

Surveillance & Response for Carbapenemase-Producing Enterobacterales (CPE) in NSW Health Facilities

Summary This Guideline is designed to assist public health care facilities in NSW to (1) identify suspected cases of Carbapenemase producing Enterobacterales (CPE); (2) implement control measures to prevent transmission of CPE; and (3) understand the local epidemiology of CPE.

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Author branch Clinical Excellence Commission

Branch contact (02) 9269 5500

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Audience All Clinical Staff

SURVEILLANCE AND RESPONSE FOR CARBAPENEMASE-PRODUCING ENTEROBACTERIALES (CPE) IN NSW HEALTH FACILITIES

PURPOSE

This Guideline is designed to assist public health care facilities in NSW to:

1. Identify suspected cases of Carbapenemase producing *Enterobacterales* (CPE)¹
2. Implement control measures to prevent transmission of CPE
3. Understand the local epidemiology of CPE.

While this Guideline has been written specifically for CPE, recommended measures may also be applicable to any species of multidrug-resistant *Enterobacterales* (MDR-E) and other carbapenemase producing organisms (CPO). The local decision whether to apply to other MDR-E and CPO is to be made in consultation with content experts.

As evidence for recommendations continues to emerge, recommendations will be reviewed and revised when significant new findings are available.

KEY PRINCIPLES AND USE OF THE GUIDELINE

Identify CPE cases

- Conduct a risk assessment to identify people who should be screened for CPE at admission
- Screen patients for CPE at admission if a case contact, if flagged or if admitted to a healthcare facility or aged care facility overseas in the last 12 months
- The minimum requirement for admission screening is one rectal swab or faecal sample
- Screening during hospital admission may also be indicated in additional clinical scenarios, based on local risk assessment

Manage CPE cases

- Implement contact precautions for patients with suspected or confirmed CPE
- Inform health care providers of patients with suspected or confirmed CPE
- Educate the patient and their family on CPE and how to prevent transmission
- Place alerts in patient medical records for patients with suspected or confirmed CPE
- Routinely manage all CPE cases under contact precautions for subsequent admissions

¹ This document uses the collective term *Enterobacterales*, rather than *Enterobacteriaceae*. Recent taxonomic studies have narrowed the definition of the family *Enterobacteriaceae*. *Enterobacteriaceae* are one of seven families in the *Enterobacterales* order. When the abbreviation CPE is used in this document, it refers to carbapenemase producing *Enterobacterales*.

Manage contacts of CPE cases

- Identify contacts of all suspected and confirmed CPE cases
- Screen contacts of all confirmed CPE cases
- For contacts that have already left the health care facility, place alerts in patient medical records to prompt screening when the patient is readmitted

Manage local transmission of CPE

- When local transmission of CPE is identified, convene a CPE outbreak management team
- Investigate the cause of the local transmission
- Implement strategies to limit further transmission
- Report local transmission to the Clinical Excellence Commission (CEC)

REVISION HISTORY

Version	Approved by	Amendment notes
August-2019 (GL2019_012)	Deputy Secretary, Public and Population Health	New guideline

ATTACHMENTS

Surveillance and Management of CPE in NSW Health Facilities: Guideline

Surveillance and Response for Carbapenemase-producing Enterobacterales (CPE) in NSW Health Facilities



Issue date: August-2019

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CONTENTS

1	CARBAPENEMASE PRODUCING <i>ENTEROBACTERALES</i> (CPE)	1
1.1	What are CPE?	1
1.2	CPE occurrence and public health significance	1
1.3	CPE colonisation and infection	2
1.4	Risk factors for acquisition of CPE	2
1.5	Route of transmission	2
1.6	People at higher risk for developing severe infection	3
2	GOVERNANCE AND PREPAREDNESS	3
2.1	Roles and responsibilities	3
2.2	Data Management	4
2.3	Communication requirements	4
3	CASE DEFINITIONS	5
4	ROUTINE PREVENTION ACTIVITIES	5
4.1	CPE screening	5
4.1.1	Risk assessment at admission	5
4.1.2	Screening methods and interpretation of findings	7
4.2	Infection prevention and control precautions	8
4.3	Antimicrobial stewardship	9
5	LABORATORY TESTING	9
5.1	Process for laboratory testing	9
6	CASE MANAGEMENT	9
6.1	Treatment for CPE colonisation / infection	9
6.2	Infection prevention and control measures	9
6.3	Determine period of transmission risk and date of likely acquisition	10
6.4	Assess for ongoing carriage in confirmed CPE cases	11
7	CONTACT MANAGEMENT	12
7.1	Identify contacts of suspected and confirmed CPE cases	12
7.2	Management of contacts of confirmed CPE cases	13
8	MANAGEMENT OF LOCAL TRANSMISSION OF CPE	14
8.1	Convene a CPE Outbreak Management Team (CPE-OMT)	14
8.2	Communication requirements when there is local transmission of CPE	15
8.3	Determine additional actions to reduce transmission risk	15
8.4	Extend contact screening	16
8.5	Environmental screening	17
8.6	Outpatient and ambulatory care	17
9	ENVIRONMENTAL ASSESSMENT AND MANAGEMENT	17
10	LIST OF ATTACHMENTS	17
11	REFERENCES	26

1 CARBAPENEMASE PRODUCING ENTEROBACTEREALES (CPE)

1.1 What are CPE?

Enterobacterales are an order of Gram-negative bacilli that occur naturally in the gastro-intestinal tract. They can spread outside the gastro-intestinal tract and cause serious infections such as bacteraemia, pneumonia, urinary tract and wound infections.

Carbapenemase producing *Enterobacterales* (CPE) are often resistant to carbapenem antibiotics by means of an acquired carbapenemase gene. CPE produce carbapenemase enzymes which hydrolyse carbapenems (as well as other β -lactamases, such as penicillins and cephalosporins).

Some acquired beta-lactamases (e.g. ESBL and AmpC enzymes) can result in carbapenem resistant *Enterobacterales* (CRE) in certain circumstances. Not all acquired carbapenemases result in carbapenem resistance. Thus, CRE are commonly CPE, and CPE are commonly CRE, but neither group is entirely a subset of the other. The highest degree concern is for the transmissible carbapenemases (in CPE) because they pose the greatest threat.

