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

BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

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

December 2017

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# Surveillance Protocol for Carbapenemase Producing Organisms (CPOs) in British Columbia

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## Preamble

The term carbapenemase-producing organisms (CPOs) refers to a large group of bacteria with genetic resistance to broad-spectrum antibiotics, including the carbapenem family of drugs, often considered one of the antibiotic treatments of last resort. The emergence and increasing spread of CPOs around the world is concerning, with little known about its epidemiology, prevention and control in British Columbia (BC). Following an outbreak in a BC hospital, a mandatory CPO surveillance program for acute care facilities was established in July 2014. A number of stakeholders collaborated on the development of the program including health authorities (HA), BC Center for Disease Control's Public Health Laboratory (PHL), and the Provincial Infection Control Network of BC (PICNet). With an increasing number of cases identified in community settings, the BC Provincial Health Officer on December 22, 2016 designated CPO a reportable condition. In order to facilitate provincial laboratory molecular testing and provincial surveillance for CPOs, the Provincial Communicable Diseases Policy Advisory Committee decided to append CPO cases identified in community to the existing CPO surveillance program. This revised protocol provides guidance on collection and reporting of testing and surveillance data for all CPO cases in the province. This guidance is the minimum requirement for CPO surveillance in BC.

## 1. Objectives of CPO Surveillance

a. To identify and monitor CPOs among populations in the province

b. To examine the epidemiology of patients who are infected or colonized with CPOs and the molecular profile of these emerging organisms

c. To synthesize all epidemiologic and laboratory information to inform practices of patient care and infection control

## 2. Methods

a. Patient population

The patient population under surveillance includes:

- Patients admitted to acute care facilities
- Haemodialysis patients visiting renal clinics
- Patients suspected to be infected or colonized with CPOs
- Other patient populations that are deemed high risk for CPO by HA

b. CPO screening

The following patients should be screened for CPOs:

- Admission screening
  - Anyone who has had an overnight stay in a hospital or has undergone a medical/ surgical procedure outside of Canada within the past 12 months
  - Anyone who has received haemodialysis outside of Canada within the past 12 months
  - Anyone who is deemed high risk for CPO by HA

- Other screening
  - Anyone who was transferred from a healthcare unit or facility which is under investigation for ongoing CPO transmission
  - Anyone who has had close contact with a known CPO patient within the past 12 months, e.g. stayed in the same room or ward in the facility, shared nursing staff, lived in the same household, etc.
  - Patients who are suspected to be infected or colonized with CPOs

Repeat screening on patients who are deemed high risk but who screened negative upon admission may be considered after consultation with medical microbiologists or infection control practitioners (ICPs) in the facility.

c. Specimen types

- Admission screening specimen
  - Rectal swab with fecal staining (preferred)
  - Perianal swab or stool is acceptable if rectal swab is not available
- Clinical specimen
  - Specimen(s) from open wounds, blood, urine, tracheostomies, ostomies, intravenous catheter sites, and others as appropriate
- Contact tracing specimen
  - Rectal swab with fecal staining (preferred)
  - Perianal swab or stool is acceptable if rectal swab is not available

d. Scope

The following organisms that harbor a carbapenemase gene(s) are under surveillance:

- Screening specimen: Enterobacteriaceae[1]
- Clinical specimen: Enterobacteriaceae, *Pseudomonas spp*., and *Acinetobacter spp.*
- Contact tracing specimen: organisms that may harbour a targeted CPO gene(s)

e. Case identification and confirmation

Isolates that have been identified as potentially harboring a carbapenemase gene(s) by the medical microbiology laboratories in HAs or communities will be sent to PHL for molecular testing and genotyping analysis. A requisition form for CPO testing (Appendix B) will be completed and sent to PHL, along with the isolate.

PHL will report the molecular testing results directly to the submitting laboratory via the electronic laboratory information system as per current standard practice.

1. This may be altered to reflect new epidemiologic knowledge and infection control practices.

f. Eligible case

A case of CPO is defined as a carbapenemase gene that was newly identified from a patient isolate.

- The same gene identified in the same patient will be regarded as the same case of CPO, regardless of bacterial species or specimen types.
- Different carbapenemase genes identified in the same patient are considered different cases of CPO, regardless of whether they are identified in the same isolate, or different isolates from the same specimen or subsequent specimens.
- Either CPO colonization or the first CPO infection is considered an eligible case.

Once an isolate is confirmed to harbor a carbapenemase gene, PHL will check the laboratory CPO testing database to determine whether the carbapenemase gene was previously identified from the patient. If the gene is identified for the first time from the patient, it is an eligible case of new CPO, as defined above, and a unique identifier will be assigned and included in the laboratory report. The medical microbiologist at PHL will notify the medical microbiologist in the submitting laboratory of identification of the new CPO case. If the gene has already been identified from the same patient, the previous case identification number will be retrieved and included in the laboratory report.

g. Case reporting

After receiving the CPO laboratory report from PHL, the submitting laboratory will check where the isolate was obtained:

- Acute care setting: if the case of CPO was identified in the isolates from patients admitted to acute care facilities or visiting haemodialysis clinics in acute care facility, the submitting laboratory will inform the Infection Prevention and Control (IPAC) in the HA and the case will continue to be reported by IPAC to PICNet. PICNet will then inform Public Health through their quarterly and annual public report.
- Community healthcare settings: including following cases:
  - CPO cases from isolates forwarded by community laboratories to PHL
  - CPO cases from isolates obtained from all residential care facilities identified by any laboratory
  - CPO cases from isolates obtained from outpatient clinics or emergency department visits, where the patient was not subsequently admitted to an acute care facility, identified by the facility's laboratory.

