Surveillance Protocol for Carbapenemase Producing Organisms (CPO) in British Columbia

Adapted from the Canadian Nosocomial Infection Surveillance Program (CNISP) document "Surveillance for Carbapenem-Resistant Gram-Negative Rods Infections, March 26, 2013".

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1. **Objectives of CPO Surveillance**

    a. To identify and monitor carbapenemase producing organisms (CPOs) in inpatients, outpatients and emergency patients in British Columbia healthcare settings.
    b. To describe the epidemiology and clinical outcomes of patients (inpatients, outpatients and emergency patients) infected or colonized with selected Carbapenem-resistant gram-negative microorganisms, (i.e., Enterobacteriaceae, *Pseudomonas spp.* and *Acinetobacter spp.)*.
    c. To examine the molecular epidemiology of the Carbapenem-resistant isolates collected, including the resistance genes present, and the microorganisms identified.

2. Methods

a. Scope:

All inpatients, outpatients and emergency patients infected/colonized with selected Carbapenem-resistant gram-negative microorganisms (i.e., Enterobacteriaceae, *Pseudomonas spp.* and *Acinetobacter spp.*) during their stay in the healthcare facility or visiting emergency departments or outpatient clinics of the hospital.

b. Eligible Cases:

Patients with laboratory confirmation of carbapenem resistance/carbapenem reduced susceptible (see **Appendix A** for laboratory criteria) in specified Gram negative organisms in Enterobacteriaceae, *Pseudomonas spp.* and *Acinetobacter spp*.

c. Case Identification and Confirmation:

Patient specimens with eligible Enterobacteriaecae and/or *Acinetobacter* and/or *Pseudomonas* spp. (per **Appendix A**) will be identified by the medical microbiology laboratory in each health authority. The suspected isolates will be sent to the BC Public Health Microbiology & Reference Laboratory (BCPHMRL) for molecular confirmation.

The BCPHMRL will enter the specimen details into Sunquest as per standard practice. A report of PCR detection results will be sent via the electronic laboratory information system to the submitting laboratory as per current standard practice.

d. Data Collection:

Once an eligible Enterobacteriaceae, *Pseudomonas spp.,* or *Acinetobacter* spp. is identified as **harbouring a carbapenemase,** the BCPHMRL will notify the submitting

laboratory or hospital that the case is confirmed as a CPO, and a Patient Questionnaire **(Appendix B)** needs to be completed.

The completed Patient Questionnaire will include:

- the CPO molecular results sent by BCPHMRL, AND
- a unique identifier generated by the submitting laboratory or affected healthcare facility, OR
- a CHEC number for those facilities already enrolled in CNISP.

All patient questionnaires should be submitted on a quarterly basis* to:

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* In circumstances where a cluster or outbreak is suspected, the accelerated submission of questionnaires to PICNet is recommended.

3. Process for Data analysis

a. For those isolates confirmed as having a CPO, the submitting microbiology laboratory or affected healthcare facility will submit the patient questionnaire, including the molecular information, with either unique identifier or CHEC number to PICNet.
b. PICNet will enter the data or merge the electronic data into the database.
c. PICNet will request denominator data from the sites and the laboratories of each health authority. The denominator data will be collected quarterly and will include:
    i. total number of hospital admissions per quarter.
    ii. total number of inpatient-days per quarter.
    iii. total number of all specimens per year processed for CPO in the medical microbiology laboratory per quarter.
    iv. total number of outpatient visits per quarter.
    v. total number of emergency department visits per quarter.
d. PICNet CPO data will be cross-checked on a quarterly basis against BCPHMRL for data quality and assurance purposes.
e. Every quarter, PICNet will prepare the aggregate and HA specific data report as per established data validation and reporting protocols developed for *C. difficile* and MRSA.

Appendix A

Gram-negative Bacilli Eligible for Inclusion and Laboratory Criteria for Determining Carbapenem Resistance

Included in this surveillance protocol are all isolates from clinical samples that tested/screened positive for at least one potential carbapenem-resistant ***Enterobacteriaceae, Pseudomonas,*** and/or ***Acinetobacter,*** using automated systems or 2012 CLSI[1] zone diameters and/or Minimal Inhibitory Concentrations (MIC) values as listed below:

At least ONE of the following:	***Enterobacteriaceae:***	
	MIC (*µg/ml*)	Disk diffusion[2] (*mm*)
Imipenem	≥ 2	≤ 22
Meropenem	≥ 2	≤ 22
Doripenem	≥ 2	≤ 22
Ertapenem	≥ 1	≤ 21

At least ONE of the following:	***Acinetobacter and Pseudomonas (not P. aeruginosa):***	
	MIC (*µg/ml*)	Disk diffusion[2] (*mm*)
Imipenem	≥ 8	≤ 15
Meropenem	≥ 8	≤ 15