There are a number of different types of carbapenemases found in CPE; the five most important globally are Imipenemase (IMP), Klebsiella pneumoniae carbapenemase (KPC), New-Delhi metallo- β -lactamase (NDM), Oxacillinases (OXA) and Verona integron-encoded metallo- β -lactamase (VIM). Each of these has been identified in patients in Australia.

Table 1 - Key definitions

<i>Enterobacterales</i>	Gram-negative bacilli that occur naturally in the gastro-intestinal tract
Carbapenemase enzymes	Beta-lactamases that hydrolyse carbapenems, usually along with other Beta-lactams
Carbapenemase-producing <i>Enterobacterales</i> (CPE)	<i>Enterobacterales</i> which produce a carbapenemase, by means of an acquired carbapenemase gene.
Carbapenem resistant <i>Enterobacterales</i> (CRE)	<i>Enterobacterales</i> which are resistant to carbapenem antibiotics, by a number of means, including carbapenemase gene acquisition.

Further information on CPE can be found in [Attachment 1](#).

1.2 CPE occurrence and public health significance

The proliferation of CPE represents a rising public health threat in Australia. CPE are an infection risk for the following reasons:

- **CPE can be easily transferred between patients.** CPE have caused a number of outbreaks in healthcare facilities nationally and overseas.
- **CPE can have severe clinical consequences.** Infections caused by CPE are associated with high rates of morbidity and mortality, as well as hospital costs.
- **CPE are difficult to treat.** Treatment of CPE infections is increasingly difficult as these organisms are often resistant to carbapenems and many (sometimes all) other

available antibiotics. Antibiotics often required are associated with significant side effects.

- **Carbapenemase genes can be efficiently transferred between organisms.**

1.3 CPE colonisation and infection

CPE colonisation refers to the presence of the bacteria in/on a body surface without signs of invasive infection. The primary site of CPE colonisation is usually the lower gastro-intestinal tract. Other potential sites for colonisation include the urinary system.

CPE infection refers to the invasion of a person's bodily tissues by the bacteria and their subsequent multiplication, resulting in disease-causing symptoms and the reaction of host tissues to these organisms and the toxins they produce.

1.4 Risk factors for acquisition of CPE

As this is an evolving international epidemic, the risk factors for acquisition are likely to change. In Australia the current major risk factor for acquiring CPE is overseas travel, especially when medical care or treatment in a healthcare facility is involved. However, there have been cases of CPE in Australia in which overseas travel was not an identified exposure route.

Additional risk factors which have been shown to be associated with increased risk of CPE acquisition include: [1, 2]:

- Prolonged hospitalisation
- Dialysis or chemotherapy in the previous 12 months
- Multiple or recent exposure to different antibiotic agents (including extended-spectrum penicillins, cephalosporins, fluoroquinolones and carbapenems)
- Indwelling medical devices (such as central venous catheters, urinary catheters, biliary catheters or wound drains)
- Organ or stem cell transplant recipients
- Mechanical ventilation
- Admission to an intensive care unit
- Diabetes mellitus
- Prior VRE colonisation
- Medical care, treatment or intervention in a healthcare facility or clinic overseas
- Recent hospitalisation in a hospital with a known CPE outbreak or endemic transmission.

1.5 Route of transmission

Patients who are colonised or have clinical infections with CPE can transmit CPE to other patients in healthcare settings via direct or indirect contact.

- **Direct contact:** patient-patient contact (with contamination from a colonised/infected site).

- **Indirect contact:** could occur via a healthcare worker who has been contaminated following contact with a patient with CPE, or via a contaminated environmental surface (including basin or toilet) and/or contaminated shared equipment.

Some CPE-positive patients are more likely to transmit CPE to others, including those with:

- Diarrhoea, faecal incontinence or enterostomies (especially if they have gastrointestinal colonisation/infection)
- Urinary catheters (especially if they have urinary tract colonisation/infection)
- Discharging wounds
- Inability to attend to their own personal hygiene.

1.6 People at higher risk for developing severe infection

Some patients are at increased risk of developing severe CPE infection, including:

- Organ or stem cell transplant recipients
- Patients admitted to an ICU
- Patients with haematological disorders or malignancy.

2 GOVERNANCE AND PREPAREDNESS

2.1 Roles and responsibilities

Table 2 – Summary of key roles and responsibilities

<i>Clinical Excellence Commission (CEC)</i>	Is the lead agency for the state-wide response to CPE in public healthcare facilities in NSW. Co-ordinate enhanced surveillance of CPE cases in public healthcare facilities.
<i>Health Protection NSW</i>	Provide state wide surveillance of all CPE notifications. Support CEC in the management of local transmission (outbreaks) of CPE as required.
<i>NSW healthcare facilities</i>	Assess risk of, screen for, treat, investigate and manage cases of CPE and their contacts. Control spread of CPE, investigate and manage local transmission when it occurs.
<i>NSW Pathology laboratories</i>	Conduct testing for CPE and report/notify results.

2.2 Data Management

Table 3 – Data management responsibilities

<i>Clinical Excellence Commission</i>	Collate analyse and report on information on CPE cases across NSW. Monitor and report on CPE related clinical indicators as required by state and federal agreements.
<i>Health Protection NSW</i>	Collate all notifications of CPE across NSW. Analyse and interprets CPE data across NSW. Report on CPE data across NSW. Assist CEC with the analysis of CPE data as required.
<i>NSW healthcare facilities</i>	Collate information on local CPE cases and contacts. Analyse and interpret local CPE data. Report within LHD on local CPE data.
<i>NSW Pathology laboratories</i>	Report findings of CPE testing to NSW healthcare facilities.

2.3 Communication requirements

To help identify cases and monitor the epidemiology, CPE has been added to the list of scheduled medical conditions notifiable by laboratories in NSW. Under the NSW Public Health Act 2010 a laboratory that detects a case (infection or colonisation) must notify Health Protection NSW via secure fax (02 9391 9189) within 24 hours of diagnosis.

Detailed communication plans should be maintained by each Local Health District.

