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

May 2019

**Contacts:**


**Dr. Linda Hoang**

Program Head, Public Health Advanced Bacteriology & Mycology
BCCDC Public Health Laboratory (BCCDC PHL)
655 West 12th Avenue, Vancouver, BC, V5Z 4R4
Phone: (604) 707-2618
Email: Linda.Hoang@bccdc.ca

**Dr. Guanghong Han**

Epidemiologist, Provincial Infection Control Network of BC (PICNet)
Suite #504, 1001 W Broadway, Vancouver, BC, V6H 4B1
Phone: (604) 875-4844 ext. 22983
E-mail: Guanghong.Han@phsa.ca


fraserhealth Better health. Best in health care. | Interior Health Every person matters | island health | northern health | Provincial Health Services Authority Province-wide solutions. Better health. | Vancouver CoastalHealth Promoting wellness. Ensuring care.

## Acknowledgements

We would like to acknowledge the contribution and expertise of the following members of PICNet's Surveillance Steering Committee and individuals in reviewing and revising this document:

- Dr. Ghada Al-Rawahi
  Medical Microbiologist, Provincial Health Services Authority
- Joanne Archer
  Acting Network Director, Provincial Infection Control Network of British Columbia
- Dr. Aamir Bharmal
  Medical Health Officer, Fraser Health
- Dr. Elizabeth Brodkin
  Medical Health Officer and Executive Medical Director, Infection Prevention and Control, Fraser Health
- Dr. Elizabeth Bryce
  Medical Microbiologist, Vancouver Coastal Health and Co-Medical Director, Provincial Infection Control Network of British Columbia
- Alison Chant
  Infection Control Coordinator, Provincial Health Services Authority
- Dr. Marthe Kenny Charles
  Medical Microbiologist, Vancouver Coastal Health
- Jun Chen Collet
  Epidemiologist, Infection Prevention and Control, Provincial Health Services Authority
- Tara Donovan
  Network Director, Provincial Infection Control Network of British Columbia
- Leslie Forrester
  Regional Director, Quality, Patient Safety & Infection Control, Vancouver Coastal Health
- Aleksandra Gara
  Regional Epidemiologist, Quality, Patient Safety & Infection Control, Vancouver Coastal Health
- Dr. Dave Goldfarb
  Medical Microbiologist, Provincial Health Services Authority
- Dr. Guanghong Han
  Epidemiologist, Provincial Infection Control Network of British Columbia
- Miles Hart
  Senior Policy Analyst, Infection Prevention & Control, Ministry of Health
- Lisa Harris
  Infection Control Practitioner, Vancouver Coastal Health
- Deanna Hembroff
  Regional Manager, Infection Prevention & Control, Northern Health
- Dr. Linda Hoang
  Medical Microbiologist, BC Center for Disease Control and Co-Medical Director, Provincial Infection Control Network of British Columbia
- Robyn Hunter
  Director, Infection Prevention and Control, Provincial Health Services Authority
- Dillon Kelly
  Infection Control Practitioner, Interior Health
- Dr. Pamela Kibsey
  Medical Microbiologist, Island Health

- Dr. Victor Leung
  Medical Director, Infection Prevention and Control, Providence Health Care
- Dr. Elisa LloydSmith
  Regional Epidemiologist, Quality, Patient Safety & Infection Control, Vancouver Coastal Health
- Dr. Christopher Lowe
  Medical Microbiologist, Providence Health Care
- Dr. Neil Mina
  Medical Microbiologist, Fraser Health
- Dr. Julie Mori
  Epidemiologist, Infection Prevention and Control, Interior Health
- Dr. Emily Newhouse
  Medical Health Officer, Vancouver Coastal Health
- Dr. David Patrick
  Professor, University of British Columbia and Medical Epidemiology Lead for Antimicrobial Resistance, British Columbia Centre for Disease Control
- Romali Ranasinghe
  Surveillance Coordinator, Provincial Infection Control Network of British Columbia
- Blair Ranns
  Epidemiologist, Infection Prevention and Control, Island Health
- Dr. Romina Reyes
  Medical Microbiologist, LifeLabs
- Brian Sagar
  Director, Infection Prevention & Control, Ministry of Health
- Azra Sharma
  Epidemiologist, Infection Prevention and Control, Providence Health Care
- Katy Short
  Senior Epidemiologist, Infection Prevention and Control, Fraser Health
- Dr. Jocelyn Srigley
  Director, Infection Prevention and Control, Provincial Health Services Authority
- Dr. Bing Wang
  Medical Microbiologist, Interior Health
- Xuetao (Katherine) Wang
  Epidemiologist, Infection Prevention and Control, Fraser Health
- Petra Welsh
  Director, Infection Prevention and Control, Fraser Health
- Dr. Titus Wong
  Medical Microbiologist, Vancouver Coastal Health
- Valerie Wood
  Director, Infection Prevention and Control, Interior Health