At least ONE of the following:	***Pseudomonas aeruginosa:***	
	MIC (*µg/ml*)	Disk diffusion[2] (*mm*)
Imipenem	≥ 4	≤ 18
Meropenem	≥ 4	≤ 18
Doripenem	≥ 4	≤ 18

Once an isolate is confirmed as a CPO, the Patient Questionnaire (Appendix B) should be completed. Please ensure that the CPO results are included in Section 9.
If you are a laboratory affiliated with a hospital and this is an inpatient, please coordinate with the infection preventionist to ensure that once an isolate is confirmed as a CPO, that the preventionist completes the surveillance form (Appendix B) as soon as possible. If this is an outpatient, the laboratory should fill out Appendix B as best as they are able to as soon as possible.

[1] Clinical and Laboratory Standards Institute. 2012. Performance standards for antimicrobial susceptibility testing; 22nd informational supplement, M100-S22 (Jan. 2012). Clinical and Laboratory Standards. Wayne, PA.
[2] Using a 10 µg disk of the appropriate antimicrobial.

Due to the importance of the timely identification of these organisms for infection control and epidemiology purposes, send isolates that meet the surveillance definition to the BCPHMRL as soon as possible for CPO confirmation by PCR – especially there is additional evidence (phenotypic or molecular) that the isolate is harboring a carbapenemase or if this is part of a suspected outbreak.

For urgent test requests, please contact Dr. Linda Hoang or the Public Health Advanced Bacteriology/Mycology Lab:

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Appendix B - Patient Questionnaire

Surveillance for *Inpatients / Outpatients* with PCR confirmed Carbapenemase

NB: If your laboratory is affiliated with a hospital and this is an inpatient, please coordinate with the infection preventionist to ensure that once an isolate is confirmed as a CPO, that the preventionist completes this questionnaire.

If this is an outpatient, the laboratory should fill out Appendix B as best as they are able, or coordinate with the healthcare provider.

1[3]	Unique Identifier or CHEC number		
2	Status		☐ Inpatient ☐ Outpatient (skip to questions 8)
3	**To the best of your knowledge:** Was the patient known to be previously CPO-positive?	☐ No ☐ Yes	*If yes, ensure that the initial unique patient identifier or CHEC number is used. This information prevents double counting of cases.*
4	Date of birth _____/_____/_____ (*dd mon yyyy*) **OR** Age _____ ☐ Years ☐ Months ☐ Days		
5	Patient's gender		☐ Male ☐ Female
6	Date of admission when current CPO was identified		_____/_____/_____ (*dd mon yyyy*)
7	Type of first positive CPO isolate		☐ Screening isolate ☐ Clinical isolate ☐ Contact tracing
8	Classification		☐ Infection ☐ Colonization ☐ Unknown
9[4]	**ORGANISM(S) ISOLATED?** *LABK ALL THAT APPLY*	*** DATE OF POSITIVE CULTURE?**	**** SITE(S) OF ISOLATION?**
	☐ *Acinetobacter* spp.	……/……/…… (*dd mon yyyy*)	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……
	CPO gene(s) detected: ☐ **NDM** ☐ **KPC** ☐ **OXA-48**	☐ **VIM** ☐ **IMP** ☐ **SME** ☐other	
	☐ *Serratia* spp.	……/……/…… (*dd mon yyyy*)	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……
	CPO gene(s) detected: ☐ **NDM** ☐ **KPC** ☐ **OXA-48**	☐ **VIM** ☐ **IMP** ☐ **SME** ☐other	
	☐ *Klebsiella pneumoniae*	……/……/…… (*dd mon yyyy*)	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……
	CPO gene(s) detected: ☐ **NDM** ☐ **KPC** ☐ **OXA-48**	☐ **VIM** ☐ **IMP** ☐ **SME** ☐other	
	☐ *Enterobacter* spp.	……/……/…… (*dd mon yyyy*)	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……
	CPO gene(s) detected: ☐ **NDM** ☐ **KPC** ☐ **OXA-48**	☐ **VIM** ☐ **IMP** ☐ **SME** ☐other	
	☐ *Escherichia coli*	……/……/…… (*dd mon yyyy*)	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……

[4] Submit incidence data only for the first episode. Any subsequent acquisition will be deemed a new case.

