may demonstrate suboptimal efficacy.

In developed countries CPE transmission occurs almost exclusively within health care settings. The main route of spread is from patient to patient via contaminated hands of health care workers although transmission has also been traced to contaminated endoscopes as well as sinks and drain pipes. Other risk factors for health care associated CPE carriage or infection include prolonged hospital stay, ICU stay, antimicrobial use, poor functional status, adult diaper use, presence of multiple invasive devices, mechanical ventilation, availability of isolation rooms, staff-to-patient ratio and compliance with hand hygiene. Long-term care settings-including Long-Term-Care-Acute Care-Hospitals (LTACHs) and Post-Acute Care...
Hospitals (PACH) that treat seriously ill patients, and nursing homes that provide care play a key role in the spread of CPE. Patients in high-acuity long-term settings have many risk factors for CPE colonization, including advanced age, multiple co-morbidities, use of multiple invasive devices, high exposure to antimicrobials, and prolonged hospitalization. CPE can also be prevalent in lower-acuity long-term settings such as nursing homes. This high prevalence can be related to advanced age and co-morbidities, as well as shared rooms, communal areas, undesirability of restricting activities, as well as lack of experience in infection control.

Transmission of CPE outside of health care settings has been documented rarely in developed countries but more common in developing countries. Other reports of community-acquired CPE in developing countries and in Westerners returning from developing countries have been published.

**Infection Prevention and Control Practices**
Implement **Containment Precautions**, in addition to **Routine Practices**. Place **Containment Precautions sign** in visible location.

Given the likelihood for prolonged gastrointestinal carriage and risk of spread of these microorganisms, do not discontinue Containment Precautions. Once a patient is positive, they will always be considered positive. Once a patient is identified as CPE Positive, maintain **Containment Precautions** for current admission and all subsequent admissions.

**Accommodation**
- Isolate in a private room
  - Cohorting of patients with the same strain may occur, in consultation with IP&C
- Cohorting of staff caring for these patients should occur on a case by case basis in discussion with Infection Prevention and Control

**Duration of Containment Precautions**
- Do not discontinue Containment Precautions, given the likelihood for prolonged gastrointestinal carriage and risk of spread of these microorganisms. Once a patient is positive, they will always be considered positive
- Maintain **Containment Precautions** for current admission and all subsequent admissions once a patient is identified as CPE Positive Screening
- Routine admission screening is not recommended
- Screening involves collection of specimen from rectal/ostomy site
- Isolate patients being screened for CPE pending culture results
- Screen a patient who was admitted to or directly transferred from facilities within or outside Canada known to have endemic rates as discussed with IP&C. This patient must have been admitted for more than 24 continuous hours
- Screen a patient who is identified as CPE Positive and whose positive status is currently unknown (e.g., self-identified; no positive lab result in chart/transfer records). Consult IP&C from previous facility if status is unclear to determine if screening is required
• Screen a patient identified as CPE Suspect in the flagging system
• Screen a patient who is identified as a CPE contact
• Refusal of screening:
  o If a patient/family refuses CPE screening, explain the procedure and rationale for the screening and any testing to the patient/family again
  o If the patient/family still refuses CPE screening, place the patient on Containment Precautions for the duration of the admission and notify IP&C
• Routine screening is not recommended for a positive patient who remains in hospital

Health Record
• Written records should not go into the room of a patient on Containment Precautions. Where there are documents that must enter the room (e.g., Power of Attorney, Paneling Papers, Advanced Care Directive)
  o Wipe the table on which the document will be signed with a facility-approved cleaner/disinfectant prior to signing
  o Assist the patient to perform hand hygiene with alcohol-based hand rub prior to signing/handling the document
  o Wipe the pen with a facility-approved disinfectant after signing
• The Medication Administration Record (MAR) should not be taken into the room of a patient on Containment Precautions; PYXIS slips may be used to perform bedside checks
  o If the MAR has been in the isolation room: wipe the pen and the external surface of the MAR with facility approved disinfectant upon leaving.
• There are no special precautions for other documents not going into the health record
• If the health record is required to accompany the patient for tests or treatments, place in a protective cover (i.e., plastic bag) to prevent contamination. Otherwise, have a dedicated staff person who can carry the chart without contamination of self or the chart
• If the outside of the chart becomes contaminated, clean and disinfect with facility-approved disinfectant
• Do not take mobile computers or e-records that cannot be cleaned and disinfected into the room of a patient on Containment Precautions. In situations where it is essential for patient care, these devices may be taken into the room if covered in plastic. Prior to removal from the room, the plastic must be removed and disposed or disinfected

