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| Victoria State Government Department of Health and Human ServicesVictorian guideline on carbapenemase-producing *Enterobacteriaceae*  For health services  Version 2.1 |
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Department of Health

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# Foreword

The emergence of multi-drug resistant organisms represents a real and growing threat in Victoria and across the world. We take for granted the effectiveness of antibiotics given for many common infections. This effectiveness will diminish and in time could disappear if there is not concerted action now to prevent the establishment of these organisms in our health services and community. The United Kingdom’s Chief Medical Officer, Dame Sally Davies, described the issue as a ‘ticking time bomb… arguably as important as climate change’.

Victoria has identified increasing numbers of the bacteria resistant to carbapenem antibiotics, including *Klebsiella pneumoniae*, *E. coli, E. cloacae, S. marcescens* and others. Carbapenems are described as a last line of defence against these bacteria. These bacteria have been limited to mostly metropolitan healthcare facilities and the responses have helped contain the problem, although the threat remains. There should be no illusions about the level of resources and commitment required to overcome such outbreaks, nor of what it would mean for health services if they became established. This guideline will apply to all carbapenemase-producing *Enterobacteriaceae* (CPE) since all CPE pose a threat of spreading critical drug resistance.

Since the establishment of this guideline, Victoria’s capacity to detect, characterise and control CPE has increased enormously and Victoria now arguably leads the country in managing the risk of CPE. It also means that we are acutely aware of how challenging the issues are, with between five and ten new CPE detections every month, compared to two or three only a few years ago. The majority of these cases have travelled overseas in the four years prior to detection, but many others have not, so close and diligent surveillance and planning is required.

The updates contained in this version of the guideline have been informed by new and emerging evidence and our own data, but even more by practical considerations of the feasibility, impact and acceptability of these interventions. I believe this version represents an improvement and it is, of course, always open to continued review. Your experience in applying this guidance and in dealing with cases of CPE will be invaluable as we go forward.

Health services and other healthcare settings represent the frontline in this critical battle. A systems approach is needed to deal with CPE, recognising the range of interventions required and the interconnectedness of our health services. A key message is that thorough surveillance and screening of those at risk can identify CPE and prevent outbreaks from occurring. When local transmission is identified, intense control measures must be put in place and can prevent patients becoming colonised or infected. Patient safety demands nothing less.

The key actions required to address this challenge are neither new technologies nor new antibiotics; they are engagement and leadership. I urge you to become familiar with this guideline but then to take the critical next step – to establish the team of people who will ensure your health service is focused and ready for CPE. Use the guideline to inform your health service plan, and benchmark your efforts against the detailed guidance provided here.

I trust that you find this guideline useful and practical, and that we all work together closely in addressing this critically important issue.



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Contents

[Foreword iii](#_Toc504999910)

[Acronyms and abbreviations 5](#_Toc504999912)

[Glossary 6](#_Toc504999913)

[Section 1: Background 9](#_Toc504999914)

[Carbapenemase-producing *Enterobacteriaceae* 9](#_Toc504999915)

[Scope of the Victorian CPE guideline 9](#_Toc504999916)

[Epidemiology of CPE 10](#_Toc504999917)

[Section 2: Governance 12](#_Toc504999918)

[Roles and responsibilities of all agencies 12](#_Toc504999919)

[Section 3: Screening, detection and investigation of CPE 16](#_Toc504999920)

[Surveillance strategy 16](#_Toc504999921)

[Choice of screening specimen(s) for patients 16](#_Toc504999922)

[Screening requirements for all facilities 16](#_Toc504999923)

[Actions when a single case of CPE is detected 19](#_Toc504999924)

[Actions when local transmission of CPE is identified 25](#_Toc504999925)

[Environmental screening 28](#_Toc504999926)

[Section 4: Management and control of CPE 29](#_Toc504999927)

[Prevention and treatment of CPE 29](#_Toc504999928)

[Infection control precautions 29](#_Toc504999929)

[Section 5: Laboratory methods and reporting requirements 36](#_Toc504999930)

[Requirements for primary diagnostic laboratories to report cases 36](#_Toc504999931)

[Other requirements for primary diagnostic laboratories 36](#_Toc504999932)

[Role of the reference laboratory 37](#_Toc504999933)

[Environmental sample testing 37](#_Toc504999934)

[Appendices 38](#_Toc504999935)

[Appendix A: Guide to microbiological testing and data collection 38](#_Toc504999936)

[Appendix B: Hyperlinks and web addresses 40](#_Toc504999937)

# Acronyms and abbreviations

AMR antimicrobial resistance

AMS antimicrobial stewardship

ATP adenosine triphosphate

CDS calibrated dichotomous sensitivity test

CLSI Clinical Laboratory Standards Institute

CPE carbapenemase-producing *Enterobacteriaceae*

CRE carbapenem-resistant *Enterobacteriaceae*

EUCAST European Committee on Antimicrobial Susceptibility Testing

HSIMT health service incident management team

ICU intensive care unit

IMP imipenemase metallo- β-lactamase

IV intravenous

KPC *Klebsiella pneumonia* carbapenemase

LTRCF long-term residential care facility

MDU PHL Microbiological Diagnostic Unit Public Health Laboratory

MIC minimal inhibitory concentration

NATA National Association of Testing Authorities, Australia

NDM New Delhi metallo-β-lactamase

OXA-48-like oxacillinase-48-like carbapenemases

PCR polymerase chain reaction

PPE personal protective equipment

PPS point prevalence screen

PRIS patients requiring pre-emptive isolation and screening

the department Department of Health and Human Services

TRA transmission risk area

VCIMT Victorian CPE Incident Management Team

VCSRU Victorian CPE Surveillance and Response Unit

VICNISS Victorian Healthcare Associated Infection Surveillance System

VIM verona integrin-encoded metallo-β-lactamase

# Glossary

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| Carbapenemase-producing *Enterobacteriaceae* | The term carbapenemase-producing *Enterobacteriaceae* (CPE) refers to bacteria that are members of the family *Enterobacteriaceae* that have been identified to carry a carbapenemase gene. |
| Carbapenem-resistant *Enterobacteriaceae* | The term carbapenem-resistant *Enterobacteriaceae* (CRE) refers to bacteria that are members of the family *Enterobacteriaceae* that have been found to have resistance to carbapenem antibiotics by any mechanism. |
| Case | **Suspected case**  A person with a species of *Enterobacteriaceae* isolated from routine clinical or screening specimens (infection or colonisation), with any of the following:  meropenem minimum inhibitory concentrations (MIC) ≥ 0.5mg/L, or disc diffusion zone ≤ 24 mm Clinical Laboratory Standards Institute (CLSI) or European Committee on Antimicrobial Susceptibility Testing (EUCAST), or calibrated dichotomous sensitivity test (CDS) disc diffusion zone ≤ 6 mm, **or**  phenotypic resistance to any carbapenem where the MIC is above the clinical breakpoint as defined by CLSI or EUCAST or zone diameter suggests resistance by CDS, **or**  positive colorimetric test for carbapenemase (CarbaNP or Blue-Carba).  This definition of a suspected case will capture patients who are colonised or infected with bacteria that are more likely to eventually be found to be either CRE or CPE, in recognition of the need to take similar infection control action at the initial point of suspicion, prior to determining whether the bacteria is CPE.  **Confirmed case**  A person meeting the definition of a suspected case and where a carbapenemase gene is detected in a sample or isolate irrespective of phenotypic susceptibility, for example, KPC2 gene-positive *Klebsiella pneumoniae*.  This definition intends for the term ‘confirmed case’ to refer to a person who is colonised or infected with a CPE. |
| Clearance | In this guideline clearance is a term that refers to applying criteria to determine that an individual no longer requires infection control precautions in relation to a risk of transmission of CPE. Further details are in [Section 3](#_Section_3:_Screening,_1). |
| Contact | An individual who is exposed to a person (a case) colonised or infected with CPE in a manner that might allow transmission to occur or a CPE-contaminated environment where there is an increased risk of acquisition of CPE, and refers to two categories of contact – a room contact, and a ward contact.  If a person meets the criteria for being considered a case of CPE (suspected or confirmed), they should be managed as a case of CPE and not as a CPE contact. Further details are in [Section 3](#_Actions_when_a).  **Room contact**  A room contact is a person who resided for ≥ 24 hours in a health service in a shared room with a case during the case’s period of transmission risk, or resided for ≥ 24 hours in a different room in a health service but where there was a shared bathroom with a case.  **Ward contact**  A ward contact is any person who has been on a ward for ≥ 24 hours in the time period that the ward has been designated as a transmission risk area (TRA) (see TRA definition below). |
| Frequently touched surfaces | As per national guidelines, surfaces can be divided into two groups – those with minimal hand contact (for example, floors and ceilings) and those with frequent hand contact (‘frequently touched’ or ‘high-risk’ surfaces). Frequently touched surfaces include doorknobs, bedrails, over-bed tables, light switches, tabletops and wall areas around the toilet in the patient’s room. |
| Local transmission / outbreak | Local transmission is defined as: two or more confirmed cases of genetically closely related CPE with a plausible epidemiological link, without an alternative explanation. The definition is deliberately inclusive. |
| Period of transmission risk | The **period of transmission risk** is the time when a CPE case could potentially transmit CPE to another patient. The period is from the date of likely acquisition until the time that the case is placed into contact precautions (or discharged or transferred). The period of transmission risk is used for determining room contacts only. |
| Point prevalence screen (PPS) | Point prevalence screening is when a census point in time is chosen to screen a cohort of patients (for example all patients on a ward on a particular date) at risk of being infected or colonised with CPE. |
| Transmission risk area | A transmission risk area (TRA) is an area (a distinct geographical area or ward) in which local transmission has been determined by the VCIMT to have occurred. The time-frame for the TRA is the period when transmission may have occurred **plus** either four consecutive weeks of negative point prevalence screens **or** four weeks after the final patient involved in the transmission was discharged. The time-frame for the TRA is different from the period of transmission risk. These concepts are explained further in [Section 3](#_Actions_when_local_1). |