	CPO gene(s) detected:	☐ **NDM**	☐ **KPC**	☐ **OXA-48**	☐ **VIM**	☐ **IMP**	☐ **SME**	☐other
	☐ *Proteus* spp.	…../……../…… *dd mon yyyy*	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……					
	CPO gene(s) detected:	☐ **NDM**	☐ **KPC**	☐ **OXA-48**	☐ **VIM**	☐ **IMP**	☐ **SME**	☐other
	☐ *Morganella morganii*	…../……../…… *dd mon yyyy*	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……					
	CPO gene(s) detected:	☐ **NDM**	☐ **KPC**	☐ **OXA-48**	☐ **VIM**	☐ **IMP**	☐ **SME**	☐other
	☐ *Citrobacter spp.*	…../……../…… *dd mon yyyy*	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……					
	CPO gene(s) detected:	☐ **NDM**	☐ **KPC**	☐ **OXA-48**	☐ **VIM**	☐ **IMP**	☐ **SME**	☐other
	☐ *Pseudomonas spp.*	…../……../…… *dd mon yyyy*	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……					
	CPO gene(s) detected:	☐ **NDM**	☐ **KPC**	☐ **OXA-48**	☐ **VIM**	☐ **IMP**	☐ **SME**	☐other
	☐ *Other Enterobacteriaceae* ……	…../……../…… *dd mon yyyy*	☐ Blood ☐ Sputum ☐ Skin/soft tissue ☐ Urine ☐ Surgical s. ☐ Stool/rectal swab ☐ Other ……					
	CPO gene(s) detected:	☐ **NDM**	☐ **KPC**	☐ **OXA-48**	☐ **VIM**	☐ **IMP**	☐ **SME**	☐other
	* ***Date of positive culture:*** *Date of sampling of the specimen from which the positive organism was isolated.* ** ***Site(s) of isolation:*** *Anatomic site(s) from which the positive organism was isolated.*							
10a	***(Optional)*** Was this patient treated with antimicrobials for CPO infection within TWO weeks of laboratory diagnosis?	☐ Yes ☐ No ☐ Unknown						
10b	***(Optional)*** If this patient was treated with antimicrobials for CPO within TWO weeks of laboratory diagnosis, which of these was / were used? (*Check all that apply*)	☐ Colistin ☐ Tigecycline ☐ Carbapenem ☐ Cephalosporin ☐ Chloramphenicol ☐ β-lactam inhibitor (eg. Pip/tazo) ☐ Aminoglycoside (amikacin, gentamicin, tobramycin) ☐ Other, specify …..……. ……						
11	Location in hospital on the day of first positive CPO culture?	☐ ICU ☐ Medical ward ☐ Surgical ward ☐ Other, specify …..……..						
12a	Was isolation implemented because of CPO diagnosis?	☐ Yes ☐ No ☐ Unknown						
12b	***(Optional)*** If yes, date isolation was implemented	…..……/……/…… *dd mmm yyyy*						

13	Is there any evidence that this was a nosocomial[5]-acquired case?	☐ Yes[6] ☐ No ☐ Unable to determine
14	Is there any evidence of transmission within the facility?	☐ Yes ☐ No ☐ Unable to determine
15a	Is there any evidence of international travel in the 12 months prior to CPO diagnosis?	☐ No, there is **no** evidence of international travel ☐ Yes, *please specify where travelled to* …….. …….. ……..
15b	If travelled internationally, is there evidence the patient sought medical care where s/he travelled to?	☐ Yes, there is evidence that the patient sought medical care while on international travel. ☐ No, there is **no** evidence that the patient sought medical care while on international travel.
15c	If sought medical care abroad, specify the medical procedure (*e.g.* surgery, interventional radiology) s/he was subjected to?	☐ Outpatient, *specify* what procedure…….. …… ☐ Inpatient, *specify* what procedure…… …… ☐ Unknown
16	***(Optional)*** Is there evidence the patient has underlying medical condition(s)? *(Check all that apply if yes)*	☐ No evidence of any underlying medical condition ☐ Yes *(please check all that apply)* ☐ Diabetes ☐ Liver disease ☐ HIV infection ☐ Cancer (active) ☐ Lung disease (e.g., asthma, COPD) ☐ Kidney disease (include all patients on dialysis) ☐ Solid organ transplantation ☐ Bone marrow transplantation ☐ Other immunosuppression, *specify* …….. ☐ Heart disease *(do NOT include hypertension alone, isolated atrial fib or mitral valve prolapse)* ☐ Other, *specify* …… ……
17	Was ICU admission required due to complications associated with CPO?	☐ Yes ☐ No ☐ N/A – patient was already in ICU ☐ Unknown
18	Patient outcome **30 days** after positive CPO diagnosis?	☐ Patient alive, still in hospital <u>30 days</u> after diagnosis ☐ Patient survived and discharged ☐ Patient survived and transferred ☐ Patient died

[5] *Nosocomial*: Patient identified > 72 hours or > three days after the date of admission to the healthcare facility with date of admission considered as Day 0.

[6] If YES, make sure the index case has been reported as well.

19	***(Optional)*** If patient died, what was the relationship of the CPO to the death?	☐ CPO was primary cause of death ☐ CPO contributed to death ☐ CPO was unrelated to death ☐ Cannot determine if CPO was related to death

Please send all completed questionnaires* to:

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