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

## Table of Contents

## 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 which are 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). CPOs were further designated as a reportable condition in BC by the Provincial Health Officer on December 22, 2016 and the provincial surveillance protocol for CPO was modified accordingly in December 2017 to incorporate identifying and reporting cases of CPO in the community. To address concerns arisen from CPO surveillance practices, a provincial CPO working meeting was convened by PICNet in June 2018 from various provincial and health authority representatives, including Medical Health Officers, medical microbiologists, epidemiologists, and infection prevention and control practitioners and leaders, to review and update the provincial surveillance protocol. PICNet's Surveillance Steering Committee revised the protocol to reflect the decisions at the meeting and knowledge gained from CPO prevention and control practice. This revised protocol provides guidance on the minimum requirements for identification of CPO, collection and reporting of surveillance data in both acute care and community care settings in the province.

## 1. Objectives of CPO Surveillance

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

b. To examine the epidemiology of people 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 CPO prevention and control and patient care

## 2. Methods

a. Population under surveillance

All cases of CPO identified in BC are included in the provincial surveillance activities. The following population will be screened by CPO screening questionnaire at the time of admission or visit for healthcare services:

- Patients admitted to acute care facilities
- People at high risk of acquiring CPO as defined by the health authority (e.g., patients who receive intensive medical care at outpatient settings, such as hemodialysis clinics, oncology clinics, bone marrow or solid organ transplant clinics, etc.)

b. Minimum screening swabs

- Admission screening swabs

  - Anyone who has had an overnight stay in a hospital or has undergone a medical/ surgical procedure outside Canada within the past 12 months
  - A health authority may choose to expand admission screening swabs to patients who had *any* healthcare encounter outside Canada or travelled to CPO endemic regions within the past 12 months

- Other screening swabs
  - Anyone who was transferred from a care unit or care facility which is under investigation for ongoing CPO transmission
  - Anyone who was deemed high risk for CPO acquisition by the health authority, such as the roommates or close contact of a known CPO-positive individual

- Serial screening swabs

  Health Authorities may consider serial screening swabs over a period of 21 days for patients with recent high risk exposure but negative for CPO upon admission swabs after consultation with medical microbiologists or infection control practitioners (ICPs) in the facility.

c. Sample collection

- Screening sample
  - Rectal swab (preferred) with fecal staining (required)
  - Stool sample is acceptable if rectal swab is not available

- Clinical sample
  - Sample(s) from open wounds, blood, urine, tracheostomies, ostomies, intravenous catheter sites, and others as appropriate

- Contact tracing sample
  - Rectal swab (preferred) with fecal staining (required)
  - Stool sample is acceptable if rectal swab is not available

d. Scope

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

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

e. Case identification and confirmation

All patient isolates that have been identified as potentially harboring a carbapenemase gene(s) by the medical microbiology laboratories in HAs or communities should be sent to PHL for molecular testing and genotyping analysis, accompanied by completed requisition form for CPO testing (Appendix B).

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

f. Eligible case

The case of CPO is defined by carbapenemase gene for the provincial surveillance. A new case of CPO is a carbapenemase gene that was identified from a patient isolate for the first time in the province.

- The same gene identified from the same patient will be regarded as the same case of CPO, regardless of bacterial species or sample types.
- Different carbapenemase genes identified from 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 sample, or subsequent samples.
- All newly identified carbapenemase genes from a patient with CPO either colonization or infection are considered new cases of CPO.