Table 4 – Summary of communication requirements

	Suspected case of CPE	Confirmed case of CPE	Local transmission of CPE
<i>Clinical Excellence Commission (CEC)</i>			
Liaise with health care facilities to obtain updates as required			YES
Advise NSW Ministry of Health when there are issues affecting service delivery			YES
<i>NSW healthcare facilities</i>			
Report within LHD through established channels (including IP&C committees, DCG)	YES	YES	YES
For discharged or transferred patient: notify receiving health care or aged care facility	NO	YES	YES
Report to CEC			YES
Submit IIMS	NO	YES	YES
<i>NSW Pathology laboratories</i>			
Report results of any testing to NSW	YES	YES	YES

healthcare facilities			
Notify cases to Health Protection NSW	NO	YES	

3 CASE DEFINITIONS

Table 5 – Case definitions

Confirmed CPE Case	A person with a species of <i>Enterobacteriales</i> isolated from routine clinical or screening specimens (infection or colonisation) where a carbapenemase gene is detected in a sample or isolate irrespective of phenotypic susceptibility.
Suspected CPE Case	A person with a species of <i>Enterobacteriales</i> isolated from routine clinical or screening specimens (infection or colonisation), with phenotypic characteristics suggestive of carbapenemase gene presence but not yet confirmed.
Local transmission	When there is epidemiological or laboratory evidence suggestive of transmission of CPE from one person to another within the health facility
Contact of a confirmed case	Immediate contact: A person who shared a room and/or bathroom with a confirmed CPE case for ≥ 24 hours in a health service during the CPE case's period of transmission risk (Section 6.3).
	Extended scope contact: Criteria for extended scope contacts are determined by the facility CPE Outbreak Management Team (CPE-OMT). These contacts are screened when local transmission of CPE is identified.

4 ROUTINE PREVENTION ACTIVITIES

4.1 CPE screening

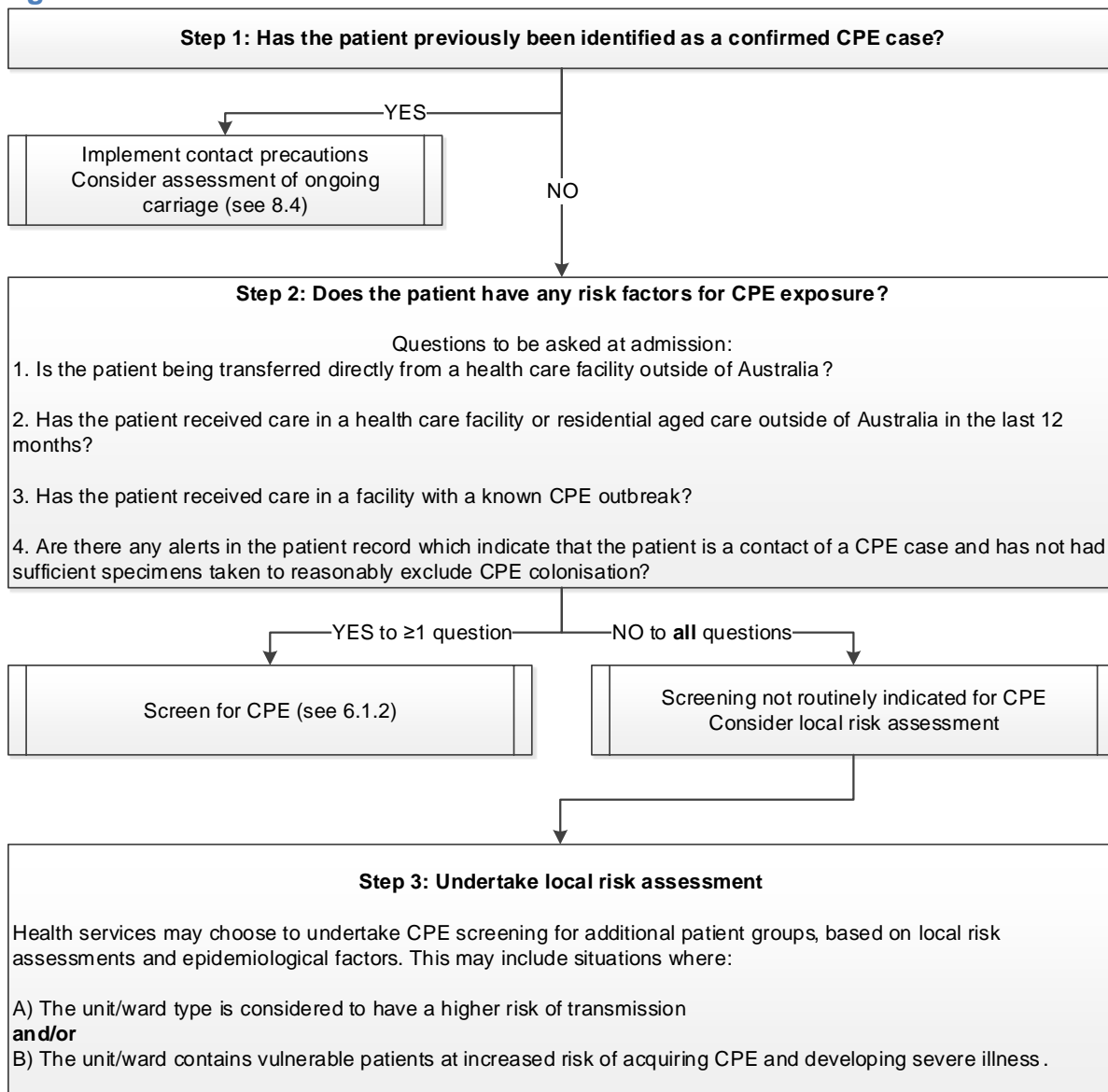
4.1.1 Risk assessment at admission

A risk assessment should be conducted at admission to identify people who require screening for CPE. See Figure 1 for detail.

Note - People who have been previously screened and found to be CPE negative, do not need to be isolated and screened each time they present to hospital, unless their risk exposures have changed since the last screening samples were taken.

All patients who are being screened for CPE should be provided information on why they are being screened and what screening involves. Patient information flyers are available.