# Section 1: Background

## Carbapenemase-producing *Enterobacteriaceae*

Carbapenemase-producing *Enterobacteriaceae* are a group of bacteria that have developed resistance to a number of front line antibiotics as well as carbapenems which are considered ‘last resort’ antibiotics for the treatment of serious infections. Carbapenemase genes encode enzymes that degrade carbapenem antibiotics. *Enterobacteriaceae* comprise the largest family of gram-negative bacteria causing human infection and includes common pathogens such as *Escherichia coli*, *Klebsiella* and *Enterobacter* species (Figure 1 below). These organisms are normal flora of the gastrointestinal tract but have the potential to cause infection and disseminate antimicrobial resistance.

## Scope of the Victorian CPE guideline

### Victorian health services

This guideline applies to all paediatric and adult health services in Victoria. For the purpose of this guideline, the term ‘health service’ refers to public and private health services, hospitals and denominational hospitals that admit patients overnight. Where there are multiple campuses within a health service, each campus is referred to as a healthcare facility.

The guidance also applies to all satellite haemodialysis units and day oncology units, due to the nature of the patients treated and the risk of transmission of serious infections. Surgical day procedure centres are not within the scope of this guideline. If a known CPE case is admitted to a surgical day procedure centre, appropriate standard and transmission-based infection control precautions should be implemented.

Recommendations in this guideline supplant all other state and national infection control guidelines related to the management of CPE. They are relevant for all health professionals, including general and specialist clinical staff, allied health, microbiology laboratory staff and general practitioners.

Any isolation of a suspected or confirmed CPE (as defined in the glossary of this guideline) from clinical, screening or environmental samples are in scope.

### Victorian long-term residential care facilities

The Department of Health and Human Services (the department) has developed a separate document for more specific guidance on CPE management within long-term residential care facilities (LTRCF) in Victoria. [Download this document from the department’s website](file:///C:\Users\dcam1607\AppData\Local\Temp\notes81ADC1\www2.health.vic.gov.au\infection-control) <www2.health.vic.gov.au/infection-control>.

### Microbiological scope

This guideline provides recommendations around the detection and response to species of *Enterobacteriaceae* (see Figure 1 below) that contain a carbapenemase gene. Carbapenemase gene families that have so far been detected in *Enterobacteriaceae* in Australia include IMP, VIM, and OXA-48-like, KPC and NDM.

Figure 1: List of Enterobacteriaceae

*Enterobacteriaceae* include the following species:

*Klebsiella spp. Serratia spp. Escherichia spp.*

*Enterobacter spp Shigella spp. Morganella spp.*

*Citrobacter spp. Salmonella spp. Proteus spp.*

*Providencia spp. Pantoea spp. Cronobacter spp.*

*Plesiomonas spp. Cedecea spp. Edwardsiella spp.*

*Raoultella spp. Ewingella spp. Hafnia alve*

*Kluyvera spp. Yersinia spp. Leclercia spp*

Suspected CPE are *Enterobacteriaceae* that have phenotypic characteristics suggestive of carbapenemase gene presence, but have not yet been confirmed. Confirmed CPE are *Enterobacteriaceae* where presence of a carbapenemase-encoding gene has been confirmed by PCR or genome sequencing. Isolates from clinical, screening or environmental samples are included in the scope of this guideline.

The microbiological scope of this guideline is consistent with the 2017 Australian Commissions on Safety and Quality in Health Care draft recommendations for the control of CPE in acute care health facilities. This reflects the greater risk that CPE carries for local transmission, including health service outbreaks and potential multi-jurisdictional spread.

The scope of this guideline does NOT extend to:

* *Pseudomonas* spp., *Acinetobacter* spp. or other non *Enterobacteriaceae* species with carbapenemase production and resistance
  + Non-carbapenemase-producing *Enterobacteriaceae* that are phenotypically resistant to carbapenem (carbapenem-resistant *Enterobacteriaceae* - CRE).

Although these organisms pose a lower risk of transmission, it is important to note they are still clinically significant. Specific control measures are required to prevent emergence, spread and dissemination within healthcare facilities. The necessary control actions are similar to those required for a variety of multi-resistant organisms, and are specified in the [Australian Guidelines for the Prevention and Control of Infection in Healthcare](https://www.nhmrc.gov.au/guidelines-publications/cd33) <www.nhmrc.gov.au/guidelines-publications/cd33> and the Victorian [Patient-centred risk management strategy for multi-resistant organisms](https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/patient-centered-management-multi-resistant) <www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/patient-centered-management-multi-resistant>.

## Epidemiology of CPE

The burden of CPE in Australia is lower than that observed in some areas of Europe, North America, the Middle East and Asia. Regulation of antimicrobial usage and geographical isolation may have contributed to keeping national rates of CPE low.

Prior to 2012, identification of CPE in Victoria was limited to patients with recent overseas hospitalisation in high burden countries and low-level transmission of IMP carbapenemase-producing bacteria in patients with long-term hospitalisation within Australia.

An increase in one particular carbapenemase*,* KPC, was observed throughout Victoria between 2012 and 2015. Many affected patients reported no recent travel. In 2015, an investigation concluded that KPC transmission in Victoria was driven by discrete healthcare associated outbreaks in a small number of healthcare facilities. In line with previous international recommendations, a statewide epidemiological and laboratory surveillance system for CPE in Victoria was commenced in 2015.

Systematic surveillance in Victoria has now detected a wide variety of carbapenemase genes. The majority of cases have been associated with recent overseas travel, particularly those of the NDM, VIM and OXA-48-like carbapenemase groups. Detection of small networks of IMP and KPC local transmission within and between Victorian health services has also occurred, enabling focussed control measures. Endemic spread of CPE in Victoria has not been observed outside these networks.

The recommendations in this guideline continue to reflect this status. Central to this document is an acknowledgment of the time-limited opportunity for control afforded by Australia’s currently low rates of CPE, and that a public health approach beyond a single healthcare facility is essential to containment. These approaches are therefore focused on prevention and, where identified, elimination of any ongoing local transmission.

# Section 2: Governance

## Roles and responsibilities of all agencies

### Department of Health and Human Services (the department)

The department is the lead agency for the statewide response to CPE. The department has engaged several partner agencies, namely the Microbiological Diagnostic Unit Public Health Laboratory (MDU PHL) and the Victorian Healthcare Associated Infection Surveillance System (VICNISS) to assist with the surveillance and response to CPE in Victoria.

The department will be the first point of contact for reporting suspected or confirmed CPE cases, and will maintain the database for all information collected during the investigation of cases.

The relevant roles for the department include:

* maintaining a notifiable conditions surveillance and response capability and capacity
* providing oversight of quality and safety in Victorian health services
  + activating and maintaining the Victorian CPE Incident Management Team (VCIMT) when required.

### MDU PHL & VICNISS

MDU PHL and VICNISS are the surveillance partners of the department, collectively known as the Victorian CPE Surveillance and Response Unit (VCSRU). These organisations undertake work in assessing and responding to CPE in Victoria on behalf of the department. Both organisations are based at the Peter Doherty Institute for Infection and Immunity.

MDU PHL is Victoria’s bacterial public health reference laboratory. All reports and isolates of suspected and confirmed CPE are sent to MDH PHL. They perform further tests to confirm, characterise and sequence CPE isolates. Whole genome sequencing and bioinformatics is used to determine how closely related certain isolates are to one another.

VICNISS has been collecting healthcare-associated infection surveillance data for many years. VICNISS, on behalf of the department will coordinate collection of data regarding patients with CPE and possible transmissions in health services. This may include (but is not limited to): information about admission and discharge times, prior admission, prior screening, and other wards where the patient/s were admitted. As infection prevention specialists VICNISS are also available to provide advice on CPE prevention and control to health services.

The combined MDU PHL and VICNISS information is used to establish whether local CPE transmission has occurred and supports the VCIMT in their response to transmissions.

### Victorian CPE Incident Management Team

The VCIMT is constituted to support and oversee the public health and health service response to CPE. The VCIMT is activated at the discretion of the department by the identification of possible or confirmed local transmission of CPE within Victoria, and will remain activated as long as coordination of risk assessment and management is required.