Housekeeping
• Facility-approved disinfectant must achieve manufacturer’s recommended contact time on all surfaces to ensure proper disinfection
• During an outbreak more extensive and frequent cleaning with the facility-approved disinfectant may be required. Any changes will be recommended by the Outbreak Management Team
• Follow Regional/Facility Standard Operating Procedure, Cleaning of Isolation Discharge Client Room/Cleaning of Occupied Client Isolation Room
Laboratory Specimens
- Dedicate specimen collection equipment to the specific patient
- Do not take phlebotomy trays/carts into the room
- Plan and take all required equipment into the room at the start of the procedure
- Deposit specimen(s) into an impervious, sealable bag immediately following removal from the patient room. Ensure outside of the bag does not become contaminated

Out-Patient Laboratory
- Avoid cross contamination between patients and supplies
- Follow Routine Practices and Containment Precautions unless otherwise directed by Infection Prevention & Control
  - Modification of Containment Precautions: ONLY when practices to avoid cross contamination between patient and supplies are in place AT ALL TIMES, Routine Practices may be sufficient when providing services to patients with an ARO in this setting. The Routine Practices procedures must first be reviewed by the Infection Control Professional and include hand hygiene, proper removal/replacement of gloves after handling the requisition/computer registration, before gathering clean supplies, and before/after drawing blood from the patient. In addition, the registration keyboard, and patient chair and armrest must be wiped between all patients with facility-approved disinfectant
  - Ensure all patient care equipment is cleaned/disinfected with facility-approved disinfectant (i.e., keyboard, patient chair and armrest)

Supplies/Equipment
- Dedicated equipment preferred
- If reusable equipment must be used, clean/disinfected with facility-approved disinfectant prior to removal from room
- Keep minimal supplies in patient room. Do not overstock
- Use dedicated personal supplies, e.g., combs, razors, lotions, creams, and soaps.
- Discard supplies that cannot be appropriately disinfected or sterilized when patient is discharged, deceased, or Containment Precautions discontinued
- Upon discharge, bag personal articles that cannot be disinfected (e.g., books, magazines, toys, playing cards) and give to the patient or discard.

Diagnostic Imaging/Ambulatory Care
- Referral source must notify department in advance of the required Containment Precautions
- Cover or remove supplies/equipment not required for the visit
- Patient performs hand hygiene on arrival
- Place patient directly in examination room. If this is not possible, maintain a spatial separation from other individuals in the waiting room
- Cover open wounds
- Procedures can be performed with 2 staff members
- One staff member must not touch:
  - The patient
  - Any equipment or surfaces that the patient or staff have contaminated by touching
• The second staff member only touches the patient, equipment or environmental surfaces the patient would have come in contact with
• If only one healthcare worker is available, everything touched by the patient and staff must be cleaned/disinfected by area staff
• All staff must wear PPE per Containment Precautions. Appropriate hand hygiene between patients and tasks is essential
• Ensure privacy curtains are changed between patients if visibly soiled
• Disinfect all reusable equipment and surfaces touched by patient and/or healthcare worker with facility-approved disinfectant after patient leaves or before use on another patient
• Cleaning and disinfection of floors after patient leaves is only necessary when visibly soiled

Inter-Facility Patient Transport
• The patient must remain in his/her room unless medically indicated
• Notify the receiving unit/clinic/site in advance of the Containment Precautions required
• During procedures, a health care worker in contact with the patient must maintain Containment Precautions. A dedicated clean person may be used to minimize environmental contamination.

Precautions for the Patient when Transported
• Patient to perform hand hygiene on leaving room
• Patient to wear clean clothes, housecoat or cover gown; no gloves or isolation gown required by the patient
• Cover all wounds
• If the patient is required to be transferred in a bed, wheelchair or other equipment that resides in the patient room
  o Clean and disinfect the external frequently touched surfaces (e.g., handles, bed rails) of the equipment with a facility-approved disinfectant prior to leaving the room
  o Cover the patient and equipment with a clean sheet
• If the patient is transferred using a clean transport stretcher or wheelchair, the stretcher or wheelchair does not need to be cleaned prior to transport. After returning the patient to the room, clean and disinfect the stretcher or wheelchair with a facility-approved disinfectant prior to removal from room

Health Care Worker Precautions for Transport
• Follow Containment Precautions to enter room
• Remove PPE before leaving the room
• Perform hand hygiene after removal of PPE and before leaving room
• Apply clean gloves and gown outside the room

Visitor Precautions for Transporting the Patient
• Perform hand hygiene before leaving the room
• Visitors are not required to wear gloves and gown outside the room
Discharge/Transfer between Facilities

- The transferring facility must identify known CPE Positive and Suspects when the patient is being transferred; this must be communicated to the receiving facility (including IP&C) in advance of the discharge/transfer.