Figure 1 – Risk assessment flowchart



4.1.2 Screening methods and interpretation of findings

Table 6 – CPE screening methods and interpretation of findings

CPE screening on admission	CPE screening for contacts
Who requires screening?	
<p>See 4.1 – risk assessment at admission</p> <ul style="list-style-type: none"> - Patients being transferred directly from a health care facility outside Australia - Patients who have received care in a health care facility or residential age care outside Australia within the last 12 months - Patients who have received care in facility with a known CPE outbreak - Patient with alerts on their record to indicate that the patient is a contact of a CPE case who has not had sufficient specimens taken to reasonably exclude CPE colonisation. - Patients deemed to require screening based on local risk assessment 	<p>See 7.1 – identifying contacts</p> <ul style="list-style-type: none"> - Contacts of confirmed CPE cases
What screening samples are required?	
<ul style="list-style-type: none"> - The minimum requirement for CPE admission screening is one rectal swab or faecal sample - When an additional site has been identified as a potential site of CPE colonisation/infection, a sample should be taken¹ on day zero and day 7. 	<p><i>At time of contact identification:</i></p> <ul style="list-style-type: none"> - A rectal swab or faecal sample is to be taken on day zero and day 7 - When an additional site has been identified as a potential site of CPE colonisation/infection, a sample should be taken².
	<p><i>≥7 days after the last exposure to the CPE case:</i> (If previous swab negative for CPE)</p> <ul style="list-style-type: none"> - repeat rectal swab or faecal sample - Repeat additional site sample
How are the results interpreted?	
<p><i>CPE positive</i> if any of the screening samples are returned positive</p>	<p><i>CPE positive</i> if any of the screening samples are returned positive</p>
<p><i>CPE negative</i> if ALL of the criteria are met:</p> <ul style="list-style-type: none"> <input type="checkbox"/> ≥1 faecal sample or rectal swab has been screened <input type="checkbox"/> All other potential sites for colonisation/infection present at time of 	<p><i>CPE negative</i> if ALL of the criteria are met:</p> <ul style="list-style-type: none"> <input type="checkbox"/> ≥1 faecal sample or rectal swab has been screened <input type="checkbox"/> All other potential sites for colonisation/infection have been

¹ Additional samples include wound swabs, urine samples (when intermittent or continuous urinary catheterisation is used), endotracheal tube swab (when patient intubated), stomal samples (for all enterostomies) and other sites where there is suspicious of active infection.

<p>admission have been screened</p> <ul style="list-style-type: none"> <input type="checkbox"/> All specimens were taken > 7 days after the most recent exposure to the identified risk (e.g. <i>contact with overseas health care facility</i>) <input type="checkbox"/> All specimens are returned negative for CPE 	<p>screened</p> <ul style="list-style-type: none"> <input type="checkbox"/> ≥1 faecal specimen and ≥1 additional site specimen (if indicated) were taken > 7 days after the most recent exposure to the identified risk (e.g. <i>contact with CPE case</i>) <input type="checkbox"/> All specimens are returned negative for CPE
<p>Should further screening be considered?</p>	
<p>Further screening may be considered when there is ongoing clinical suspicion for CPE infection/colonisation. Note: negative screening has more significance in a patient who has received significant amounts of antibiotics such as ceftriaxone that would have selected for any occult colonisation.</p>	<p>Further weekly screening may be considered while the contact remains in hospital if there is clinical suspicion of infection/colonisation. Local Infection Prevention and Control professionals should be consulted to determine if this is necessary</p>

4.2 Infection prevention and control precautions

Infection prevention and control precautions are essential to minimise the transmission of CPE. Standard precautions and transmission based precautions are outlined in the [NSW Health Infection Prevention and Control Policy](#) (PD2017_013) [3] and the [NSW Infection Prevention and Control Practice Handbook](#) [4].

Standard precautions are the minimum infection prevention measures that apply to all patient care settings, regardless of suspected or confirmed infection status of the patient. They are essential to minimise the transmission of micro-organisms (including CPE) during the delivery of healthcare.

Transmission-based precautions are additional clinical practices that are applied in situations where standard precautions alone may be insufficient to prevention transmission of infection. They are used in addition to standard precautions. As CPE is transmitted through contact (indirect and direct), contact precautions are required for all confirmed CPE cases and all suspected CPE cases.

Detail on applying infection prevention and control precautions for cases is found in [Attachment 2](#), and for contacts in [Section 7.2](#).

Healthcare facilities should also implement policies and procedures for reprocessing of all bronchoscopes and endoscopes in accordance with AS/NZS 4817:2014 - *Reprocessing of reusable medical devices in health service organizations*.

Further information is in the [Recommendations for the control of carbapenemase-producing Enterobacteriaceae \(CPE\) – guide for acute care health facilities](#) (section 1.4) from the Australian Commission on Safety and Quality in Health Care [1] and the [Infection Control in Endoscopy Consensus Statements on Carbapenemase-Producing Enterobacteriaceae](#) [6].

4.3 Antimicrobial stewardship

[Antimicrobial stewardship \(AMS\) is a crucial component in the prevention of multi-resistant organisms.](#) All health care facilities are required to have antimicrobial stewardship that is monitored at the highest level of governance within the organisation.

Treatment with multiple classes of antimicrobial agents has been shown to be a risk factor for CPE colonisation and/or infection. As part of AMS, 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 local transmission of CPE is identified, any restriction on the use of specific antimicrobials is to be overseen by the AMS lead for the health facility.

5 LABORATORY TESTING

5.1 Process for laboratory testing

Laboratories should follow local in-house testing protocols. The Microbiology Clinical Stream of NSW Health Pathology is developing a standard protocol for laboratory testing for CPE.

6 CASE MANAGEMENT

6.1 Treatment for CPE colonisation / infection

The treating doctor is responsible for managing treatment of patients with CPE colonisation and/or infection.

In general, for a patient colonised with CPE:

- No antibiotic treatment is required
- There is no recognised method for decolonisation for CPE

For a patient who develops an infection with CPE, the general guidelines for management are:

- Ensure treatment is started promptly
- Treatment is to be guided by antibiotic susceptibility results and under the advice of a clinical microbiologist or infectious diseases specialist and concordant with any local restricted antimicrobial procedures.