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 already identified from the patient. If the gene is identified for the first time from the patient, it will be considered a new case of 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 at:

- If the CPO positive isolate was obtained from patients admitted to an acute care facility, including long-term care units or facilities that are housed in or affiliated to an acute care facility, the submitting laboratory will inform the Infection Prevention and Control (IPAC) team in the HA and the case will be reported by the HA's IPAC to PICNet. PICNet will then inform Public Health through their quarterly and annual public report.
- If the CPO positive isolate was obtained at community healthcare settings, including:
  - isolates forwarded by community laboratories to PHL
  - isolates obtained from all residential care facilities identified by any laboratory
  - isolates obtained from outpatient clinics or emergency department visits, where the patient was not subsequently admitted to an acute care facility

  PHL and submitting laboratory will inform the local Medical Health Officer (MHO) as a Reportable Condition based on the location of patient's residence (including First Nations peoples on and off reserve and clients/residents in the residential care facility). If the residence of patient is not available, the submitting laboratory will contact the care provider directly. 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).

- PHL Medical microbiologist will inform HA's IPAC program of CPO cases identified in the communities within their HA.
- The MHO's Office and IPAC within each HA will continue to communicate with each other regarding CPO cases identified in their HA.

h. Surveillance data collection

All new cases of CPO require completing the surveillance forms, which should be sent to PICNet for the purpose of provincial surveillance and reporting.

- New cases in acute care settings

  ICPs in HA are responsible for collecting surveillance information and completing the surveillance forms (e.g., chart review, consultation with healthcare provider or physician, etc.). The IPAC Epidemiologist in HA will review the information collected and submit the data to PICNet as established process.

  - For a new case of CPO (either colonization or infection), the surveillance form for CPO (**Appendix C**) must be submitted.
  - If the patient is infected with CPO, or if the patient was initially reported as CPO colonization and subsequently developed into a CPO infection within a year from initial identification, an addendum form for CPO infection (**Appendix D**) must be submitted.

- New 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 physician or care provider should send the enhanced surveillance form to PICNet in a timely manner via email (picnet@phsa.ca) or fax (604-875-4373).

i. CPO transmission investigation

- Initiation of investigation

  If there is suspected transmission in a care unit or care facility, an investigation should be initiated. Indicators of possible transmission may include a newly detected CPO case among a currently admitted patient or there are two or more cases in the care unit or care facility that are epidemiologically linked.

- Closure of investigation

  The investigation will be declared over if there is no further CPO positive isolates identified after six weeks of the last CPO in the unit.

- Notification of CPO transmission investigation

When there is suspected ongoing transmission within a care unit or care facility, or the HA has reason to believe that other patients may have been exposed, HA's IPAC will complete the form of notification of ongoing CPO transmission investigation (**Appendix E**) and send it to PICNet in a timely manner. PICNet will disseminate the notification form to IPAC program in other HAs.

Once the investigation is resolved, an updated notification of CPO transmission investigation form (Appendix E) should be sent to PICNet, who will disseminate the updated notification form to IPAC program in other HAs.

HA's IPAC should inform Public Health in their HA regarding initiation and closure of ongoing CPO transmission investigation.

## 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. IPAC in HA should inform PICNet and PHL of initiation and closure of investigation of suspect CPO transmission when the transmission is believed to be ongoing or IPAC has reason to believe other patients may been exposed (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.

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

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

**Screening samples** are samples collected at the time of patient admission/visit to or stay at a care facility or a care unit for the purpose of detection, prevention and control of CPO. Enterobacteriaceae will be tested for carbapenemase activities by the medical microbiology laboratories in HAs or community. 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 samples** are samples collected for routine microbiology workup where carbapenem resistance is suspected by the medical microbiology laboratory based on 2019 CLSI interpretive criteria[1]. All isolates suspicious carbapenemase producing Enterobacteriaceae, *P. aeruginosa*, and *Acinetobacter spp* should be pursued further with phenotypic/molecular methods.