  These cases will be reported to the local Medical Health Officer as a Reportable Communicable Disease. The MHO's office will receive (1) a copy of the PHL laboratory report with the unique identifier, which will be transcribed onto the "Letter to the Ordering Provider" – Appendix F, and (2) "Enhanced Surveillance Form for Carbapenemase-Producing Organisms (CPO) Identified in the Community" – Appendix G. The Enhanced Surveillance Form will be returned non-nominally to PICNet to be included for surveillance.

PHL Medical microbiologist will inform the IPAC program of the health authority regarding any CPO cases identified in the community within their health authority.

The MHO's Office and IPAC within each HA will also continue to communicate with each other regarding CPO cases identified in their HA.

h. Surveillance data collection

All new CPO cases (either colonization or infection) are required to complete the surveillance forms and send them to PICNet for the purpose of provincial surveillance and reporting.

- CPO cases in acute care settings: ICPs in HA are responsible for collecting surveillance information and completing the surveillance form (e.g., chart review, consultation with healthcare provider or physician, etc.). The Infection Control Epidemiologist will review the information collected and submit the data to PICNet as established.
  - For a new CPO case (either colonization or infection), the surveillance form for CPO (**Appendix C**) should be completed
  - If the patient is infected with CPO, or if the patient was initially reported as a CPO colonization and subsequently develops into a CPO infection within a year from initial identification, an addendum form for CPO infection (**Appendix D**) should be completed
  - A notification form (**Appendix E**) should be completed if the care unit is under investigation for CPO transmission
- CPO cases in community healthcare settings: MHO's office will send "Enhanced Surveillance Form for Carbapenemase-Producing Organisms (CPO) Identified in the Community" (Appendix G), along with "Letter to the Ordering Provider" (Appendix F) including the unique identifier number, and a CPO Health File to the patient's ordering physician or care provider, and ask them to fill the enhanced surveillance form (**Appendix G**). Once completed, the form should be sent to PICNet in a timely manner via email (picnet@phsa.ca) or fax (604-875-4373).

Appendix B, and fillable forms for appendix C, D, E, F and G are available on the PICNet website (https://www.picnet.ca/surveillance/cpo/cpo-surveillance/)

## 3. Data Management and Reporting

a. Provincial molecular testing and genotyping analysis data for CPO are managed by PHL. Provincial surveillance data are managed by PICNet. PHL and PICNet will share the information with HAs when necessary for CPO prevention and control, as per the data sharing agreement.

b. PICNet and PHL will cross-check the data weekly for data quality and assurance purposes. The information on the Requisition Form for CPO Testing will be de-identified and shared with PICNet, along with the molecular testing results.

c. Each quarter, PICNet will report the number of new CPO cases identified by HA and genotype, and post them on the PICNet's website for the Ministry of Health, HAs, all

healthcare professionals, and the public as per established data validation and reporting protocols for dissemination of surveillance data.

d. PICNet and PHL will work together to summarize the CPO laboratory testing and surveillance data and report back to the HAs, British Columbia Association of Medical Microbiologists (BCAMM), and the Ministry of Health annually or as necessary.

e. If a unit or facility is under investigation for CPO transmission, the HA should inform PICNet and PHL (Appendix E). PICNet will then inform other HAs of the investigation.

f. In case of an outbreak of CPO in an acute care facility, IPAC will consult with MHO regarding outbreak investigation and control. If the outbreak occurs in a community setting, such as residential care facilities and outpatient clinics, IPAC will assist the MHO in case management and infection control. The HA should communicate with or inform other HAs, PICNet, PHL, as well as the public as per established outbreak management processes.

For questions regarding CPO prevention and control, please visit PICNet's website (www.picnet.ca) for general information, or contact with IPAC in your HA.

For questions regarding CPO confirmatory tests, please contact

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## Appendix A - Laboratory Interpretive Criteria for Identifying Suspected Carbapenemase-Producing Organisms (CPO)

Included in this surveillance protocol are isolates recovered from **admission screening, clinical** and **contact tracing** specimens received by the microbiology laboratories in the health authorities.

**Admission screening specimens** are specimens collected at the time of patient admission to the facility or a care unit for the purpose of detection, prevention and control of CPO. Enterobacteriaceae will be tested for carbapenemase activities in the medical microbiology laboratory in each HA. If the isolates are suspected carbapenem resistant, they should be tested further with phenotypic/molecular methods. Non-Enterobacteriaceae may be pursued if there are epidemiological risk factors for CPO.

**Clinical specimens** are specimens collected for routine microbiology workup where carbapenem resistance is identified using automated systems or 2014 CLSI[1] zone diameters and/or Minimal Inhibitory Concentrations (MIC) values as listed below. All suspicious carbapenemase producing Enterobacteriaceae, *P. aeruginosa*, and *Acinetobacter spp* should be pursued further with phenotypic/molecular methods.