6.2 Infection prevention and control measures

Table 7 – CPE case management: infection prevention and control measures

	Actions required	
	Suspected CPE case	Confirmed CPE case
Prevent transmission	<input type="checkbox"/> Ensure standard precautions are in place <input type="checkbox"/> Implement contact precautions <input type="checkbox"/> Limit non-essential patient movement whenever possible	

Inform and educate the patient and family	<input type="checkbox"/> Educate the patient and/or carer regarding CPE <input type="checkbox"/> Reinforce importance of personal hygiene (including hand hygiene) to prevent transmission to others <input type="checkbox"/> Reinforce importance of patient remaining within their room	
Inform health care providers	<input type="checkbox"/> Ensure health care providers are alerted to the patient's CPE status <input type="checkbox"/> Communicate the positive CPE result and the need for contact precautions prior to transfer within or between health facilities or aged care homes, including Ambulance, Patient Transport or other transport agency. <input type="checkbox"/> Inform the patient's GP of the case's CPE status at discharge	
Place alert in patient file	<input type="checkbox"/> Place an alert in the hard-copy and/or electronic medical record advising of CPE status (suspected or confirmed)	
	<input type="checkbox"/> If patient is found to not have CPE on confirmatory testing, remove the alert	<input type="checkbox"/> Ensure the alert includes information on infection prevention and control requirements on subsequent presentations.
Transport Requirements	<input type="checkbox"/> If awaiting for results transport as per confirmed <input type="checkbox"/> Risk assessment <input type="checkbox"/> Remove the query based on negative results	<input type="checkbox"/> No multiple patient transport <input type="checkbox"/> Cleaning of vehicle as per HealthShare NSW's Patient Transport Service Operational Guideline Transport of patients with Multi Resistant Organisms (MRO)
Laboratory testing	<input type="checkbox"/> Request confirmatory testing for CPE	<input type="checkbox"/> Follow up on outcome of tertiary testing
Waste Management	<input type="checkbox"/> As per standard precautions	<input type="checkbox"/> As per standard precautions
Determine period of transmission risk	<input type="checkbox"/> Obtain information to determine date of likely acquisition and period of transmission risk	
Contact tracing	<input type="checkbox"/> Identify immediate contacts (shared the same room or bathroom \geq 24 hours) during period of transmission risk	<input type="checkbox"/> Screen immediate contacts (for extended screening see outbreak management section).
	<i>See Section 8 (Contact Management)</i>	

Further detail on applying infection prevention and control precautions can also be found in [Attachment 2](#).

6.3 Determine period of transmission risk and date of likely acquisition

The **date of likely acquisition** depends on exposure factors, such as:

- when contact first occurred with a known CPE case
- when contact first had exposure to an overseas health care facility

If there is no epidemiological evidence to suggest a date of likely acquisition, then the case is considered to have an unknown date of acquisition.

The **period of transmission risk**, is the period of time during which the case could have transmitted the CPE to another person. The start date of the period of transmission risk will depend on the date of likely acquisition. Once appropriate infection prevention and control precautions are in place, the period of transmission risk is considered to have ceased. Possible scenarios are illustrated in [Attachment 3](#).

6.4 Assess for ongoing carriage in confirmed CPE cases

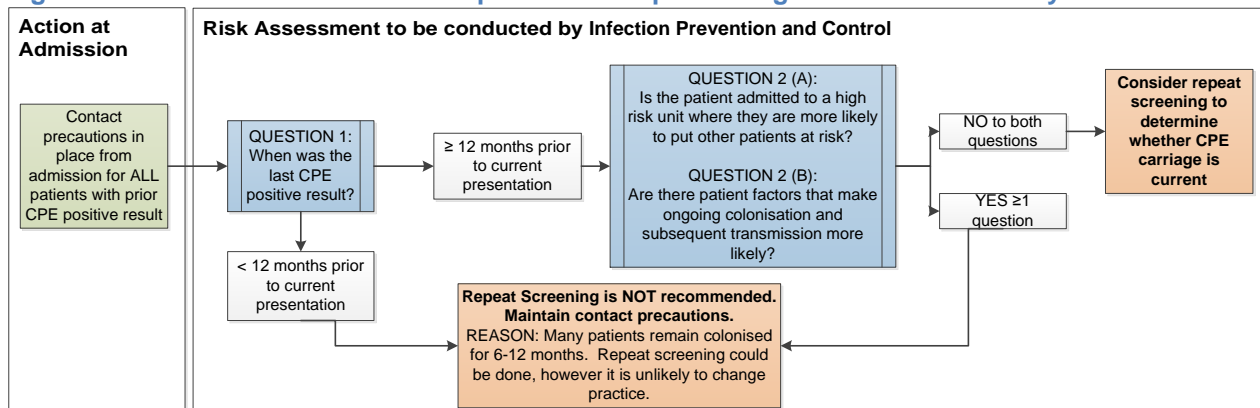
In the absence of high quality evidence to support clearance of CPE colonisation, a cautious approach is required.

The recommendations for assessment of ongoing carriage in confirmed CPE cases are based on a review of national and international guidelines, noting the following key assumptions:

- The natural history and duration of CPE carriage is variable; persistence for 12 months is well documented. It is unclear whether carriage varies on whether the patient is colonised or infected, or by organism or resistance type.
- Patients at higher risk of CPE transmission and patients in units that are considered high risk for CPE transmission are assumed either to be still colonised or at increased risk if transmission occurs and therefore screening is unlikely to change practice.

On presentation to a health care facility, contact precautions are required for all patients who have tested positive for CPE (either from screening or clinical samples), unless cleared. This includes day only admissions. Infection Prevention and Control staff should conduct a risk assessment at the earliest opportunity to determine if repeat screening for CPE carriage is indicated. Generally, repeat screening is not indicated. See Figure 2 for further detail.

Figure 2 - Action to be taken for CPE positive case presenting to health care facility



In order to consider ceasing contact precautions for patients previously CPE positive, the following criteria **must** be met:

- Screening involves three rectal swabs or faecal samples, each taken at least 24 hours apart. See Section 0 for further detail on screening samples.
- Last positive test for CPE was > 12 months prior
- Three screening samples have been taken and all are negative for CPE.