The VCIMT is chaired by the Victorian Chief Health Officer or delegate, and will provide advice and guidance on required control measures based on the authority of the *Public Health and Wellbeing Act 2008.* The membership of the VCIMT will include expertise in:

* public health medicine
* microbiology
* infectious diseases
* epidemiology
* infection prevention and control
* communications
  + health service quality and safety support.

Appointment to these roles is at the discretion of the Victorian Chief Health Officer or delegate and may comprise internal and/or external participants.

A member from a [health service incident management team](#_Health_Service_Incident) (see below) may be invited to join the VCIMT. The VCIMT will be supported in its functions by Safer Care Victoria, MDU PHL, VICNISS and other agencies, who will perform roles such as assisting in collection of information and provision of advice and guidance.

The VCIMT will oversee a range of actions, including coordinating a risk assessment, undertaking an epidemiological and microbiological investigation, determining the requirement for control measures and coordinating risk communication activities.

The key decisions that the VCIMT has the authority to make include:

* determining if one or more transmissions have occurred within a health service
* determining and communicating actions required of the health service to address the transmission/s
* determining any other investigation, control action or communication required
  + audits of infection prevention and control measures and compliance with these measures by the affected health service.

The need for a coordinated response to the threat of CPE means that on occasion, there may be different views formed by individual professionals, healthcare facilities, a health service’s incident management team or the department relating to the CPE control actions and risk communication. The VCIMT will retain the responsibility via the chairperson for final decisions on any matter of assessment, control or communication when there is not unanimous agreement as to the required approach.

Outcomes and recommendations of VCIMT meetings and decisions will be communicated directly to the affected health services. This communication will only be emailed to the:

* health service chief executive
* medical lead for infection prevention and control
  + nursing lead for infection prevention and control.

All other unaffected public and private health services will receive an email alert from the department directing them to refer to the restricted VICNISS website for status updates on Victorian [transmission risk areas (TRA)](#_Actions_when_local_1). Under the direction of the department, VICNISS maintains an up-to-date list of all active TRAs within a secure online portal. TRA information will remain listed within the portal until 12 months has lapsed since the end of the [TRA timeframe](#_Health_facility_actions:). Access to this information is restricted to relevant health professionals from Victorian public and private health services and LTRCFs. Portal access can be granted to relevant staff required to view TRA information such as quality managers, infectious diseases clinicians, infection control practitioners and chief executives but not to the general public. Login access to the restricted area is at the discretion of the infection control coordinator or equivalent at each facility and/or VICNISS Coordinating Centre. For any enquiries regarding access/registration phone VICNISS on 9342 9333 or [email VICNISS](mailto:vicniss@mh.org.au) <vicniss@mh.org.au>.

### Health services

Health services must implement this guideline, and have a number of specific roles and responsibilities as outlined within each chapter.

#### Management plans for CPE

All health services should develop plans for the prevention, detection and management of CPE.

This guideline is intended to provide a template to assist health services in the development of individual management plans.

Any health service staff member managing a suspected or confirmed case of CPE should be familiar with the required actions, how to check that these are in place, and know who to contact for assistance. Non-laboratory clinicians are not required to report suspected of confirmed cases to the department. Reporting is a laboratory requirement only.

The following areas should be covered in any health services plan:

* governance and communication
* awareness and prevention of CPE
* screening and detection of CPE
  + infection prevention and control measures.

### Health Service Incident Management Team

A health service incident management team (HSIMT) is an approach that can provide best practice governance for a response to transmission of CPE within a healthcare facility. An HSIMT should be established when there is confirmation of local transmission of CPE.

An HSIMT will be activated at the discretion of the relevant lead at a health service. Membership could include representatives from:

* the health service executive
* the affected ward/unit – for example nurse unit manager, medical lead
* infectious diseases
* infection prevention and control
* microbiology
  + environmental services.

The HSIMT should ensure that:

* there is timely notification of suspected cases
* all required data is collected and provided to the VCIMT
* all control measures recommended in this guideline or by the VCIMT are implemented
  + any media and risk communication is undertaken in agreement with the department.

#### Staff communication and education

All health services should provide education to staff covering issues of high-risk patient identification and isolation, screening and transmission based precautions. This education can be ‘bundled’ into regular hand hygiene or personal protective equipment (PPE) education sessions.

When single (sporadic) cases or transmissions are identified, the affected ward or unit should receive further education, covering all staff who may provide care to the affected patients, and who may be involved in the environmental response (that is cleaning).

VICNISS has developed education tools and resources that can be modified by each health service for this purpose. The tools are available on the VICNISS website for registered users. To request these tools in an accessible format, phone VICNISS on (03) 9342 9333 or [email VICNISS](mailto:vicniss@mh.org.au) <vicniss@mh.org.au>.

#### Compliance with national standards and guidelines

All health services should comply with the Australian national standards and guidelines around infection prevention and control, and ensure that compliance is monitored in accordance with the current iteration of [Standard 3 of the National Safety and Quality Health Service (NSQHS) Standards](https://www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/) <https://www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/>.

Local audits of CPE management are not required to be submitted to the department or VICNISS. In some circumstances, the department may initiate an audit of healthcare facility preparedness and response arrangements. This will be communicated in writing should it be required.

### Diagnostic microbiology laboratories

The role of diagnostic laboratories is to identify suspected CPE, and to report suspected CPE to the department by faxing the result within one business day to 1300 651 160. All clinical, screening and environmental isolates must be sent to MDU PHL for characterisation. After confirmation, the diagnostic laboratory should notify the healthcare facility infection control lead and executive as agreed locally.

For information on detailed actions and timelines, see [Appendix A](#_Appendix_A:_Guide).

| Scenario 1 |
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| The haematology ward (Acacia Ward) at Valhalla Hospital has had three patients confirmed with the same *Klebsiella pneumoniae* KPC within a three-week period. The Victorian CPE Incident Management Team (VCIMT) classifies Acacia Ward as a transmission risk area (TRA). Valhalla Hospital convenes a Health Service Incident Management Team (HSIMT) to coordinate the response and interventions at the health service level. The HSIMT includes a member of the health service executive, an infection control consultant, the Acacia Ward nurse unit manager, the medical director of the haematology unit and the manager of environment services. They also receive infectious diseases advice as they would routinely from a tertiary hospital in Melbourne. The HSIMT liaise directly with the VCIMT to provide all data required, information about interventions instituted and other measures taken (for example PPE audits). |

# Section 3: Screening, detection and investigation of CPE

## Surveillance strategy

The objective of surveillance for CPE in Victoria is to detect all cases of CPE in order to understand the extent of the problem and to ensure infection control and outbreak management processes are applied whenever necessary. A precautionary approach is being applied.

The guideline approaches this objective by describing the minimum requirements of health services for screening of patients for CPE. Using scientific understanding of risk factors for acquisition, transmission and increased severity of illness (Figures 2, 3 and 4 below), recommendations describe the minimum frequency and extent of screening for different cohorts of patients.

This section describes minimum standards healthcare facilities must adhere to in relation to contact tracing and screening. A healthcare facility may choose to undertake more extensive contact tracing based on a local risk assessment. This should be undertaken or overseen by an infection control professional or equivalent.

## Choice of screening specimen(s) for patients

International guidelines outline a range of specimen types and duration since an exposure event. Most patients appear to develop faecal or rectal positivity at around eight days post exposure.

The ideal sampling strategy with the greatest sensitivity and specificity for the detection of CPE in a well patient is a faeces specimen.

Take a faeces specimen to screen for CPE whenever possible. Where this is not practically or clinically possible, a rectal swab (with evidence of faecal matter on the swab) **plus** an inguinal swab should be taken. A rectal swab alone is the least preferred screening specimen. A peri-anal swab is not acceptable because of lower sensitivity and specificity.

In addition, the following samples should also be considered, but not routinely undertaken:

* for patients with wounds, a single wound swab should be collected
* for patients with intermittent or continuous urinary catheterisation, a urine sample should be collected
* for patients who are intubated, an endotracheal tube (ETT) sample should be collected
  + for patients with enterostomies, a stomal specimen should be collected.

In all cases, follow appropriate referenced collection methods for the sample type(s) taken.

## Screening requirements for all facilities

The following patients are at significant risk of being infected or colonised with CPE. The in-patient admission process should include relevant questions to identify patients requiring pre-emptive isolation and screening (PRIS) as indicated in Figure 2.

Figure 2: Patients requiring pre-emptive isolation and screening (PRIS)

* Direct transfer from an overseas hospital.
* Overnight stay in an overseas healthcare or long-term residential care facility in the previous 12 months.
* A room contact of a CPE case who has not achieved clearance criteria (see below for definition).
  + A ward contact of a CPE case where transmission has occurred.

On admission, these patients will require a single room, contact precautions and screening. Details of the requirements for contact precautions can be found in [Section 4](#_Section_4:_Management_1).