**Contact tracing specimens** are screening specimens from patients who have been identified as having epidemiological with a confirmed CPO case(s). Enterobacteriaceae and/or non-Enterobacteriaceae harbouring the CPO gene identified in the confirmed case will be targeted in testing of contact tracing specimens.

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

| **ALL of the following:** | ***Acinetobacter:*** | |
|---|---|---|
| | MIC (*µg/ml*) | Disk diffusion[2] (*mm*) |
| Imipenem | ≥ 4 | ≤ 21 |
| Meropenem | ≥ 4 | ≤ 17 |

1. Clinical and Laboratory Standards Institute. 2014. Performance standards for antimicrobial susceptibility testing; 24th informational supplement, M100-S24 (January, 2014). Clinical and Laboratory Standards, Wayne, PA.

2. Using a 10 µg disk of the appropriate antimicrobial.

| **ALL of the following:** | ***Pseudomonas aeruginosa:*** | |
|---|---|---|
| | MIC (*µg/ml*) | Disk diffusion[2] (*mm*) |
| Imipenem | ≥ 4 | ≤ 18 |
| Meropenem | ≥ 4 | ≤ 18 |
| Ceftazidime | ≥ 16 | ≤ 17 |

Once the isolate is identified as carbapenem resistant, phenotypic or molecular screening for CPO is performed, using any of the MAST, ROSCO, E-test, PCR, or other equivalent methods.

Positive isolates are sent to PHL, along with the CPO Requisition Form, for molecular testing and additional genotyping analyses.

Due to the importance of timely identification of these organisms for infection control and epidemiologic investigation, please send the isolates that are suspected of harbouring a carbapenemase gene(s) to the PHL as soon as possible.

When there is an internal alert or an outbreak of CPO is suspected, accelerated submission is strongly recommended.

PHL will report results back to the submitting laboratory directly via the electronic laboratory information system. For CPO positive isolates, PHL will check the laboratory database and determine whether it meets the definition of an eligible CPO case (see Section 2e in the Protocol). If it is a new case, a unique identifier will be assigned and included in the laboratory report. The submitting laboratory should work with ICPs to ensure that the CPO Surveillance Form (Appendix C) is completed and submitted to PICNet.

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

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BCCDC Public Health Laboratory
655 West 12th Avenue, Vancouver, BC, V5Z 4R4

## Appendix B – Requisition Form for Carbapenemase-Producing Organisms (CPO) Testing

BAM

BC Centre for Disease Control

**Public Health Laboratory**

655 West 12th Avenue, Vancouver, BC V5Z 4R4
www.bccdc.ca/publichealthlab

**Bacteriology and Mycology Requisition**
**Carbapenemase Producing Organism Testing**

BAM LM LABS

### Section 1 - Patient Information

| PERSONAL HEALTH NUMBER (or out-of province Health Number and province) | DOB (DD/MMM/YYYY) | GENDER ☐ M ☐ F ☐ UNK | DATE RECEIVED |
|---|---|---|---|
| PATIENT SURNAME | PATIENT FIRST AND MIDDLE NAME | | LABORATORY USE ONLY |
| ADDRESS | CITY | POSTAL CODE | |

### Section 2 - Submitting Laboratory Details

| CONTACT PERSON | HOSPITAL (Name and address for report delivery) | SAMPLE REF. NO. |
|---|---|---|
| TELEPHONE NUMBER | PHSA CLIENT NO. | DATE COLLECTED (DD/MMM/YYYY) |
| ADDITIONAL COPIES TO: | | |

### Section 3 - Specimen Details

ORGANISM IDENTIFICATION: Genus Species

☐ SCREENING ISOLATE ☐ CLINICAL ISOLATE ☐ CONTACT TRACING

PREVIOUS CPO SCREENING: ☐ NO ☐ YES DATE:

SPECIMEN SOURCE ☐ respiratory ☐ blood ☐ urine ☐ wound ☐ rectal ☐ other: _____

**Automated Antibiogram:**

| Antibiotic | MIC | Interpretation (S, I, R) | Antibiotic | MIC | Interpretation (S, I, R) |
|---|---|---|---|---|---|
| Ampicillin | | S☐ I☐ R☐ | Gentamicin | | S☐ I☐ R☐ |
| Ampicillin/Clavulanate | | S☐ I☐ R☐ | Imipenem | | S☐ I☐ R☐ |
| Aztreonam | | S☐ I☐ R☐ | Levofloxacin | | S☐ I☐ R☐ |
| Amikacin | | S☐ I☐ R☐ | Meropenem | | S☐ I☐ R☐ |
| Cefazolin | | S☐ I☐ R☐ | Minocycline | | S☐ I☐ R☐ |
| Cefepime | | S☐ I☐ R☐ | Nitrofurantoin | | S☐ I☐ R☐ |
| Cefoxitin | | S☐ I☐ R☐ | Pefloxacin | | S☐ I☐ R☐ |
| Cefpodoxime | | S☐ I☐ R☐ | Piperacillin | | S☐ I☐ R☐ |
| Ceftazidime | | S☐ I☐ R☐ | Piperacillin/Tazobactam | | S☐ I☐ R☐ |
| Cefixime | | S☐ I☐ R☐ | Rifampin | | S☐ I☐ R☐ |
| Ceftriaxone | | S☐ I☐ R☐ | Ticarcillin | | S☐ I☐ R☐ |
| Cephalothin/Cephalexin | | S☐ I☐ R☐ | Ticarcillin/Clavulanic Acid | | S☐ I☐ R☐ |
| Ciprofloxacin | | S☐ I☐ R☐ | Tigecycline | | S☐ I☐ R☐ |
| Colistin | | S☐ I☐ R☐ | Tobramycin | | S☐ I☐ R☐ |
| Ertapenem | | S☐ I☐ R☐ | Trimethoprim/Sulfamethoxazole | | S☐ I☐ R☐ |