If these criteria are met, the facility can consider ceasing contact precautions for the current admission. The final decision to cease contact precautions must be made in consultation with Infection Prevention and Control, Infectious Diseases and Microbiology professionals.

In order to identify any relapse in detectable CPE colonisation, any patient for whom precautions are ceased should have their risk reassessed at every subsequent day only or overnight admission to a health facility. This means that contact precautions should be enacted, and the flow chart in

Figure 2 should be followed.

7 CONTACT MANAGEMENT

7.1 Identify contacts of suspected and confirmed CPE cases

When there is a **case of suspected or confirmed CPE**, all immediate contacts should be identified. Immediate contacts are patients who shared a room and/or bathroom with a confirmed CPE case for ≥ 24 hours in a health service during the CPE case's period of transmission risk (as per Table 5). This includes people who remain in hospital, as well as those who have been transferred elsewhere. Discharged patients should be followed up and alerted for screening at their next admission.

When a suspected or confirmed case of CPE is identified that has attended high risk outpatient units (e.g. haemodialysis) during their period of transmission risk, the Infection Prevention and Control team should conduct a risk assessment to determine which contacts require screening. Consideration should be given to:

- The case's likelihood of onwards transmission (e.g. episodes of diarrhoea, enterostomies)
- The susceptibility of other patients who were in the unit at the same time
- Risks associated with the service (e.g. type of service, frequency of visits, hand hygiene compliance record of the unit, environmental cleaning concerns).

If contact tracing is deemed to be required following the risk assessment, it is suggested that an initial look-back include up to at least 1 month from the time that the case was identified as CPE positive. This timeframe is a guide, and should be reviewed by Infection Prevention and Control professionals.

When there is **evidence** (or high clinical suspicion) **of local transmission**, contact tracing and screening should be expanded. See Section 0 for detail.

7.2 Management of contacts of confirmed CPE cases

Table 8 - CPE contact management

	Action Required	
	Contact remains an <u>inpatient</u> at time of identification	Contact has been <u>discharged</u> prior to identification
CPE Screening	<ul style="list-style-type: none"> <input type="checkbox"/> Perform CPE screening (as per section 0) 	<ul style="list-style-type: none"> <input type="checkbox"/> Place an alert in the hard-copy and/or electronic medical record, to ensure that contact precautions are implemented and the patient is screened if they are readmitted within 12 months.
Prevention transmission in hospital	<ul style="list-style-type: none"> <input type="checkbox"/> Ensure standard precautions are in place <input type="checkbox"/> Implement contact precautions (until criteria for CPE negative are met – see 0) 	<ul style="list-style-type: none"> <input type="checkbox"/> If the patient has been discharged to another facility ensure that the CPE positive results are communicated to the receiving facility.
Inform and educate the patient and family	<ul style="list-style-type: none"> <input type="checkbox"/> Educate the patient and/or carer regarding their status as a contact of a CPE case <input type="checkbox"/> Reinforce importance of personal hygiene to prevent transmission to others 	<ul style="list-style-type: none"> <input type="checkbox"/> Send letter to patient advising them that they have been identified as a contact of confirmed CPE case. <input type="checkbox"/> Advise patient that if they represent to hospital within the next 12 months (and possibly longer if they have had subsequent antibiotic therapy), they will be screened for CPE on presentation.
Inform health care providers	<ul style="list-style-type: none"> <input type="checkbox"/> Ensure other health care providers are alerted to the patient’s CPE contact status <input type="checkbox"/> Communicate the requirement for contact precautions if they are transferred to another health care facility 	<ul style="list-style-type: none"> <input type="checkbox"/> Inform the GP that the patient has been identified as a contact of a confirmed CPE case (template letter).
Place alerts in the patient file	<ul style="list-style-type: none"> <input type="checkbox"/> While results are pending, place an alert in the hard-copy and/or electronic medical record advising of CPE contact status 	<ul style="list-style-type: none"> <input type="checkbox"/> Place an alert in the hard-copy and/or electronic medical record, to ensure that contact precautions are implemented and the patient is screened if they are readmitted within 12 months.
At time of discharge	<ul style="list-style-type: none"> <input type="checkbox"/> If patient is discharged before clearance criteria are met, place an alert in the hard-copy and/or electronic medical record, to ensure that contact precautions are implemented and the patient is screened appropriately <input type="checkbox"/> If the results are negative remove the alert from the medical record 	N/A

8 MANAGEMENT OF LOCAL TRANSMISSION OF CPE

Transmission of CPE is where evidence from epidemiological or laboratory notification is suggestive of CPE transmission from one person to another, or from an environmental source. The following criteria are used:

- Two or more confirmed cases of genetically related CPE and a plausible epidemiological connection between the two cases, either through geographic proximity or shared staff, equipment or other exposures in the facility.

OR

- Where acquisition from an environmental source is hypothesised, clustering in time and place without a direct patient to patient epidemiological link.

Because of the potential delay between CPE exposure and identification, ongoing transmission is defined using the following criteria:

- Within a 12-month period, two or more units are affected by genetically related CPE.

OR

- Single cases with the same molecular epidemiology, as confirmed by whole genome sequencing, occur in more than one unit.

When local transmission of CPE is identified, action should be taken to prevent further spread in the healthcare facility. Confirmation of local transmission by sequencing should not delay outbreak management planning. The [NSW Health Infection Prevention and Control Policy](#) [3] includes a section on Outbreak Management Procedures, and specifies that each Public Health Organisation must have written procedures that address outbreak management requirements for common communicable diseases and Multidrug-Resistant Organisms (MROs) and identify delegations of responsibility during the outbreak.

8.1 Convene a CPE Outbreak Management Team (CPE-OMT)

The role of the CPE-OMT is to:

- Develop an outbreak management plan
- Determine investigational needs
- Determine communication requirements
- Undertake a risk assessment and determine additional actions to reduce ongoing transmission (see Section 8.3)
- Determine criteria for extension of contact screening (see Section 8.4)
- Coordinate environmental screening where indicated (see Section 8.5)
- Investigate possible transmission routes and contamination sources
- Minimise the disruption to normal service delivery
- Escalate decisions for executive approval.