**Contact tracing samples** are samples collected from people who have been identified as having an epidemiological link 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 samples.

| **At least ONE of the following** | **Enterobacteriaceae** | |
|---|---|---|
| | MIC (*µg/ml*) | Zone diameters (*mm*) |
| Ertapenem | ≥ 2 | ≤ 18 |
| Imipenem | ≥ 4 | ≤ 19 |
| Meropenem | ≥ 4 | ≤ 19 |

| **At least ONE of the following** | ***Acinetobacter spp.*** | |
|---|---|---|
| | MIC (*µg/ml*) | Zone diameters (*mm*) |
| Imipenem | ≥ 8 | ≤ 18 |
| Meropenem | ≥ 8 | ≤ 14 |

| **ALL of the following** | ***Pseudomonas aeruginosa*** | |
|---|---|---|
| | MIC (*µg/ml*) | Zone diameters (*mm*) |
| Imipenem | ≥ 8 | ≤ 15 |
| Meropenem | ≥ 8 | ≤ 15 |
| Ceftazidime | ≥ 32 | ≤ 14 |

1. Clinical and Laboratory Standards Institute. 2019. Performance standards for antimicrobial susceptibility testing; 29th informational supplement, M100-S29 (December 27, 2018). Clinical and Laboratory Standards, Wayne, PA.

All carbapenem resistant strains of Enterobacteriaceae, *Pseudomonas spp.*, and *Acinetobacter spp*. should be sent to PHL, along with the CPO Requisition Form (**Appendix A**) , 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 in the HAs and care providers to ensure that the CPO surveillance information is collected and submitted to PICNet.

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

**Dr. Linda Hoang**, Program Head
Phone: (604) 707-2618; Email: Linda.Hoang@bccdc.ca

**Ana Paccagnella**
Phone: (604) 707-2610; Email: Ana.Paccagnella@bccdc.ca

**Supervisors**
Phone: (604) 707-2617; Fax: (604) 707-2604

**Mailing address**
Public Health Advanced Bacteriology/Mycology Lab
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 ☐ 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 | **Did the patient travel outside of Canada within the past 12 months?**<br>☐ Yes. *Please specify the name of the country* _____ ☐ Country not provided<br>☐ No. *Please skip Question 7.*<br>☐ Unknown or patient is discharged. *Please skip Question 7.* |
| 7 | **If answered Yes to Question 6, did the patient have a healthcare encounter outside of Canada within the past 12 months?**<br>☐ Yes, an overnight stay in a hospital or undergone medical/surgical procedure outside of Canada<br>☐ Yes, other healthcare encounter, e.g., visited GP, walking clinic, dentist, ER, etc.<br>☐ No healthcare encounter ☐ Unknown |
| 8 | **What types of healthcare encounters has the patient had in BC in the past 12 months?** *(Check all that apply)*<br>☐ An acute care unit/facility admission<br>☐ A long-term care facility admission<br>☐ A medical/surgical procedure in an outpatient setting<br>☐ No healthcare encounter ☐ Unknown |
| 9 | **Is the unit/facility in which the patient is currently admitted under investigation for CPO transmission?**<br>☐ Yes<br>☐ No<br>☐ Unknown or patient is discharged |
| 10 | **Did the patient have contact *[minimum 12 hours]* with a known CPO case within the past 12 months?** *(Check all that apply)*<br>☐ Yes, within an acute care facility<br>☐ Yes, within a long-term care facility<br>☐ Yes, private household<br>☐ Yes, other *please specify* _____<br>☐ No. *Please skip Question 11.*<br>☐ Unknown. *Please skip Question 11* |
| 11 | **If answer Yes to Question 10, what was the *nature* of the contact?** *(Check all that apply)*<br>☐ Roommate ☐ Same unit/facility or house ☐ Healthcare provider ☐ Friend/Relative<br>☐ Environmental sources (e.g., contaminated sink or other surface, medical equipment, etc.)<br>☐ Other, *please specify* _____<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 | 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 | Check 'Inpatient' (hospitalized) if the patient was admitted to an acute care unit. Otherwise, check 'Other' and specify in written text the location where the sample was collected (e.g., Emergency Department, Hemodialysis or Oncology Clinic, etc) |
| 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 sample 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><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 | Did the patient travel outside of Canada within the past 12 months? | Select **Yes** if the patient had travelled to other countries or had healthcare encounter outside Canada in the past 12 month. Specify which country the patient travelled.<br><br>Select **No** if the patient did not travel in the past 12 months and skip the Question 7. |
| 7 | If answered Yes to Question 6, did the patient have a healthcare encounter outside of Canada within the past 12 months? | Select **one** that applies based on the information available |
| 8 | What types of healthcare encounters has the patient had in BC in the past 12 | Check **all** that apply based on the patient's healthcare encounter history |