☐ **OR, See attached for automated AST results**

**Phenotypic Confirmation:**

E-test/discs

| Antibiotic | MIC | Zone diameter | Interpretation |
|---|---|---|---|
| Ertapenem | | | |
| Meropenem | | | |
| Imipenem | | | |

Rosco Disc Interpretation: _____

**Other Results:**

ESBL E-test Interpretation: _____

Other Tests and Interpretation: _____

CPO PCR Interpretation: _____

Form PHBM_225_2001F Version 1.1 05/2017

BAM BAM

## Appendix C – Surveillance Form for Carbapenemase-Producing Organisms (CPO) Identified in Acute Care Facility

| | |
|---|---|
| 1 | **Unique Identifier** – assigned by BCCDC Public Health Laboratory (PHL) _____ |
| 2 | **Patient's status** ☐ Inpatient ☐ Haemodialysis clinic patient<br>☐ Other, *please specify* _____ |
| 3 | **Date of admission or visit** (dd/mmm/yyyy) _____ |
| 4 | **Name of the facility** _____ |
| 5 | **CPO status** ☐ Infection (please also complete appendix D) ☐ Colonization ☐ Unknown |
| 6 | **Has the patient had an overnight stay in a hospital or undergone medical/surgical procedure outside of Canada within the past 12 months?**<br>☐ Yes, *please specify the name of the country* _____ ☐ Country not provided<br>☐ No<br>☐ Unknown |
| 7 | **Has the patient had haemodialysis outside Canada within the past 12 months?**<br>☐ Yes, *please specify the name of the country* _____ ☐ Country not provided<br>☐ No<br>☐ Unknown |
| 8 | **Was the patient transferred from a unit which was under investigation for CPO transmission?**<br>☐ Yes, *please specify the name of the unit and facility* _____<br>☐ No - the patient was transferred from a unit or facility which was NOT under investigation for CPO transmission<br>☐ Unknown - it is unknown whether the unit or facility from which the patient was transferred was under investigation for CPO transmission<br>☐ N/A, the patient was not transferred |
| 9 | **Has the patient had contact with a known CPO case within the past 12 months?**<br>☐ Yes, *please specify the nature of contact*:<br>☐ Roommate in a healthcare facility ☐ Same unit in a healthcare facility<br>☐ Household ☐ Other, *please specify* _____<br>☐ No<br>☐ Unknown |
| 10 | **Is there any evidence that this case was associated with the reporting facility?**<br>☐ Yes ☐ No ☐ Unable to determine |
| 11 | **Is there any evidence of transmission within the reporting facility?**<br>☐ Yes ☐ No ☐ Unable to determine |

Once completed, please send it to PICNet at picnet@phsa.ca (cc Guanghong.han@phsa), or fax 604-875-4373

## Description and notes

| | | |
|---|---|---|
| 1 | Unique Identifier | Record the ID number assigned by PHL on their laboratory report. The format of ID includes yyyy####-###-##: yyyy is the year of the first CPO test for the patient; #### is the serial number of the patient being tested for CPO in the year beginning from 0001 each year; ### is a serial number for the isolate being tested from the patient, and ## is a serial number of carbapenamase genes identified from the patient.<br><br>If the ID number has not been received for this case or there are any questions about ID, please contact PHL |
| 2 | Patient's status | Specify whether the patient was an 'inpatient' (hospitalized), or a 'haemodialysis clinic patient' at the time when the specimen was collected.<br><br>If neither, check 'Other' and specify' in written text the location where the specimen was collected (e.g., Emergency Department, Outpatient Clinic) |
| 3 | Date of admission or visit (dd/mmm/yyyy) | Record the Day (e.g., 17), Month (e.g., Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014). Write out the month (e.g. Jan, Mar, Aug, etc.). |
| 4 | Name of the Facility | Specify the name of the facility where the patient was admitted or visited at the time when the specimen was collected. |
| 5 | CPO status | Specify the patient's CPO status in terms of infection, colonization or unknown according to the following definitions:<br><br>**Infection** is defined as a patient with evidence of clinical signs and symptoms resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) in addition to a positive culture of CPO. Clinical evidence may be derived from direct observation of the infection site (e.g., a wound), or review of information in the patient chart or other clinical records, or a physician or surgeon diagnosis of infection. Please refer to the 2015 "CDC/NHSN Surveillance Definitions for Specific Type of Infections" for definitions and criteria of all specific types of infections (http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf). (Note that by checking infection, Appendix D needs to be completed.)<br>**Colonization** is the presence of CPO on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms.<br><br>**Unknown** if there is no or insufficient information to define whether the patient's CPO status represents an infection or colonization. |
| 6 | Has the patient had an overnight stay in a hospital or undergone a medical/surgical procedure outside of Canada within the past 12 months? | Examples of healthcare exposure outside Canada in the past 12 months include (but are not limited to):<br>• an overnight stay or longer in a hospital or other healthcare facility<br>• invasive diagnostic procedure, such as endoscopy, cardiac catheterization, Pap smear, trans-esophageal echocardiography, trans-vaginal or trans-rectal ultrasound, biopsy, etc<br>• invasive therapeutic procedure, such as, intravenous therapy, blood transfusion, etc<br>• surgical procedure, including plastic and cosmetic surgery, and organ transplantation<br>• other medical procedure, such as wound or surgical site cleaning and |