Those who are being screened based on contact exposure or risk factors can be taken out of isolation once they have achieved appropriate clearance criteria for room contacts (see [clearance criteria for room contacts](#_Clearance_criteria_for_1)), ward contacts (see [clearance criteria ward contacts](#_Clearance_criteria_for)) or overseas healthcare facility contact (see clearance criteria below).

Patients who have had a previous positive result for CPE should remain in contact precautions, regardless of negative screens.

### Clearance criteria for overseas healthcare facility contact

Patients who have been in a hospital overseas in the last 12 months do not need to be isolated and screened each time they are admitted as long as the following criteria have been met.

* All screening specimens were taken > 7 days after the most recent contact with an overseas facility.
* A faeces sample has been screened and the result is negative.
  + All other relevant sites (for example wounds, urine if indwelling catheter) present at time of first admission have been screened following the most recent contact with an overseas facility.

### **Higher-risk patients – consider screening based on local risk assessment**

Health services may choose to undertake hospital wide or high-risk ward point prevalence screen (PPS) based on local risk assessments. The VCIMT may request the results of voluntary screening results as part of investigations into cases.

There are two types of high-risk patients that health services may consider screening: those who are at higher-risk for acquiring CPE (see Figure 3 below), and those at higher-risk of developing severe illness due to CPE (see Figure 4 below). Health services may decide to increase screening frequency of some or all of these patients at their own discretion.

Figure 3: Higher-risk patients for acquiring CPE

* Prolonged hospital stay for example geriatric evaluation and management units.
* Multiple or recent exposures to different antibiotic agents, including extended-spectrum penicillins, cephalosporins, fluoroquinolones and carbapenems.
* An indwelling medical device, such as a central venous catheter, urinary catheter, biliary catheter or wound drain.
* An organ or stem-cell transplant.
* Admission to the intensive care unit.
  + Mechanical ventilation.

Figure 4: Higher-risk patients for developing severe illness due to CPE

* Patients with organ or stem-cell transplants
* Patients admitted to the intensive care unit
  + Haematology patients.

Flowchart 1: CPE screening requirements for all facilities

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## Actions when a single case of CPE is detected

### Management of the case

#### Suspected CPE cases

1. Implement immediate infection prevention and control measures as per ‘management of CPE cases’ guidance in [Section 4](#_Section_4:_Management) of this document.
2. Ensure the isolate is referred immediately to MDU PHL for further confirmation and typing; along with the CPE isolate referral form. Download the form from the [department’s website](www2.health.vic.gov.au/infection-control) <www2.health.vic.gov.au/infection-control> or the [MDU PHL website](http://biomedicalsciences.unimelb.edu.au/departments/microbiology-Immunology/research/services/microbiological-diagnostic-unit-public-health-laboratory#services) <http://biomedicalsciences.unimelb.edu.au/departments/microbiology-Immunology/research/services/microbiological-diagnostic-unit-public-health-laboratory#services>.
3. If a suspected case is rejected by MDU PHL, a revision of infection control precautions required for the case should occur as per the [Australian Guidelines for the Prevention and Control of Infection in Healthcare](https://www.nhmrc.gov.au/guidelines-publications/cd33) <https://www.nhmrc.gov.au/guidelines-publications/cd33 > and the Victorian [Patient-centred risk management strategy for multi-resistant organisms](https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/patient-centered-management-multi-resistant) <https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/patient-centered-management-multi-resistant>.

Flowchart 2: Suspected CPE case reporting and management requirements

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#### Confirmed CPE cases

1. Ensure the patient, and/or their carer is notified and counselled appropriately regarding the diagnosis. An information sheet for patients with CPE can be found on the [department’s website](www2.health.vic.gov.au/infection-control) <www2.health.vic.gov.au/infection-control>.
2. Ensure the patient’s local doctor is informed of the case confirmation upon discharge. An example template letter and information sheet for clinicians can be found on the [department’s website](www2.health.vic.gov.au/infection-control) <www2.health.vic.gov.au/infection-control>.
3. Ensure other healthcare providers are alerted to the patient’s CPE status, and the requirement for isolation should they be transferred to another healthcare facility or long-term residential care facility.
4. Complete Part A of the CPE data collection form and return to VICNISS within two business days. This form can be found on the [department’s website](www2.health.vic.gov.au/infection-control) <www2.health.vic.gov.au/infection-control>.
5. Place an alert in the hard-copy and/or electronic patient records.
6. Identify (where possible) and document the **date of likely acquisition** and **period of transmission risk**. This is required in order to determine which patients are room contacts of the case.
   1. The **date of likely acquisition** depends on epidemiological factors, such as when contact first occurred with a known case with the same strain, or an overseas hospital admission in the absence of local risks. The final determination will be made by the VCIMT.
   2. The **period of transmission risk** is from the date of likely acquisition until the time that the case is placed in contact precautions.
   3. If the date of likely acquisition is unable to be determined, the period of transmission risk is considered to be one month prior to the date of CPE isolation (the date the screen or test was taken) until the time that the case is placed in contact precautions.
7. If CPE was first isolated from a clinical or screening sample other than faeces, a faecal sample should also be screened for CPE and the result reported to MDU PHL.

### Clearance of cases

**Once a person is identified as a case of CPE, they are considered potentially infectious indefinitely**. This is the position for all Victorian healthcare facilities until sufficient evidence can be identified to inform the development of clearance criteria.

This means that there are no clearance criteria for confirmed cases and that infection control precautions as outlined in the guideline must always be implemented upon readmission of a case to a healthcare facility.

### Management of contacts

#### Purpose of contact tracing

The purpose of contact tracing is to identify potentially infected or colonised patients and to manage risk of onwards transmission from these patients. This occurs by identifying which patients should be screened and over what period of time this should occur, and may also involve providing information or pre-emptive isolation until a person is cleared.

No contact tracing is required until the case has been confirmed.

#### Room contacts

A room contact is any person who shared a room or a bathroom with a case for ≥ 24 hours in a health service during the case’s period of transmission risk. Patients discharged prior to the case being diagnosed, but who meet the room contact criteria are included in the required actions.

Room contacts should have infection control precautions and other recommendations applied until clearance criteria are met.

On confirmation of a case of CPE, the following actions must be taken for all room contacts:

1. Room contacts who are still inpatients:
   1. Pre-emptively isolate and screen for CPE
   2. Implement contact precautions until clearance criteria (see below) have been met.
2. Room contacts who have been discharged prior to diagnosis and/or who have not met clearance criteria prior to discharge:
   1. Give or send the room contact written advice of their room contact status. An example room contact letter can be found on the [department’s website](www2.health.vic.gov.au/infection-control) <www2.health.vic.gov.au/infection-control>.
   2. Place an alert on their hard-copy and/or electronic hospital records so that they are placed into a single room with contact precautions and screened if readmitted before clearance criteria are met in the 12 months following last contact with the CPE case. This includes room contacts who have refused to be screened. (Alerts in hospital records may be removed after 12 months if screening has not occurred.)

##### Clearance criteria for room contacts

A **room contact is considered cleared** when two suitable specimens taken > 48 hours apart are negative for CPE. Both specimens must be taken more than seven days after cessation of room contact with a case of CPE.

#### Further screening following confirmation of case of CPE

A [ward contact](#_Glossary), as previously defined, is any person who has been on a ward for ≥ 24 hours in the time period that the ward has been designated as a transmission risk area (TRA). Therefore, when there has been **no local transmission, there are no ward contacts** for the purposes of this guideline. Further actions are required if transmission is identified – see [Actions when local transmission of CPE is identified](#_Actions_when_local_1).

Some cases, however, are considered high-risk for onwards transmission (Figure 5 below). Health services may conduct their own risk assessment regarding these patients, and consider performing further screening on some or all of the other patients on that ward. Further advice can be sought from the VCSRU (see [Appendix A](#_Appendix_A:_Guide) for contact details) if a health service requires guidance or assistance in responding to complex cases.

Figure 5: Patients at higher-risk for onwards transmission

* Have copious or uncontained drainage from wounds or abscesses.
* Have diarrhoea, are incontinent of stools, have intestinal stoma or who have had a colorectal procedure.
* Have copious or uncontained respiratory secretions or urine.
* Have an indwelling urinary catheter.
* Have difficulty complying with hygiene and self-care, for example patients living with dementia and wandering behaviours.
  + High acuity – admitted to ICU, patients with burns, malignant haematology patients.

#### Healthcare workers, household and casual contacts

Healthcare workers who care for and manage a case of CPE are generally not recommended to be screened.

Household and community contacts do not require contact tracing or screening.

Screening of healthcare workers or household contacts may be undertaken at the discretion of the VCIMT, however given the lack of current evidence regarding the risk for transmission this is unlikely and would only occur in an extreme circumstance.