| | | |
|---|---|---|
| | month? | |
| 9 | Is the unit/facility in which the patient is currently admitted under investigation for CPO transmission? | Select **Yes** if the patient was admitted to a unit which was under investigation for on-going CPO transmission during his/her stay in the unit.<br>Select **No** if the was **NOT** under investigation for CPO transmission during his/her stay in the unit. |
| 10 | Did the patient have contact [minimum 12 hours] with a known CPO case within the past 12 months? | Check **all** that apply based on the patient's contact with a known CPO case |
| 11 | If answer Yes to Question 10, what was the nature of the contact? | Check **all** that apply based on the nature of the contact |

## 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 surveillance form for CPO (***Appendix C***) has been completed for this case.

| | |
|---|---|
| 1 | **Unique Identifier** – assigned by BCCDC Public Health Laboratory (PHL) _____ |
| 2 | **Patients' status** ☐ Inpatient ☐ 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<br>☐ Surgical site ☐ 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 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 |
| 10 | **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 | Check 'Inpatient' (hospitalized) if the patient was admitted to an acute care unit. Otherwise, check 'Other' and specify in written text the location where the sample was collected (e.g., Emergency Department, Hemodialysis or Oncology Clinic, etc) |
| 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 ICU admission required due to CPO infections or the complications associated with CPO infection? | Select **one** of the options that applies to the patient |
| 10 | Patient outcome at 30 days or up until discharge after identification of CPO infection | Select **one** of the options that apply to the patient at 30 days or at the time of discharge after the CPO infections was identified. |

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

***Please complete this form for notification of ongoing 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 of the index case* identified (dd/mm/yyyy): _____

Organism (Genus species): _____

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

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

* A case that makes health authority suspected of CPO transmission. It may be or may not be the first case in the transmission.

**C. Transmission Investigation Resolved**

Date investigation closed (dd/mm/yyyy): _____

Notes:

_____

_____

_____

_____

_____

Reported by: _____ Date: _____

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 | **At what care setting was the patient identified with CPO?**<br>☐ Outpatient clinic ☐ Emergency room ☐ Community health center/clinic<br>☐ Long-term care facility ☐ GP's office ☐ Other, *please specify* _____ |
| 4 | **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 ☐ Unknown |
| 5 | **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 ☐ Unknown |
| 6 | **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 ☐ Unknown |
| 7 | **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>☐ Healthcare facility, i.e., stayed in the same care unit or long-term care facility with a patient/resident with CPO<br>☐ Other, *please specify* _____<br>☐ No ☐ Unknown |
| **If the patient was infected with CPO, please answer the following questions** | |
| 8 | **Site(s) of infection** (*Check all that apply*)<br>☐ Bloodstream ☐ Urinary tract ☐ Respiratory tract ☐ Wound ☐ Surgical site<br>☐ Other, *please specify* _____ |
| 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 |