| | | |
|---|---|---|
| | | dressing<br>• dental procedures, e.g. dental implant, dental surgery.<br>If responding with Yes, specify which country the patient travelled to. |
| 7 | Has the patient had haemodialysis outside Canada within the past 12 months? | Select **Yes** if the patient had haemodialysis outside Canada within the past 12 months and specify the name of the country the patient travelled to. |
| 8 | Was the patient transferred from a unit which was under investigation of CPO transmission? | Select **Yes** if the patient was transferred from a unit, either within the facility or from another facility, which was under investigation for CPO transmission during his/her stay in the unit.<br>If responding with Yes, specify the unit and facility where the patient was transferred from.<br>Select **No** if the patient was transferred from a unit which was **NOT** under investigation for CPO transmission during his/her stay in the unit. |
| 9 | Has the patient had close contact with a known CPO case within the past 12 months? | Select **Yes** if the patient had contact with a known CPO patient in the past 12 months. If yes, specify the nature of the contact. |
| 10 | Is there any evidence that this case was associated with the reporting facility? | Select **Yes** if the CPO was identified more than 72 hours or 3 days after admission to the reporting facility **AND** the patient **did NOT** have any of the following factors:<br>• an overnight stay in a hospital or a medical/surgical procedure outside of Canada within the past 12 months<br>• haemodialysis outside of Canada within the past 12 months<br>• transferred from a healthcare unit or facility with a high prevalence of CPO<br>• close contact with a known CPO case in their household or from another healthcare facility within the past 12 months |
| 11 | Is there any evidence of transmission within the reporting facility? | Select **Yes** if<br>• the genotype is the same as another CPO case(s) in the facility in the past 12 month, AND<br>• there is epidemiologic link to another CPO case(s) in the facility in terms of time and space, e.g., stay in the same unit or floor, shared equipment or nursing staff, etc |

## Appendix D – Addendum Form for Carbapenemase-Producing Organisms (CPO) Infections Identified in Acute Care Facility

**NB:** This form should be complete if a) the case was identified as a CPO infection; b) the case was initially reported as colonization, and subsequently developed into a CPO infection within a year from initial identification. Please ensure that the CPO surveillance form (***Appendix C***) has been completed for this case.

| | |
|---|---|
| 1 | **Unique Identifier** – assigned by BCCDC Public Health Laboratory (PHL) _____ |
| 2 | **Patients' status** ☐ Inpatient ☐ Haemodialysis clinic patient<br>☐ Other, *please specify* _____ |
| 3 | **Date of admission or visit** (dd/mmm/yyyy) _____ |
| 4 | **Name of the facility** _____ |
| 5 | **Date of CPO infection identification** (dd/mmm/yyyy) _____ |
| 6 | **Site(s) of infection** ☐ Bloodstream ☐ Urinary tract ☐ Respiratory tract ☐ Wound ☐ Surgical site<br>☐ Other, *please specify* _____ |
| 7 | **Organism(s) isolated** (Check all that apply)<br>☐ *Acinetobacter* spp. ☐ *Serratia* spp. ☐ *Klebsiella pneumonia* ☐ *Enterobacter* spp.<br>☐ *Escherichia coli* ☐ *Proteus* spp. ☐ *Morganella morganii* ☐ *Citrobacter* spp.<br>☐ *Pseudomonas* spp. ☐ *Other Entero-bacteriaceae, please specify* _____ |
| 8 | **CPO gene(s) detected:** ☐ NDM ☐ KPC ☐ OXA-48 ☐ VIM ☐ IMP ☐ SME<br>☐ Other, *please specify* _____ |
| 9 | **Was the patient treated with an antibiotic for CPO infection?**<br>☐ Yes, please specify the antibiotic(s) was / were used? (*Check all that apply*)<br>☐ Colistin ☐ Tigecycline ☐ Other, *please specify* _____<br>☐ No<br>☐ Unknown |
| 10 | **Was ICU admission required due to CPO infections or the complications associated with CPO infection?**<br>☐ Yes – the patient was admitted to ICU as a result of a CPO infection or complications associated with a CPO infection.<br>☐ No – the patient was not admitted to ICU<br>☐ N/A – patient was already in ICU due to other medical conditions<br>☐ Unknown |
| 11 | **Patient outcome <u>30 days</u> or up until discharge after identification of CPO infection**<br>☐ Patient alive, still in hospital 30 days after diagnosis<br>☐ Patient survived and discharged<br>☐ Patient survived and transferred<br>☐ Patient died |