Flowchart 3: Confirmed CPE case management and screening requirements

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| Scenario 2 |
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| Mr King is a liver transplant patient with faecal incontinence and confusion who was admitted on 5 April 2017 to a four-bed bay on a general medical ward of a large tertiary hospital. On 12 April 2017, Mr King was transferred to a two-bed room on the liver transplant ward for ongoing management. On 19 April 2017, a rectal swab was taken and screened for CPE as part of the hospital’s CPE surveillance program. On 21 April 2017 the local infection control team was notified by the laboratory that a suspected CPE had been identified. Mr King was moved immediately to a single room and contact precautions commenced.  The isolate was confirmed as CPE on 24 April 2017 by MDU PHL. Completion of Part A of the CPE data collection form by the health service’s infection control lead reveals Mr King had not travelled overseas for at least 10 years and had no known contacts with cases of CPE. Although other CPE cases have been identified at this health service, the species and gene types are different to Mr King’s isolate. Therefore, Mr King was classified by the VCSRU as a sporadic CPE case.  The date of likely acquisition of CPE for Mr King could not be determined and as such, the period of transmission risk was considered to be one month prior to the date of isolation of CPE until Mr King was placed into a single room with contact precautions. Therefore, the period of transmission risk was from 19 March 2017 until 21 April 2017.  The infection control team conducted a lookback to identify all of Mr King’s room contacts from the date of admission (5 April 2017) to the date Mr King was placed into a single room with contact precautions (21 April 2017). As Mr King’s last admission to a health service was more than one month ago, therefore no other health facility needed to be contacted regarding the CPE result and need for contact tracing.  Two of Mr King’s room contacts from the general medical ward are still inpatients and four have been discharged home. One liver transplant room contact has also been discharged home. All room contacts still within the health service have been placed into single rooms with contact precautions and the screening protocol for clearance of room contacts has commenced.  The health service sent a letter to each of the five discharged room contacts advising them to be screened for CPE. An alert is also placed in the medical history of these five patients so that they can be placed into contact precautions and screened if readmitted within 12 months should clearance criteria not have been met before then.  Mr King was also identified as a higher-risk patient for onwards transmission due to his faecal incontinence, confusion and wandering behaviours. The health service’s infection control and infectious disease units determined that they would undertake a single once-off screen of all patients currently on the liver transplant ward that have been there ≥ 24 hours. It was determined that if any of these patients are CPE positive the screen will be extended to all patients that have been in the same ward/s as Mr King for >24 hours. |

## Actions when local transmission of CPE is identified

When transmission of CPE is suspected, the VCSRU will prepare a risk assessment for the VCIMT. The VCIMT will review the information and determine if transmission has occurred. If transmission has occurred, the ward (or a specified geographical area in the health service) will be designated as a **transmission risk area** (TRA)**.** It is not necessary to delay the commencement of contact screening and other actions while awaiting formal recommendations from the VCIMT.

### Transmission risk area – overview

A TRA is an area (a distinct geographical area or ward) in which local transmission has been determined by the VCIMT to have occurred. The following criteria are used by the VCIMT:

* two or more confirmed cases of genetically related CPE as determined by MDU PHL **and**
* at least one case is a locally acquired case **and**
  + there is a plausible epidemiological connection between the two cases, either through geographic proximity or shared staff, equipment or other exposures in the healthcare setting as determined by the VCIMT

**or**

* + where acquisition from an environmental source is hypothesised, clustering in time and place without a direct patient to patient epidemiological link will also be considered.

If the VCIMT cannot reach a consensus regarding a TRA, the Victorian Chief Health Officer or delegate will have the final determination.

### Health facility actions:

1. **Determine and document the time-frame for the TRA**

This will be done formally by the VCIMT. The facility should also make a preliminary determination at the time a transmission is identified in order to commence contact tracing activities without delay.

* 1. If one or more of the patients remains an inpatient, or was discharged within the past four weeks: generally the TRA will apply from the day that the first CPE positive patient involved in the transmission was admitted, until there have been four consecutive weeks of negative ward screens.
  2. If all of the patients involved in the transmission have been discharged for longer than four weeks: generally the TRA will apply from the time that the first patient involved in the transmission was admitted to four weeks after the final patient involved in the transmission was discharged.
  3. For an hypothesised environmental source the timeframe will apply as for category b. Re-establishment or extension of the TRA timeframe will occur if there is evidence of further clustering of cases.

1. **Identify, notify and place alerts on room contacts as** [**previously described**](#_Room_contacts).
2. **Commence screening programs**
   1. If one or more of the patients remains an inpatient, or were discharged within the past four weeks, perform a weekly [point prevalence screen (PPS)](#_Glossary) for CPE on ward patients until there have been four consecutive weeks of negative screens.
   2. If all of the patients involved in the transmission have been discharged for longer than four weeks, perform a single PPS on the ward.
   3. Where an environmental source is implicated in the TRA, the VCIMT may recommend environmental screening in addition to patient screening requirements outlined above.
3. **Identify, notify and place alerts on ward contacts**

A ward contact is any person who has been on a ward for ≥ 24 hours during the time period that the ward has been designated as a TRA.

* 1. Ensure that all ward contacts discharged before clearance criteria are met have alerts placed on their medical record (see below for further information on clearance criteria). This is to ensure they are placed into contact precautions and screened if readmitted prior to meeting clearance criteria within 12 months of their last contact with the TRA. (Alerts in hospital records may be removed after 12 months if screening has not occurred.)
  2. Ensure that all ward contacts discharged before clearance criteria are met have a ward contact letter posted or given to them. This includes ward contacts who were discharged prior to the transmission being identified. An example ward contact letter can be found on the [department’s website](www2.health.vic.gov.au/infection-control) <www2.health.vic.gov.au/infection-control>.
  3. Notify any healthcare or long-term residential care facilities where TRA ward contacts have been transferred prior to clearance, to enable the receiving facility to place alerts and consider further action if required.

1. **Enact patient transfer procedures for ward contacts (if the TRA is active)**

When transferring patients from a TRA to another ward or healthcare facility:

* 1. Ensure that all ward contacts are screened on discharge or within the 24 hours prior to transfer to another ward or healthcare facility.
  2. Inform the receiving ward or facility in writing that the patient is a ward contact and that the patient must be placed in contact precautions until cleared.

When transferring patients to long-term residential care facilities (LTRCF):

1. Ensure that all ward contacts are screened on discharge or within the 24 hours prior to transfer to a LTRCF.
2. If the result will be available within 24 hours, then it is ideal to wait for the result prior to transferring the patient.
3. LTRCFs **should not** refuse transfer of a patient awaiting a screening result.
4. LTRCFs should manage any cases of CPE as per the [*Victorian Guideline on carbapenemase-producing Enterobacteriaceae for long-term residential care facilities*](www2.health.vic.gov.au/infection-control) (2018) <www2.health.vic.gov.au/infection-control>.

#### Clearance criteria for ward contacts

A **ward contact is considered cleared** when:

* A suitable specimen is negative for CPE at any time after discharge or transfer out of the TRA

**OR**

* + A suitable specimen taken within 24 hours of discharge or transfer out of the TRA is negative for CPE.

If a patient remains in contact with a TRA, they should be screened weekly as per the TRA requirements.

Flowchart 4: Local transmission/outbreak response requirements

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#### Healthcare workers, household and casual contacts

As discussed above, healthcare workers who care for and are in direct contact with a case of CPE are not generally recommended to be screened.

Household and community contacts do not require contact tracing or screening.

Screening for healthcare workers or household contacts may be undertaken at the discretion of the VCIMT, however given current evidence regarding the risk for transmission, this is unlikely and would only occur in an extreme circumstance.

| Scenario 3 |
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| Mrs Cook is a patient in a large metropolitan health service (Central Hospital) who is to be transferred back to a small rural health service (Murray Hospital). The Central Hospital ward Mrs Cook has been in for the past four weeks was classified as a transmission risk area one week after her admission. The TRA had three weekly-screening surveys performed in the lead up to the point of her transfer back to Murray Hospital with no evidence of further transmission to date.  Further screening specimens from Mrs Cook were taken by Central Hospital the day of her transfer. Murray Hospital placed Mrs Cook into a single room and implemented contact precautions. Central Hospital notified Murray Hospital that the screening results were negative for CPE two days after her transfer therefore contact precautions were ceased. After a further week of negative screening results at Central Hospital, the practice of screening ward contacts before transfer was ceased after agreement with the VCIMT. |

## Environmental screening

* + Environmental screening in non-outbreak situations is generally not required. When there is evidence of local transmission, environmental screening may be undertaken to identify any environmental reservoir of CPE. Screening taken before comprehensive cleaning can be a valuable part of an investigation to determine the source of persistent cases of CPE in a healthcare setting. Screening undertaken after comprehensive cleaning can enable a healthcare facility to target problem areas effectively.

Sites that may be sampled for CPE can be categorised into wet or dry surfaces. In general, *Enterobacteriaceae* species are isolated from wet or moist environments more frequently than dry surfaces, although this is also dependent on the particular organism. CPE outbreaks have also been associated with point source acquisition (for example contaminated ultrasound gel; contaminated endoscopes). Where epidemiological evidence exists for such acquisition, sampling sites should be extended to include these possibilities.

The VCIMT may direct a health service to undertake environmental screening as part of the required responses for managing a TRA. Choice and number of sampling sites is to be determined in consultation with the VCIMT.