CPE Suspect

- Document the status of a CPE Suspect patient on the patient’s Inter-facility Transfer Referral Form; communicate same with IP&C.

CPE Positive

- Prior to discharge/transfer, notify the receiving facility, physician and other involved health care agencies (e.g., Home Care, Physiotherapy) of the patient’s CPE Positive status and treatment.
- Advise the patient of the importance of informing any health care worker of their CPE Positive status.
- Document patient’s CPE Positive status on the patient’s Inter-facility Transfer Referral Form.
- The receiving facility should not rescreen a known CPE Positive patient following transfer.
- An ambulance is not required for the transport of a CPE Positive patient. The patient can be transferred by a transportation company with trained staff and the ability to follow proper IP&C precautions. Other transportation systems, (e.g. Stretcher Care Service) may be used.
  - Prior to discharge/transfer the transferring facility must notify the transport service when the patient is on Containment Precautions.

Precautions relevant to the Patient for Transfer

- Use a clean stretcher or wheelchair.
- Cover all wounds.
- Patient to perform hand hygiene on leaving room.
- Patient to wear clean clothes, housecoat or cover gown; no gloves required for the patient.

Precautions relevant to the Health Care Worker for Transfer

- Follow Containment Precautions to enter and exit room.
- Remove PPE before leaving the room.
- Perform hand hygiene before contact with the patient, after removal of PPE, and before leaving the room.
- Apply clean gloves and gown outside the room to transport patient.

Precautions relevant to the Transport Service

- Follow Containment Precautions inside the patient room and when leaving the room.
- Follow Containment Precautions at the receiving facility, to place patient in their room and upon leaving patient room.
- Consider wheelchair/stretcher used to transport the patient as contaminated. Clean and disinfect prior to removal from isolation space or use with another patient.
- Disinfect vehicle surfaces and any equipment that was in contact with the patient with facility- approved disinfectant.

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Waste
- Routine Practices; no special precautions required. Double bagging of waste not required.
- Wear clean gloves to remove waste from room.
- Remove gloves and perform hand hygiene after handling waste.

Code Blue
- Unit staff member to inform Code Blue team of patients ARO status and required Containment Precautions.
- Keep Code Blue cart with medications outside the room. In a multi-bed room, the cart should stay outside the bed space curtain.
- Clean HCW shall pass supplies as required to staff in room.
- Obtain all necessary supplies prior to entering room or bed space.
- Remove defibrillator from the cart and take into the room.
- The intubation basket may be taken into the room.
- When resuscitation is completed, all reusable equipment that entered the room must be sent to MDR for reprocessing, or cleaned and disinfected.
- Discard single use items and all disposable used or unused supplies.
- If Code Blue medications are brought into the room, follow the Code Blue Team Resuscitation in Acute Care Policy # 110.050.010, available at http://home.wrha.mb.ca/corp/policy/files/110.050.010.pdf.
- If the Code Blue cart is taken into the room, clean and disinfect the cart, inside and out, with facility approved disinfectant.

Emergency/Resuscitation Room
- Remove all unnecessary supplies from the room.
- Ensure items remaining on top of carts are kept in an enclosed bin or placed in a drawer.
- Relocate chart from racks to outside of room.
- Disinfect outside surfaces of all carts in surrounding bed space upon patient discharge.
- Change curtain upon patient discharge. Changing of curtains is recommended for all patients cared for in the resuscitation room due to the higher risk of body fluid sprays and splashes.