A CPE Outbreak Management Team (CPE-OMT) may include expertise from the groups listed below. Where the expertise is not available locally, the health care facility may contact CEC to identify assistance as required.

- Infection Prevention and Control
- Microbiology
- Infectious diseases
- Hospital management
- Epidemiology
- Communications
- Antimicrobial stewardship
- Environmental cleaning management
- Staff health
- Directors/managers of relevant clinical units – including nursing, medical and allied health staff where applicable.

A **lead** should be identified from the CPE-OMT, who is responsible for ensuring that:

- The CPE-OMT acts effectively, and investigations and response activities are well coordinated and managed
- Sufficient resources are allocated to the CPE-OMT
- Regular updates are provided to the LHD executive and the CEC
- There is a pathway in place to escalate issues for discussion and decision making to LHD executive
- Decisions made by the CPE-OMT are communicated appropriately
- A CPE-OMT report is prepared when the local transmission episode ceases.
- Debriefs with the CPE-OMT and relevant clinical teams are held during and at the cessation of the local transmission episode.

8.2 Communication requirements when there is local transmission of CPE

The CPE-OMT should determine communication requirements locally and develop a communication plan accordingly.

In addition to locally determined communication requirements, an initial report from the Local Health District (LHD) to the Clinical Excellence Commission (CEC) is required within 1 day of the identification of local transmission of CPE. Updates are requested until the incident is brought under control. The CEC may escalate issues to the Ministry of Health (MoH) as required.

8.3 Determine additional actions to reduce transmission risk

Following risk assessment, the local CPE-OMT team may determine additional activities to be undertaken to reduce transmission risk, such as:

- Review/reinforce environmental cleaning
- Audit of shared reusable equipment cleaning and disinfection practices
- Review antimicrobial use
- Review compliance with standard precautions including hand hygiene and waste management
- Review compliance with transmission based precautions (contact precautions)
- Review and reinforce communication to staff, family and visitors
- Introduce additional infection prevention and control measures, such as:
 - Patient cohorting
 - Changing staff allocation
 - Ward closures
 - Restricting transfers in from other health care facilities while contact screening pending
 - Restricting transfers to other health care facilities while contact screening pending
 - Notify the receiving or transferring facility about the outbreak including inter-state or trans-border
 - Escalation of the outbreak to relevant authority.

8.4 Extend contact screening

When local transmission has occurred, the extent of contact screening may be expanded.

The CPE-OMT has a role in reviewing the epidemiology of the outbreak and determining the criteria for extended scope contacts. Depending on the local assessment of risk, this may include:

- Patients who have had feasible CPE case exposure for ≥ 24 hours in the time period of transmission risk:
 - Same ward/unit
 - Same equipment (if the equipment is deemed a possible source)
 - Same clinical staff
 - Same procedures (if the equipment/procedure is deemed a possible source)
- Higher risk patient cohorts with plausible CPE case exposure
 - Transplant recipients, haematology/oncology patients etc.

All extended scope contacts should be screened as per the method set out in Section 0. While awaiting screening test results, all contacts are to be managed as per the management recommendations in Section 7.

8.5 Environmental screening

Environmental reservoirs have been implicated in hospital CPE transmission episodes internationally, and suspected to have contributed to some hospital CPE transmission episodes in Australia. Reservoirs have mostly been associated with bathroom and water environments including contaminate sinks, waste-water drainage, patient toilets and a patient mattress.

Environmental screening may be useful to detect environmental reservoirs of CPE following identification of local transmission. When done, environmental screening should include: toilets and surrounds, washbasins or sinks, shared patient equipment (e.g. blood glucose monitors, blood pressure monitors, patient lifting devices), and frequently touched surfaces (e.g. call buttons, bedside tables, chairs, door handles, computers on wheels).

8.6 Outpatient and ambulatory care

Standard precautions are the minimum infection prevent measures that apply to all patient care settings, including outpatient and ambulatory care settings, regardless of suspected or confirmed infection status of the patient. In outpatient and ambulatory care settings, in addition to standard precautions, contact precautions should be used for patients who are CPE positive unless a risk assessment demonstrates standard precautions are sufficient ([see section 1.5](#)). Patients' clinical care should not be compromised by their positive status.

9 ENVIRONMENTAL ASSESSMENT AND MANAGEMENT

For further information on environmental assessment and management see:

- [NSW Health Infection Prevention and Control Handbook](#) [4] – section 4.6
Environmental Cleaning
- [NSW Health Environmental Cleaning Policy \(PD2012_061\)](#)
- [NSW Health Environmental Cleaning Standard Operating Procedures](#) – module 4.
Cleaning requirements for MROs

10 LIST OF ATTACHMENTS

1. Detailed information on CPE
2. Additional detail on contact precautions for CPE
3. Determining period of transmission risk
4. Implementation checklist

Attachment 1: Detailed information on CPE

Carbapenemase producing *Enterobacteriales* (CPE) are resistant to carbapenem antibiotics, by means of an acquired carbapenemase gene. CPE produce carbapenemase enzymes which hydrolyse carbapenems (as well as other β -lactamases, such as penicillins and cephalosporins).

Enterobacteriales are a family of Gram-negative bacilli that occur naturally in the gastro-intestinal tract. These organisms can spread outside the gastro-intestinal tract and cause serious infections such as bacteraemia, pneumonia, urinary tract and wound infections. Within the *Enterobacteriales* order, carbapenemases have been found most commonly in *Escherichia coli* and *Klebsiella pneumoniae*.