The *Victorian guideline on environmental sampling for CPE* (2018) outlines recommended sampling and laboratory methods for the isolation of CPE from the environment. This guideline can be found on the [department’s website](www2.health.vic.gov.au/infection-control) <https://www2.health.vic.gov.au/infection-control>.

### Screening endoscopes

Endoscopes should be screened / microbiologically tested if more than one patient with confirmed CPE is found to have had a common exposure to an endoscope. Such screening should be conducted in addition to routine microbiological sampling as laid out in the current edition of the Gastroenterological Society of Australia [*Infection Control in Endoscopy*](http://www.gesa.org.au/resources/clinical-guidelines-and-updates/endoscopy-infection-control/) <www.gesa.org.au/resources/clinical-guidelines-and-updates/endoscopy-infection-control/>. Refer to sections ‘Quality control, Microbiological surveillance cultures’ and ‘Investigation of possible infection transmission by endoscopy’.

# Section 4: Management and control of CPE

Health services should ensure that their routine admission processes reliably identify patients requiring pre-emptive isolation and screening (PRIS). Each patient should be assessed on admission and re-admission to the healthcare facility as well as any transfer from another healthcare facility.

Transmission pathways for CPE in healthcare settings can be caused by contamination of healthcare workers’ hands, shared patient equipment and the healthcare environment. The interventions to control transmission are therefore focused on these transmission pathways.

A review of infection control interventions applied to international outbreaks of CPE has highlighted that increased hand hygiene compliance (and oversight) and contact precautions are core measures that every facility must implement in order to prevent the spread of CPE. In addition, in outbreaks where initial interventions were insufficient to control transmission, timely identification of colonised patients and their subsequent cohorting appear to have been significant additional measures that helpedto bring about the end of an outbreak.

## Prevention and treatment of CPE

### Antimicrobial stewardship (AMS)

AMS is a crucial aspect of the prevention of all multi-resistant organisms. National standards provide guidance in antimicrobial stewardship and the Implementation Plan for the National Antimicrobial Resistance Strategy 2015-2019 published in November 2016 outlines priority areas for action.

All healthcare facilities should have an AMS program.

Although the role of this activity specifically for CPE has not been well-studied, multiple classes of antimicrobial agents have been shown to be a risk factor for CPE colonization and/or infection. As part of an antimicrobial stewardship program, facilities should work to ensure that antimicrobials are used for appropriate indications and duration and that the narrowest spectrum antimicrobial that is appropriate for the specific clinical scenario is used.

When there is local transmission of CPE, evidence is moderate as to the value and benefit of restrictions on the use of specific antimicrobials. Such restrictions are not routinely recommended but could be considered. Any restriction should be overseen by the lead for the AMS program.

### Medical therapy

Treatment of patients with a CPE infection should be managed in consultation with an infectious diseases physician.

For colonised patients, an infectious diseases physician should be consulted to provide advice on the use of antimicrobials in situations such as prophylaxis for planned invasive procedures or when a patient is unwell with sepsis or is significantly immunosuppressed.

At this time, there are no known proven interventions for decolonisation.

## Infection control precautions

CPE requires targeted interventions to prevent ongoing transmission in health services. The standard and transmission based infection control precautions required for CPE are outlined below.

### Standard precautions

The use of standard precautions is an essential infection control strategy for the successful minimisation of transmission of infections, including multi-resistant organisms. All healthcare facilities must ensure compliance with standard precautions as outlined in the current version of the [*Australian Guidelines for the Prevention and Control of Infection in Healthcare*](http://www.nhmrc.gov.au/guidelines-publications/cd33) <www.nhmrc.gov.au/guidelines-publications/cd33> and that compliance is monitored in accordance with the current iteration of [Standard 3 of the National Safety and Quality Health Service (NSQHS) Standards](https://www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/) <https://www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/>.

Standard precautions should be applied at all times and include:

* Hand hygiene, in accordance with the 5 moments of hand hygiene

*Note*: Patients should also be strongly encouraged to wash their hands after toileting, before eating and prior to leaving their room. If a patient’s cognitive state is impaired, staff caring for them must be responsible for helping with this activity.

* Use of personal protective equipment
* Safe use and disposal of sharps
* Routine environmental cleaning
* Reprocessing of reusable medical equipment and instruments
* Respiratory hygiene and cough etiquette
* Aseptic non-touch technique
* Waste management
  + Appropriate handling of linen.

### Transmission-based precautions

Transmission-based precautions are infection control practices used in *addition* to standard precautions to prevent the spread of certain infectious organisms. As CPE is transmitted by direct and indirect contact, in addition to standard precautions, **contact precautions** are required for the following patients:

* All suspected CPE cases
* All confirmed CPE cases
* All room contacts until clearance criteria have been met
  + All PRIS patients until clearance criteria have been met.

The following contact precautions apply to all healthcare settings except where specified below, that is lower acuity settings including subacute, rehabilitation and ambulatory care.

*Note:* Standard precautions are adequate for linen management, dishes and cutlery.

#### Patient placement

Patient should be placed in a single room with their own ensuite. If this is not possible, give highest priority should be given to CPE cases who have higher-risk factors for onwards transmission (see [Figure 5](#_Further_screening_following)). Patients with the same strain of CPE can be cohorted in the same room.

When a single room is not available patient placement should be prioritised as below:

1. Single room with separate dedicated bathroom facilities
2. Single room with dedicated commode, but shared showering facilities
3. Shared room with dedicated commode.

Clear signage should be visible to alert healthcare workers of required precautions before entering the room.

#### Cohorting of patients and/or staff

If the patient has two or more risk factors for onwards transmission (see [Figure 5](#_Further_screening_following)), or if there are significant difficulties in ensuring compliance with infection prevention and control precautions, then there should be strong consideration of providing one-to-one nursing care.

When there is local transmission, a risk assessment by the HSIMT should consider the value of staff and patient cohorting. If staff cohorting is enacted, priority should be given to cohorting nursing staff, allied health professionals and patient care attendants. If considering patient cohorting, only patients with the same strain of CPE should be cohorted together.

#### Personal Protective Equipment

A long-sleeved gown and gloves must be worn whenever entering the patient’s room. Always remove gown and gloves **before** exiting the patient’s room and perform hand hygiene before and after all glove use. Gloves must be changed and hand hygiene performed during patient care in accordance with the five moments of hand hygiene.

Visitors are not required to wear a gown and gloves unless assisting with patient care for example showering, toileting. After exiting the room, visitors should be discouraged from visiting other patients within the health service.

#### Movement of patients

Patients should be strongly encouraged to stay within their room at all times. If it is necessary to attend other clinical areas for diagnostic tests or procedures contact precautions must be maintained. Clinical areas receiving patients for procedures or investigations should be advised well in advance of patient arrival to enable adequate preparation to manage a CPE case, for example allow enough time to perform environmental cleaning and disinfection before the next patient.

Patients should avoid using toilets outside their room however if necessary, staff should ensure cleaning and disinfection occurs after toilet use or that a commode is used where possible which must also be cleaned and disinfected afterwards.

#### Equipment and instruments/devices

Disposable equipment should be used where possible (for example, tourniquet or blood pressure cuff). Where this is not possible, dedicate the use of non-disposable equipment to the one patient (for example, commode). If equipment must be shared between patients (for example, lifting machine), ensure the equipment has been cleaned and disinfected before use on another patient (see below for information regarding cleaning and disinfection).

#### Environmental cleaning

Routine cleaning should be intensified. The patient’s room and bathroom should be cleaned and disinfected daily. In addition, frequently touched surfaces (for example bedrails, IV pump, overbed table) require twice daily cleaning and disinfection.

Select a disinfectant or combined cleaning and disinfecting agent that is either ‘listed’ or ‘registered’ with the Therapeutics Goods Administration (TGA). The agent selected must be effective against the vast majority of organisms that cause healthcare-associated infections and for practical purposes have a fast kill time (or contact time).

If healthcare facilities use an alternative method for cleaning and disinfection, the method must be validated to be equivalent to the above.

If using a no-touch method of surface disinfection (for example, ultraviolet [UV-C] or hydrogen peroxide vapour) prior cleaning is required.

Always follow the manufacturer’s instructions when using the selected disinfectant (that is, amount, dilution, contact time, safe use and disposal) or no-touch method of surface disinfection.

Terminal cleaning should take place on patient discharge according to the recommendations above.

*When there is ongoing transmission*, healthcare facilities should strongly consider the use of no-touch methods for terminal disinfection, such as ultraviolet (UV-C) or hydrogen peroxide vapour.

#### Audit of infection control processes

Health services are encouraged to routinely audit infection control practices; for example, PPE use and environmental cleaning in accordance with the current iteration of [Standard 3](http://www.safetyandquality.gov.au/wp-content/uploads/2012/10/Standard3_Oct_2012_WEB.pdf) of the National Safety and Quality Health Service standards. Observational audits for environmental cleaning should be supplemented with objective methods of assessing cleaning such as fluorescent gel markers or ATP bioluminescence.