Management of CPE Positive Patient in the Operating Room (OR)
- The patient can be scheduled on the OR slate and does not need to be scheduled for a particular time of day.
- Transport the patient as outlined above.
- During the procedure a health care worker who is in contact with the patient must maintain Containment Precautions. A dedicated clean person may need to be present to minimize environmental contamination.
- The patient health record and specific procedure forms needed for the procedure may be taken into the OR.
  - Keep on a designated table in a low traffic corner of the theatre that does not have contact with the health care worker who has patient contact.
• Recover the patient in the Post Anaesthetic Care Unit on Containment Precautions. If the patient is unable to be recovered in the Post Anaesthetic Care Unit, rescheduling of patients may need to be done to recover them in the theatre on Containment Precautions
• After the case, standard OR cleaning procedures are sufficient to clean the theatre

Management of Neonate Born to CPE Positive Mother

Infant is Rooming in with Mother
• Implement Containment Precautions for care of the mother and infant with the following modifications
  o Assisting the mother with the infant: e.g., breastfeeding, holding infant: gloves/gowns do not need to be changed when moving between mom and infant. As per Routine Practices, perform hand hygiene and change gloves/gown as required, to prevent cross contamination from one body site to another (especially prior to performing health care procedures and assessments such as post-partum checks)
  o Infant is identified as CPE Suspect. Upon discharge the infant will be maintained as CPE Suspect and screened if readmitted to a health care facility

Infant Admitted to Level II or Level III Nursery
• Identify infant as CPE Suspect
• Screen infant and place on Containment Precautions pending results of screening
• Collect specimen(s) from the infant greater than or equal to 48-96 hours after birth
  o If infant tests CPE positive, implement Containment Precautions. Screening for persistent carriage will be done on direction by IP&C
  o If infant tests negative, contact the site ICP to determine if Containment Precautions should be discontinued. Maintain CPE Suspect flagging
• Upon discharge the infant will be maintained as CPE Suspect and screened if readmitted to a health care facility

Visitors to a CPE Positive Patient
• Perform hand hygiene on entering and leaving the patient room
• Visitors are not required to wear PPE, unless they are assisting in the direct care of a patient. This does not include feeding a patient or pushing them in a wheelchair
• Direct visitors to ask for assistance in obtaining patient care supplies/items from shared spaces on the unit

CPE Positive Patient Visiting Other Patients
• Patients who are CPE Positive do not visit other patients in hospital. In extraordinary circumstances, and on a case-by-case basis, visiting may be done for compassionate reasons following consultation with Infection Prevention and Control
CPE Positive Patient Requiring Rehabilitation (e.g. Physiotherapy, Occupational Therapy)
- Patient requiring rehabilitation should receive therapy as indicated
- Transport the patient as outlined above
- Consult Infection Prevention and Control to develop case-by-case precautions as required during rehabilitation for a specific patient
  - Maintain Containment Precautions
  - Designate therapy to one area of the department
  - Schedule therapy to minimize possible exposure/transmission
  - Use patient-dedicated equipment. If unavailable, clean and disinfect shared equipment with facility-approved disinfectant between patient uses
  - Clean and disinfect communal equipment (e.g., parallel bars) with facility-approved disinfectant between patient uses

CPE Positive Patient Requiring Recreational Therapy
- Some patients in acute care who are panelled for nursing home and other long-term stay patients should receive Recreational Therapy as indicated by caregivers
- Precautions required during Recreational Therapy may be developed for a specific patient in consultation with Infection Prevention and Control
- Transport the patient as outlined above

Management of CPE Positive Patient on Mental Health Unit
- Follow Routine Practices; Containment Precautions are not required
- CPE Positive patients must perform hand hygiene regularly and prior to leaving the unit. This must be emphasized as compliance is sometimes not optimal due to the nature of the illness

Handling of Deceased Bodies
- Follow Containment Precautions
  - Place clean sheet on transfer stretcher prior to entering deceased patient’s room
  - Don PPE while attending the body
  - Wrap the body in a shroud and transfer to stretcher
  - Remove PPE and perform hand hygiene upon leaving the room
  - Transport body to the morgue
  - Perform hand hygiene upon leaving the morgue
  - Clean stretcher with facility approved disinfectant before use on another patient

Home Visit/Pass with Health Care Worker, Companion or Family

Precautions required for Patients
- Cover all wounds
- Patient performs hand hygiene on leaving room
- Patient is not required to wear gloves following hand hygiene
- The patient should wear clean clothes
Precautions for Health Care Worker Accompanying Patient

- A separate HCW transports the patient to the door of the facility they are leaving
- The HCW accompanying the patient on the home visit meets the patient at the door of the facility they are leaving
- Alcohol-based hand rub must be available for hand hygiene of patient and HCW during visit
- Bag, clean, and disinfect any equipment taken on the visit according to facility policy after return to the facility and before use by another patient

Family Accompanying Patient

- Perform hand hygiene prior to leaving room
- Bag, clean, and disinfect any equipment taken on the visit according to facility policy after return to the facility and before use by another patient