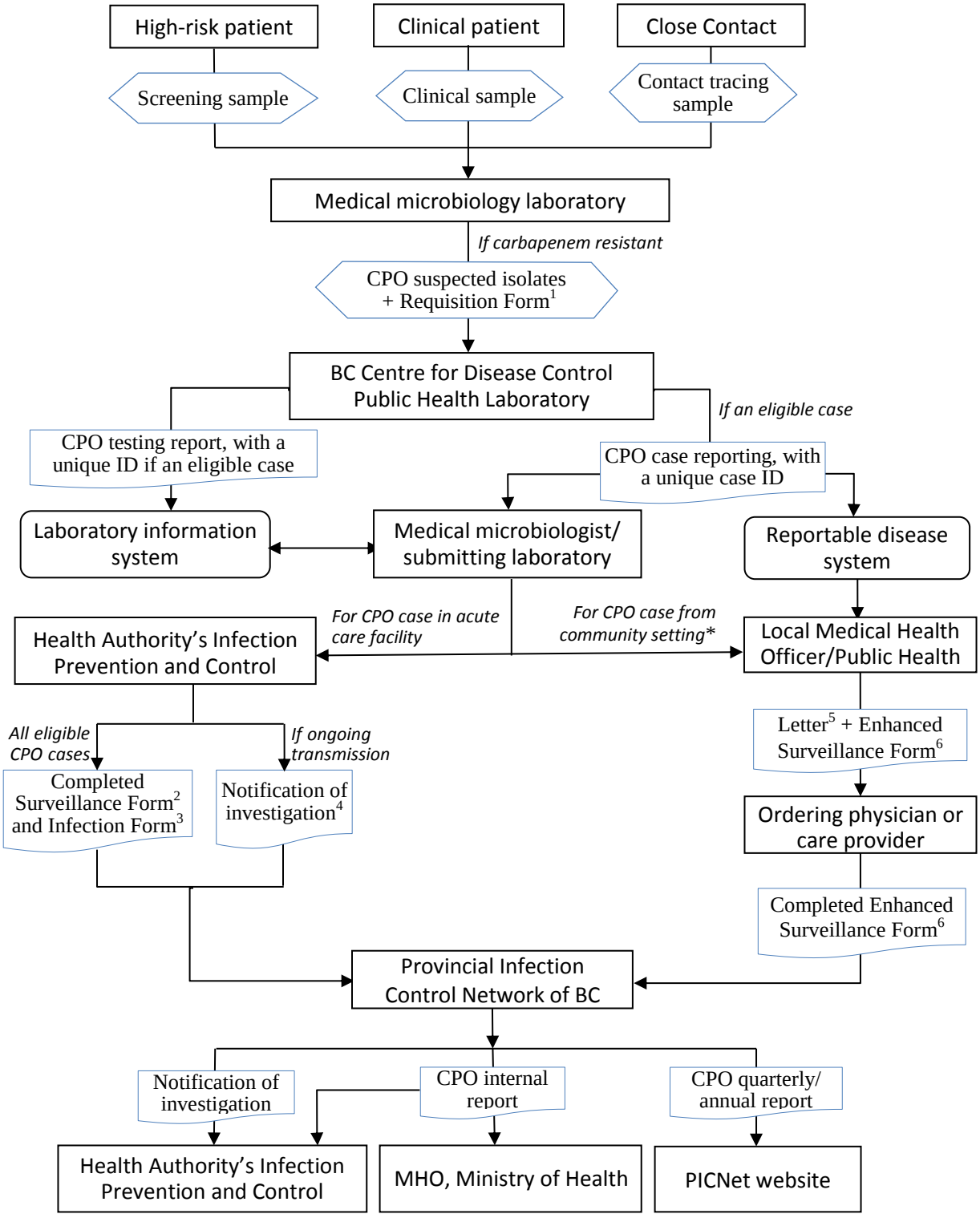
Once completed, please send it to PICNet at picnet@phsa.ca (cc guanghong.han@phsa) or fax 604-875-4373

## 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 | At what care setting was the patient identified with CPO? | Check one that apply |
| 4 | 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. |
| 5 | 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>If responding with **Yes**, specify which country the patient travelled to. |
| 6 | 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. |
| 7 | 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. |

| | | |
|---|---|---|
| 8 | Site(s) of infection | Check the site(s) of CPO infection – check all that apply or specify the site(s) of infection(s). |
| 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 Testing (Appendix B);
2. Surveillance Form for CPO (Appendix C);
3. Addendum Form for CPO Infection (Appendix D);
4. Notification Form of CPO Transmission (Appendix E);
5. Sample Letter to Ordering Provider (Appendix F);
6. Enhanced Surveillance Form for CPO (Appendix G)

## Contact information

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.

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

For questions regarding CPO confirmatory tests, please contact

**Dr. Linda Hoang,** Medical Microbiologist,
Associate Director, BCCDC Public Health Laboratory
Co-Medical Director, Provincial Infection Control Network of BC
655 West 12th Avenue, Vancouver, BC, V5Z 4R4
Phone: (604) 707-2618
Email: Linda.Hoang@bccdc.ca

For questions regarding surveillance data collection and submission, please contact

**Dr. Guanghong Han,** Epidemiologist,
Provincial Infection Control Network of BC
Suite #504, 1001 W Broadway, Vancouver, BC, V6H 4B1
Phone: (604) 875-4844 ext. 22983;
Fax: (604) 875-4373
E-mail: Guanghong.Han@phsa.ca