Once completed, please send it to PICNet at picnet@phsa.ca (cc Guanghong.han@phsa) or fax 604-875-4373

## Description and notes

| | | |
|---|---|---|
| 1 | Unique Identifier | Record the ID number assigned by PHL for the CPO positive isolate that was associated with the infection.<br>If the ID number has not been received for the isolates or there are any questions about ID, please contact PHL. |
| 2 | Patient's status | Specify whether the patient was an 'inpatient' (hospitalized) , or a 'haemodialysis clinic patient' at the time when CPO infection was identified.<br>If neither, check 'Other' and specify' in written text the location where the specimen was collected (e.g., Emergency Department, Outpatient Clinic) |
| 3 | Date of admission or visit (dd/mmm/yyyy). | Record the Day (e.g., 17), Month (e.g., Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014). Write out the month (e.g. Jan, Mar, Aug, etc.). |
| 4 | Name of the Facility | Specify the name of the facility where the patient was identified with CPO infection |
| 5 | Date of CPO infection identification (dd/mmm/yyyy) | Record the date when the CPO infection was identified, and enter Day (e.g. 17), Month (e.g. Jul) and Year (e.g. 2014) in this order (e.g., 17-Jul-2014). |
| 6 | Site(s) of infection | Check the site(s) of CPO infection – check all that apply or specify the site(s) of infection(s). |
| 7 | Organism (s) isolated | Check all of the organisms that were associated with the infection(s). |
| 8 | CPO gene(s) detected | Check all of the CPO genes that were associated with the infection(s). |
| 9 | Was the patient treated with an antibiotic for CPO infection? | Select **Yes** if the patient received antibiotic treatment for the CPO infection(s), and check or specify what antibiotics were used.<br>Select **No** if the patient was not treated with antibiotics |
| 10 | Was ICU admission required due to CPO infections or the complications associated with CPO infection? | Select one of the options that applies to the patient |
| 11 | Patient outcome at 30 days or up until discharge after identification of CPO infection | Select one of the options that applies to the patient at 30 days or at the time of discharge after the CPO infections was identified. |

## Appendix E – Notification of Carbapenemase-Producing Organisms (CPO) Transmission Investigation

***Please complete this form for notification of a CPO transmission investigation in your facility or health authority and email to picnet@phsa.ca or fax to 604-875-4373***

**A. Notification Information**

Health Authority: Facility Name: Unit:

Contact Person: Title:

Contact Phone: Email:

Facility type: ☐ Acute Care Hospital ☐ Residential Care Facility ☐ Other ( )

Is this report: ☐ Notification of transmission investigation *(complete section **B** below)*
☐ Notification of transmission investigation resolved *(complete section **C**)*

**B. Transmission Investigation Notification**

Date investigation initiated* (dd/mm/yyyy):

Organism (Genus species) _____

CPO gene identified (e.g. NDM, KPC) _____

**C. Transmission Investigation Resolved**

Date investigation closed (dd/mm/yyyy):

Notes:

Reported by: _____ Date: _____

* Date of investigation initiation = date of positive index case. Please contact Dr. Linda Hoang at 604-707-2618 or Linda.Hoang@bccdc.ca for questions or clarifications regarding this form.

Once completed, please send it to PICNet at picnet@phsa.ca (cc Guanghong.han@phsa) or fax 604-875-4373

## Appendix F – Letter to Ordering Provider in Response to CPO Cases Identified in the Community

Date:

Dear *Health Care Provider (ordering provider),*

Re: *Patient Last name, First name; PHN; DOB*

Public Health has received laboratory notification that your patient tested positive for a carbapenemase-producing organism (CPO) - an emerging public health concern. As per the Public Health Act and the Communicable Disease Regulation, physicians/administrators for laboratories that identify CPO are required to report cases to their local medical health officer.

A provincial non-nominal surveillance program is in place to monitor the epidemiology (e.g. risk factors, laboratory data) of CPO in BC. Each patient isolate is assigned a unique identifier for this purpose. The unique identifier for your patient is _____. Attached is a surveillance form. We ask that you complete this form to the best of your ability and return it by email or fax to the Provincial Infection Control Network of BC at picnet@phsa.ca or 604-875-4373.

CPOs are multi-drug resistant gram negative bacteria that pose significant risk to vulnerable patients in healthcare facilities, as the antibiotics available to treat infections are very limited. Due to this risk, please request that your patient inform any healthcare facility on admission and/or routine healthcare encounters (such as hemodialysis, oncology clinics, BMT day care) that they have tested positive for CPO. Infection Control measures will be put in place to decrease the likelihood of spreading these bacteria to other patients.

At this time, little is known about the carriage and clearance of CPO infections in the community after treatment. Follow-up testing of clearance is not recommended, as carriage may return after treatment with a carbapenem antibiotic.