In the event of local transmission, the VCIMT may request evidence that relevant auditing has taken place. The department may perform external audits of patient management and the infection prevention and other measures which are in place. The frequency of these external audits may increase if local transmission continues for an extended period of time.

#### Limiting ward activity and ward closure

If after initial control measures, for example screening, contact precautions and cleaning and disinfection, there is ongoing transmission the VCIMT may consider closure of an affected ward to new admissions.

If transmission involves a surgical ward, consider cancelling elective surgery.

### Subacute or rehabilitation healthcare setting

Patient care activities in the subacute or rehabilitation healthcare setting are different from those in the acute healthcare setting. Patients are generally more ambulant and frequently participate in group activities or attend communal areas such as gymnasiums. In this lower acuity setting the application of some of the above contact precautions can be modified to allow CPE cases to participate in rehabilitation activities as indicated below.

#### Personal Protective Equipment

At a minimum, staff should use a gown or apron and gloves when attending to a patient’s personal care, such as showering and toileting. Each facility should conduct their own risk assessment to determine if they require staff to always wear a gown/apron and gloves whenever entering the patient’s room. The risk assessment should be based on the following factors.

* The acuity of the patients within the facility.
* The location of the ward or facility (for example, stand-alone rehabilitation facility vs rehabilitation ward co-located with acute care wards).
  + Individual risk factors of the CPE case (for example, patient has [risk factors for onwards transmission](#_Further_screening_following)).

When there is ongoing transmission a long-sleeved gown and gloves must be worn by staff whenever entering the patient’s room.

Visitors are not required to wear a gown and gloves unless assisting with patient care for example showering, toileting. After exiting the room, visitors should be discouraged from visiting other patients in the health service.

##### Use of PPE during activities outside the patient’s room

Staff conducting group activities or one-to-one sessions (for example physiotherapist) where minimal physical contact occurs do not need to wear PPE, unless providing close personal care, such as toileting, where clothes may become contaminated.

#### Movement of patients/participation in group activities

Unless a patient is unwell (for example, diarrhoea), they may freely attend shared areas such as the dining room, and group activities. Patients should be educated to perform hand hygiene whenever they leave their room and when entering a communal area. If patient ability to perform hand hygiene is in doubt staff should assist. Patients’ personal hygiene should be maintained and clean clothes worn when outside their room. Ensure wounds are covered with a dressing that contains any ooze.

Avoid using toilets outside the patient’s room however if it is necessary, ensure cleaning and disinfection occurs after toilet use, or use a commode where possible which must also be cleaned and disinfected afterwards.

#### Equipment and instruments/devices

Disposable equipment should be used where possible. Where this is not possible, dedicate use of non-disposable equipment to the one patient. If equipment must be shared between patients, ensure the equipment has been cleaned and disinfected before use on another patient.

Equipment used in groups activities (for example gymnasium equipment, weights) should be wiped over with a disinfectant wipe after use by a patient with CPE.

#### Environmental cleaning

When patients with suspected or known CPE are present, routine cleaning should be intensified. The patient’s room and bathroom, including frequently touched surfaces (for example, bed rails, overbed table, commode, toilet surfaces in resident bathrooms, doorknobs) should be cleaned and disinfected daily.

Environmental cleaning and disinfection of communal areas, such as gymnasiums, should also be increased when there is ongoing local transmission.

### Ambulatory healthcare settings

For the purpose of this guideline, ambulatory healthcare settings do not include outpatient clinics. Haemodialysis and day oncology units are in scope, and have a number of differences compared to the acute healthcare setting. Patients are generally only admitted for a few hours and access to single rooms is often limited. In this setting, the application of some of the above contact precautions may be difficult and require modification.

#### Patient placement

The principles outlined above should be applied wherever possible. If none of these options are available then patients with CPE should be placed away from other patients (for example at the end of the row) and a toilet or commode should be dedicated to the patient for the duration of their day admission.

#### Personal Protective Equipment

A gown or apron and gloves should be worn when undertaking procedures (for example IV cannula insertion) or assisting a patient to toilet. Staff should remember to always remove the gown/apron and gloves **before** exiting the immediate patient care area. Gloves must be changed during patient care in accordance with the five moments of hand hygiene.

**Movement of patients**

Patients should be restricted to their rooms or chairs when they are unwell (for example, diarrhoea). Patients should be educated to attend to their hand hygiene as previously described, or be assisted by staff if required. Wounds should be covered with a dressing that contains any ooze.

**Equipment and instruments/devices**

In addition to the above, some items (for example blood pressure cuff, tourniquet) can be solely dedicated for the one patient’s use for all subsequent admissions. Such items should be appropriately cleaned, disinfected and stored between admissions.

**Environmental cleaning**

The patient’s immediate environment and surrounds (for example chair and surrounds) must be thoroughly cleaned and disinfected on discharge.

| Scenario 4 |
| --- |
| Mr Petrakis is identified as a sporadic case of CPE. He had been transferred to a Victorian health service from an overseas hospital following a car accident while on holidays in Greece. Mr Petrakis has been in a single room with contact precautions since his admission.  Mr Petrakis has required several investigations including X-rays and an MRI. Where possible X-rays were performed in his room. When he had an MRI Mr Petrakis was placed last on the procedure list for the day and was transferred down from the ward on a trolley just prior to the scan to avoid a long wait in the waiting area.  Mr Petrakis has now commenced rehabilitation. The physiotherapist initially implemented a program for him that could be undertaken in his room while still in the acute care setting. Mr Petrakis was subsequently transferred to a rehabilitation facility within the same health service. Although he was placed into a single room with contact precautions at the rehabilitation facility, he is able to participate in a more intensive rehabilitation program in the gym. Physiotherapy staff ensure Mr Petrakis uses hand rub whenever he enters the gym and staff wipe down all equipment with a disinfectant wipe after he has used it. Although staff do not wear aprons or gloves when working with Mr Petrakis in the gym, all staff entering his room on the rehabilitation ward use a gown or apron and gloves when attending to Mr Petrakis’ personal care. |

### Hydrotherapy

Patients with CPE may be required to access hydrotherapy pools as part of their rehabilitation program. A patient with CPE should be permitted to attend a hydrotherapy pool and not be excluded merely because they are colonised or infected with CPE. A risk assessment of patients should be conducted prior to their use of the hydrotherapy pool. At times, a patient’s access to the pool may need to be deferred, for example, when they are incontinent of faeces.

Hydrotherapy pools are regulated under the *Public Health and Wellbeing Act 2008* and the Public Health and Wellbeing Regulations 2009. As such, pool operators must comply with Part 6 of the Regulations to maintain water quality. All facilities should also have a faecal incident response plan or policy. Download further information about aquatic facility requirements from the department’s [Aquatic facilities website](https://www2.health.vic.gov.au/public-health/water/aquatic-facilities) <https://www2.health.vic.gov.au/public-health/water/aquatic-facilities>.

Further information about infection control precautions for hydrotherapy pools and management of patients can be found in the Australian Physiotherapy Association *Australian guidelines for aquatic physiotherapists working in and/or managing hydrotherapy pools*, second edition, 2015. Download this document from the [APA website](http://www.physiotherapy.asn.au/DocumentsFolder/APAWCM/The%20APA/National%20Groups/Aquatic%20Physiotherapy%20-%20Guidelines.pdf) <http://www.physiotherapy.asn.au/DocumentsFolder/APAWCM/The%20APA/National%20Groups/Aquatic%20Physiotherapy%20-%20Guidelines.pdf>

#### Personal protective equipment

In general, staff will not need to wear PPE unless providing close personal care, such as toileting, where clothes may become contaminated.

#### Equipment and instruments/devices

Where possible, dedicate the use of equipment to one patient. If equipment must be shared between patients, ensure the equipment has been cleaned and disinfected before use on another patient. If a sling is used to transfer the patient in and out of the pool, the sling should preferably be dedicated to the use of that patient for the duration of their rehabilitation. Following use, the sling will need to be laundered prior to use on another patient.

#### Management and risk assessment of patients

* A risk assessment of all patients should be undertaken prior to hydrotherapy to determine their suitability. A risk assessment should include, but not be limited to, whether the patient is continent of urine or faeces, has an active infection or is colonised and if they have any wounds present.
* All patients should shower (including washing their bottom) before entering the pool.
* Patients with uncontrolled faecal incontinence should be deferred from using the pool until this has either ceased or can be managed with appropriate devices (for example, incontinence aids).
  + Patients should inform the facility if they have had loose bowel motions or been unwell. Hydrotherapy may need to be deferred for a period (for example, a period of two weeks after diarrhoea ceases).

##### Wounds

Patients with a wound may be able to participate in hydrotherapy. All wounds should have an occlusive dressing that will keep the wound covered and prevent exudate from leaking from the wound. Patients with heavily exudating wounds that are not able to be adequately contained within a dressing should not enter the pool.

##### Stomas

Patients with a healed stoma may participate in hydrotherapy with the following recommendations.