Interpretation of this laboratory result should be in context of the overall health of your patient. In the community, patients who test positive for a CPO do not generally pose a risk to others. Patients should be advised to maintain good personal hygiene and avoid sharing personal items to prevent spread to others. Added precautions are NOT required in the community office setting.

Attached is a patient information sheet for your patient (CPO Health file). Further information on CPO is available at BCCDC website.

## Appendix G – Enhanced Surveillance Form for Carbapenemase-Producing Organisms (CPO) Identified in the Community

| | |
|---|---|
| 1 | **Unique Identifier** – assigned by BCCDC Public Health Laboratory (PHL) _____ |
| 2 | **Patient's CPO status** ☐ Infection ☐ Colonization ☐ Unknown |
| 3 | **Has the patient travelled outside Canada within the past 12 months?**<br>☐ Yes, *please specify the name of the country* _____ ☐ Country not provided<br>☐ No<br>☐ Unknown |
| 4 | **Has the patient had an overnight stay in a hospital or undergone medical/surgical procedure (e.g., endoscopic procedure, inserting catheter, hemodialysis, outpatient surgery) outside of Canada within the past 12 months?**<br>☐ Yes, *please specify the name of the country* _____ ☐ Country not provided<br>☐ No<br>☐ Unknown |
| 5 | **Has the patient had an overnight stay or longer in any BC care facilities (e.g., hospital, residential care facility) within the past 12 months?**<br>☐ Yes, *please specify the name of the facility* _____<br>☐ No<br>☐ Unknown |
| 6 | **Has the patient had contact with a known CPO case within the past 12 months?**<br>☐ Yes, *please specify the nature of contact*:<br>☐ Household, i.e., a family member with CPO<br>☐ Non-household, i.e., a friend/acquaintance with CPO<br>☐ Other, *please specify* _____<br>☐ No<br>☐ Unknown |
| **If the patient was infected with CPO, please answer the following questions** | |
| 7 | **Site(s) of infection** (*Check all that apply*)<br>☐ Bloodstream ☐ Urinary tract ☐ Respiratory tract ☐ Wound ☐ Surgical site<br>☐ Other, *please specify* _____ |
| 8 | **Was the patient treated with an antibiotic for current CPO infection?**<br>☐ Yes, please specify the antibiotic(s) was / were used? (*Check all that apply*)<br>☐ Colistin ☐ Tigecycline ☐ Other, *please specify* _____<br>☐ No<br>☐ Unknown |
| 9 | **Was the patient admitted to a BC hospital due to current CPO infection?**<br>☐ Yes, the patient was admitted due to CPO infection. *Specify the name of the facility* _____<br>☐ No, the patient was admitted due to other medical conditions.<br>☐ No, the patient was not admitted<br>☐ Unknown |

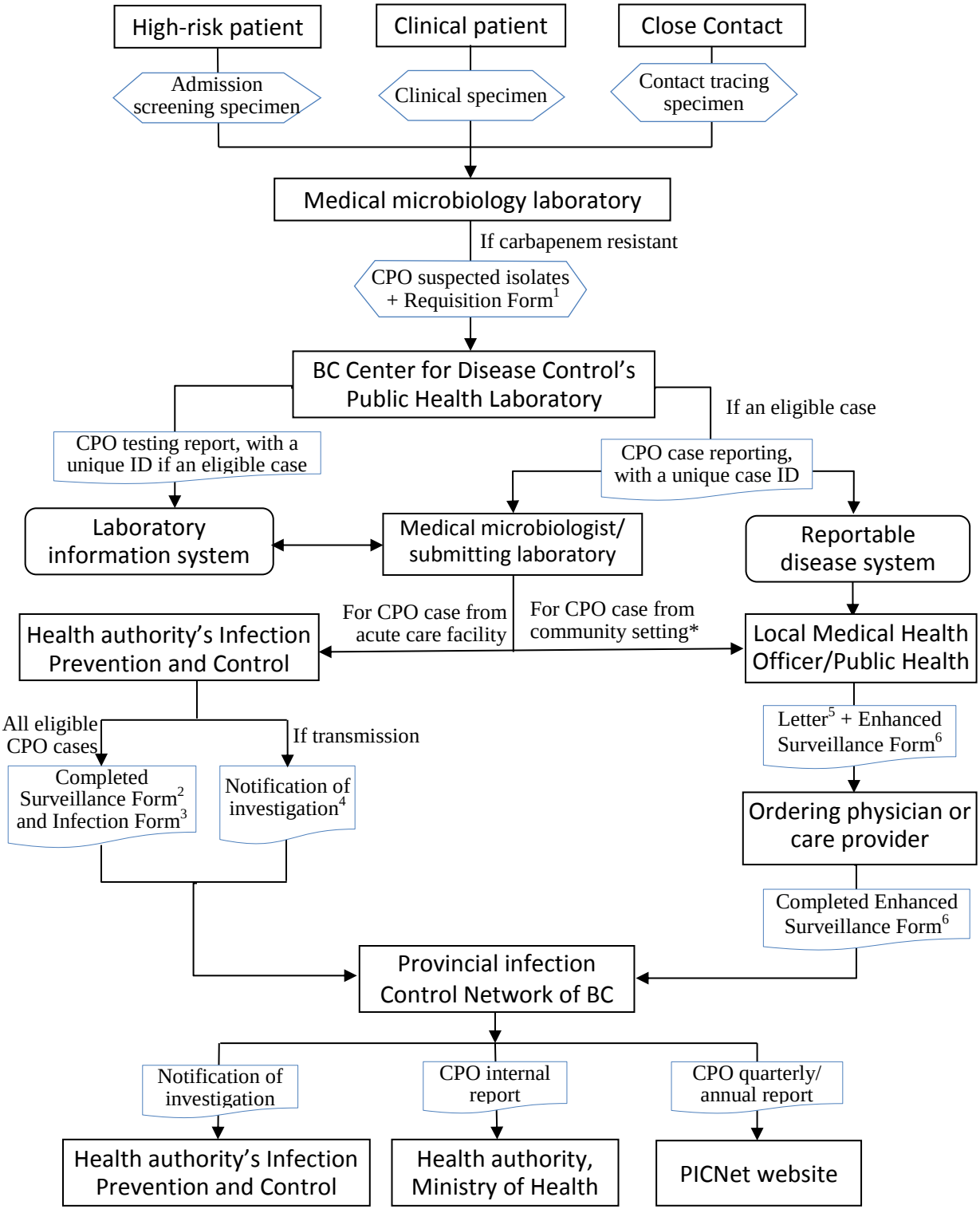
Once completed, please send it to PICNet at picnet@phsa.ca (cc Guanghong.han@phsa) or fax 604-875-4373

## Description and notes

| | | |
|---|---|---|
| 1 | Unique Identifier | The unique ID for the CPO case assigned by PHL is provided in the letter from medical health officer. If the ID number has not been included or there are any questions about ID, please contact PHL (telephone 604-707-2617, fax 604-707-2604, or email to linda.hoang@bccdc.ca). |
| 2 | CPO status | Specify the patient's CPO status in terms of infection, colonization or unknown according to the following definitions:<br><br>**Infection** is defined as a patient with evidence of clinical signs and symptoms resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) in addition to a positive culture of CPO. Clinical evidence may be derived from direct observation of the infection site (e.g., a wound), or review of information in the patient chart or other clinical records, or a physician or surgeon diagnosis of infection. Please refer to the 2015 "CDC/NHSN Surveillance Definitions for Specific Type of Infections" for definitions and criteria of all specific types of infections (http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf).<br><br>**Colonization** is the presence of CPO on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms.<br><br>**Unknown** if there is no or insufficient information to define whether the patient's CPO status represents an infection or colonization. |
| 3 | Has the patient travelled outside Canada within the past 12 months? | If the patient has stayed outside Canada for overnight or longer within the past 12 months, select **Yes** and specify which country the patient travelled to. |
| 4 | Has the patient had an overnight stay in a hospital or undergone medical/surgical procedure outside of Canada within the past 12 months? | Examples of healthcare exposure outside Canada in the past 12 months include (but not limited to):<br>• an overnight stay or longer in a hospital or other healthcare facility<br>• hemodialysis<br>• invasive diagnostic procedure, such as endoscopy, cardiac catheterization, Pap smear, trans-esophageal echocardiography, trans-vaginal or trans-rectal ultrasound, biopsy, etc<br>• invasive therapeutic procedure, such as, intravenous therapy, blood transfusion, etc<br>• surgical procedure, including plastic and cosmetic surgery, and organ transplantation<br>• other medical procedure, such as wound or surgical site cleaning and dressing<br>• dental procedures, e.g. dental implant, dental surgery.<br><br>If responding with **Yes**, specify which country the patient travelled to. |
| 5 | Has the patient had an overnight stay or longer in any BC care facilities within the past 12 months? | Select **Yes** if the patient had an overnight stay or longer in any BC care facilities (e.g. acute care facility, residential care facility, rehab center, etc.) within the past 12 months prior to identification of CPO in the patient. Specify the name of the facility. |
| 6 | Has the patient had contact with a known CPO case within the past 12 months? | Select **Yes** if the patient had contact with a known CPO patient in the past 12 months prior to identification of CPO in the patient. If **Yes**, specify the nature of the contact. |
| 7 | Site(s) of infection | Check the site(s) of CPO infection – check all that apply or specify the site(s) |

| | | |
|---|---|---|
| | | of infection(s). |
| 8 | Was the patient treated with an antibiotic for current CPO infection? | Select **Yes** if the patient received antibiotic treatment for the CPO infection(s), and check or specify what antibiotics were used. |
| 9 | Was the patient admitted to a BC hospital due to current CPO infection? | Select **Yes** the patient admitted to a hospital due to current CPO infection. Select **No** if the patient admitted to a hospital due to other medical conditions, or the patient was not admitted. |

## Appendix H – Process Flowchart for Carbapenemase-Producing Organisms (CPO) Surveillance




* includes CPO cases identified in community clinics, outpatient clinics, emergency rooms, and residential care facilities

1. Requisition Form for CPO Test (Appendix B); 2. CPO Surveillance Form (Appendix C);
3. CPO infection form (Appendix D); 4. Notification of CPO Transmission Investigation (Appendix E);
5. Sample Letter from local Medical Health Officer (Appendix F); 6. Enhanced Surveillance Form( Appendix G)