* Empty bags prior to entering the pool.
* Ensure the stoma bag is well adhered and closed.
  + Secure the bag to the patient’s body with tubigrip or strapping.

# Section 5: Laboratory methods and reporting requirements

## Requirements for primary diagnostic laboratories to report cases

All suspected and confirmed cases of CPE from clinical, screening and environmental samples must be reported to the department by faxing the microbiological reports to Communicable Disease Prevention and Control on 1300 651 170 within one business day of detection. Results should be reported regardless of whether these have arisen from sporadic cases or as part of a recognised local outbreak.

## Other requirements for primary diagnostic laboratories

Infection prevention and control staff (or after hours, management staff) and treating clinicians should be notified of suspected or confirmed CPE so that appropriate precautions and necessary alerts can be implemented.

All *Enterobacteriaceae* that are suspected to be CPE are to be stored at the testing laboratory for six months.

All isolates of suspected or confirmed CPE are to be referred to MDU PHL for further confirmation and typing. Isolates are to be accompanied by a completed laboratory CPE isolate referral form. Forms for human isolates or environmental isolates can be found on the department’s website <www2.health.vic.gov.au/infection-control>. The form has provision for including the names of any infectious disease personnel that require a copy of the report.

Laboratories are also encouraged to send carbapenemase-producing isolates that are not *Enterobacteriaceae* to MDU PHL for confirmation, for example *Pseudomonas* species. This may help with the understanding of the extent of the challenge posed by highly resistant bacteria.

**Methods for detecting suspected or confirmed CPE**

Further advice and recommendations for primary laboratories.

* Isolates of *Enterobacteriaceae* from any submitted sample should undergo routine susceptibility testing (AST) using the usual method undertaken by the laboratory. It is not necessary to introduce new methods of testing. As a minimum standard, laboratories should test meropenem susceptibility on all isolates.
* Isolates meeting **any** of the following screening criteria are suspected CPE:
  + - Meropenem MIC ≥ 0.5 mg/L
    - Disk diffusion zone ≤ 24 mm (CLSI or EUCAST methods)
    - CDS disc diffusion zone ≤ 6 mm
    - Positive colorimetric test for carbapenemase (CarbaNP or Blue-Carba)
    - Positive carbapenemase inactivation method (CIM) test.
* These CPE screening breakpoints have been selected to capture isolates that are carbapenemase producing but phenotypically susceptible to carbapenems.
* Although some diagnostic laboratories have the capacity to detect a number of carbapenemase genes in *Enterobacteriaceae* by PCR testing, all suspected CPE isolates (as defined above) must be sent to MDU PHL for confirmatory testing and genomic analysis (unless excluded below).
  + Please note, if a suspected CPE is of *Enterobacter* or *Morganella* genera*,* has a meropenem MIC between 0.5 and 2 mg/L, and is CIM test negative, the isolate does not need to be sent to MDU PHL. Such isolates must be considered suspected CPE for infection control purposes until a negative CIM test result is obtained. This exclusion applies only to these two species for the MIC values listed above, and where CIM test performance has been validated by the diagnostic laboratory performing the testing.

## Role of the reference laboratory

All suspected and confirmed isolates should be referred to MDU PHL for further testing, unless excluded above. This testing includes:

* extended antimicrobial susceptibility testing
* molecular and genomic characterisation to determine carbapenemase gene presence
  + phylogenetic analysis and inference of transmission pathways, where applicable.

## Environmental sample testing

The *Victorian guideline on environmental sampling for CPE* (2018) outlines recommended sampling and laboratory methods for the isolation of CPE from the environment. Download this guideline from the [department’s website](https://www2.health.vic.gov.au/infection-control) <https://www2.health.vic.gov.au/infection-control>.

If you require assistance with environmental sampling contact MDU PHL.

# Appendices

## Appendix A: Guide to microbiological testing and data collection

| Agency | **Action** | **When to initiate** |
| --- | --- | --- |
| **Diagnostic microbiology laboratory** | Process clinical and screening samples referred for CPE testing as per CPE guideline ([Section 5](#_Section_5:_Laboratory)) | The day the samples arrive in the laboratory |
| Report suspected or confirmed CPE to the referring clinician and an infection control representative in the healthcare facility | Same day that the suspected or confirmed result is available |
| Report suspected or confirmed CPE isolates to Communicable Disease Prevention and Control by faxing the initial result to **1300 651 170** |
| Refer suspected or confirmed CPE isolates to MDU PHL using a completed CPE isolate referral form available on the department’s website <www2.health.vic.gov.au/infection-control> | Within two business days of isolation |
| **Healthcare facility** | When CPE is confirmed infection control lead or delegate must complete [Part A](https://www2.health.vic.gov.au/infection-control) (available <www2.health.vic.gov.au/infection-control>) of the initial data collection form and fax to VICNISS **(03) 9342 9355** | Within two business day of receiving confirmation of CPE result |
| Where local transmission of CPE is suspected the infection control lead or delegate must complete [Part B](https://www2.health.vic.gov.au/infection-control) of the initial data collection form and fax to VICNISS **(03) 9342 9355** | Within three business day of receiving confirmatory CPE results |
| Refer all screening samples to your clinical diagnostic microbiology laboratory for testing. Ensure the referral form is clearly marked as a CPE sample | When screening samples collected |
| **MDU PHL** | Confirm phenotypic resistance and perform PCR testing for carbapenem resistance genes on suspected or confirmed CPE isolates submitted by clinical diagnostic laboratories when deemed necessary | Within two business days of receiving the isolate |
| Report results to referring laboratory | Same day that the result is available |
| Perform genetic sequencing on all CPE isolates when deemed necessary | Within five to seven business days of confirming CPE |
| Review and collate epidemiology data from all CPE cases and collaborate with VICNISS to determine if a new case is sporadic or suggests local transmission | Each time a CPE case is reported |
| Notify the VCIMT if samples suggest local transmission | When two or more epidemiologically linked cases of CPE are identified and genomic analysis is consistent with potential transmission |

| Agency | Action | When to initiate |
| --- | --- | --- |
| **VICNISS** | CPE in healthcare facility: Receive and assess completed surveillance forms | [Part A](https://www2.health.vic.gov.au/infection-control) within one business day of reporting, [Part B](https://www2.health.vic.gov.au/infection-control) within two business days of confirmation of CPE |
| CPE outside healthcare facility (for example GP or LTRCF): Collect surveillance data from clinician or case |  |
| Collaborate with MDU PHL to determine if a new case is sporadic or suggests local transmission | Each time a case is reported |
| Audit health service infection prevention and control responses | As directed by VCIMT |
| **Department of Health and Human Services** | Coordinate Victorian CPE Incident Management Team and the Victorian CPE Surveillance and Response Unit | As required |

## 

## Appendix B: Hyperlinks and web addresses

| Reference document/web page | Web address |
| --- | --- |
| Australian Commission on Safety and Quality in Health Care | [www.safetyandquality.gov.au/](http://www.safetyandquality.gov.au/) |
| Australian Guidelines for the Prevention and Control of Infection in Healthcare, National Health and Medical Research Council | [www.nhmrc.gov.au/guidelines-publications/cd33](http://www.nhmrc.gov.au/guidelines-publications/cd33) |
| National Safety and Quality Health Service (NSQHS) Standards | [www.safetyandquality.gov.au/publications/national-safety-and-quality-health-service-standards/](http://www.safetyandquality.gov.au/publications/national-safety-and-quality-health-service-standards/) |
| health.vic website | [www2.health.vic.gov.au/](https://www2.health.vic.gov.au/) |
| Infection Control in Endoscopy, Gastroenterological Society of Australia | [www.gesa.org.au/resources/clinical-guidelines-and-updates/endoscopy-infection-control/](http://www.gesa.org.au/resources/clinical-guidelines-and-updates/endoscopy-infection-control/) |
| Microbiological Diagnostic Unit Public Health Laboratory (MDU PHL) website | [biomedicalsciences.unimelb.edu.au/departments/microbiology-Immunology/research/services/microbiological-diagnostic-unit-public-health-laboratory](http://biomedicalsciences.unimelb.edu.au/departments/microbiology-Immunology/research/services/microbiological-diagnostic-unit-public-health-laboratory) |
| Patient-centred risk management strategy for multi-resistant organisms, Victorian Department of Health | [www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/patient-centered-management-multi-resistant](https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/patient-centered-management-multi-resistant) |
| Victorian CPE forms, templates and resources | [www2.health.vic.gov.au/infection-control](https://www2.health.vic.gov.au/infection-control) |
| Victorian Guideline on carbapenemase-producing *Enterobacteriaceae* for long-term residential care facilities | [www2.health.vic.gov.au/infection-control](https://www2.health.vic.gov.au/infection-control) |
| Victorian guideline on environmental sampling for carbapenemase-producing *Enterobacteriaceae* | [www2.health.vic.gov.au/infection-control](https://www2.health.vic.gov.au/infection-control) |
| Victorian Healthcare Associated Infection Surveillance System (VICNISS) website | [www.vicniss.org.au/](http://www.vicniss.org.au/) |