There are a number of different types carbapenemases found in CPE. The five most important carbapenemases globally are described in the table below [7, 8] . Each of these has been identified in Australia. Further information may be found in [CARAlert¹](#) reports and the [AGAR² sepsis annual report](#). It is important to note that the geographic distribution of each carbapenemase is constantly evolving with changing epidemiology. It is advisable to refer to the latest epidemiological data on CPE surveillance for regions/countries as required:

- <https://ecdc.europa.eu/en/antimicrobial-resistance/surveillance-and-disease-data/data-ecdc>
- <https://resistancemap.cddep.org/AntibioticResistance.php>

Carbapenemase gene family	First Isolated	Geographic distribution of endemic / inter-regional spread
Imipenemase (IMP)	1991	Relatively uncommon in Europe, in comparison with other carbapenemases. This is the most common CPE in Australia. Affected regions: Greece, and scattered globally
<i>Klebsiella pneumoniae</i> carbapenemase (KPC)	1996	KPC have the most extensive global distribution of all carbapenemases Affected regions: United States, South America, Central America, Western Europe (Greece, Italy), Asia (China) and the Middle East (Israel)
New-Delhi metallo- β -lactamase (NDM)	2008	Affected regions: Asia (India, Pakistan, Bangladesh, China, Hong Kong), Eastern Europe (Denmark, Poland, Romania), and South America
Verona integron-encoded metallo- β -lactamase (VIM)	1997	Affected regions: Europe (Greece, Spain, Italy, Hungary) and South America
Oxacillinases (OXA)	2001	Affected regions: Europe (in particular Malta, Turkey, Spain, France, Belgium and Romania), Middle East, Africa, Asia and South America.

Note: limited data available, particularly from Africa

¹ National Alert System for Critical Antimicrobial Resistances (CARAlert)

² Australian Group on Antimicrobial Resistance

Carbapenemases (especially IMP and NDM) have also been reported in other Gram-negative bacteria, such as *Pseudomonas* and *Acinetobacter* species.

Attachment 2: Additional detail on contact precautions for CPE

Full detail on contact precautions can be found in the [NSW Infection Prevention and Control Policy](#) [PD2017_013] page 15, and attachment 3 and the [NSW Infection Prevention and Control Practice Handbook](#) .

Alerts

Contact precautions signage is to be visible at the entrance to the patient's room, to alert health care workers of required precautions.

The patient's medical record is to be updated to include an alert regarding CPE status. Any relevant addition systems are to be checked to ensure they contain appropriate alerts (*including patient journey boards, handover sheets, diagnostic test request forms, patient flow processes, theatre lists and emergency department systems*).

Room & bathroom

Patient should be placed in a single room with their own en-suite and waste bins.

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

1. Single room with separate dedicated bathroom facilities
2. Single room with dedicated commode, but shared showering facilities (if they are continent)
3. Shared room with dedicated commode.

Highest priority is to be given to CPE cases that are assessed as being a higher risk for onwards transmission.

Whenever possible remove non-essential equipment to prevent environmental contamination.

Personal Protective Equipment (PPE)

PPE is to be worn according to LHD policy.

The minimum requirement for PPE is an apron and gloves. When wearing an apron, a person is to be bare below the elbow, with the exception of gloves. Gloves should always be put on immediately before the procedure or contact with body substance.

When wearing gloves, change or remove gloves if moving from a contaminated body site to another within the same patient.

PPE is to be removed before exiting the patient's room or leaving the patient zone.

Hand hygiene is to be performed before and after all PPE use.

When local transmission is suspected or confirmed: PPE requirements may be reviewed by the CPE outbreak management team (CPE-OMT) (see section 0).

Patient Equipment

Wherever possible, disposable equipment is to be used (e.g. tourniquet, blood pressure cuff).

When the use of disposable equipment is not possible, non-disposable equipment is to be dedicated to the one patient, cleaned and disinfected when no longer required and before use on another patient (see Environmental cleaning and disinfection).

If equipment must be shared between patients (e.g. lifting machine), ensure the equipment

has been cleaned and disinfected after use and before use on another patient (see Environmental cleaning and disinfection).

Whenever possible remove non-essential equipment to ensure rooms are not overstocked with supplies. Only take into the room what is needed for that shift.

Movement of patients

Patients are to be encouraged to stay within their room as much as possible.

If it is necessary to attend other clinical areas for diagnostic tests or procedures, contact precautions must be maintained. Ensure appropriate notification to the transporting agency. Clinical areas receiving patients for procedures or investigations are to be advised well in advance of patient arrival to enable adequate preparation to manage a CPE case, e.g. allow enough time to perform cleaning and disinfection before the next patient.

Patients to perform hand hygiene prior to and entering their room

Patients to avoid using toilets outside their room. However if necessary, staff are to ensure cleaning and disinfection occurs after the toilet is used, or that a commode is used where possible (which must also be cleaned and disinfected afterwards).

Transporting and transferring patients with CPE: see [Table 7](#) in this document and the [NSW Infection Prevention and Control Handbook](#) (section 7.4.3).

Staff allocation

Changes to staff allocation are not indicated in single cases of CPE.

When local transmission is suspected or confirmed: staff allocation may be reviewed by the CPE outbreak management team (CPE-OMT) (see section 0).

Environmental cleaning and disinfection

The patient's room and bathroom (special attention to hand washing sinks and faucets) are to be cleaned and disinfected daily. In addition, frequently touched surfaces (e.g. bedrails, IV pump, and over-bed table) require twice daily cleaning and disinfection.

Terminal cleaning is required on discharge. All equipment in the room is to be cleaned, and must remain in the room until the completion of cleaning.

The agent selected must be effective against the vast majority of organisms that cause health care associated infections and for practical purposes have a fast kill time (or contact time). Always follow the manufacturer's instructions when using the selected cleaning or disinfecting agent (that is, amount, dilution, contact time, safe use and disposal).

If health care facilities use a novel method for environmental disinfection, the method must be validated to be equivalent to the above.

Food Services

There is no difference in required precautions for provision of food services to any other multi-resistant organism.

Linen and Waste Management

There is no difference in required precautions for provision of linen and waste management services to any other multi-resistant organism.

Visitors

Visitors are to be instructed to perform appropriate hand hygiene.

Visitors are not required to wear PPE unless assisting with patient care e.g. showering,

toileting.

Visitors are to be discouraged from visiting other patients within the health service.

Visitors are to be discouraged from using the ward kitchen.

Parents/carers and visitors of children with CPE

Education regarding hand hygiene should be reinforced, particularly after attending to personal care for themselves and their child, upon entry/exit of the patient room, ward and facility.

PPE is to be worn by parents/carers and visitors according to local policy. Parents/carers and visitors should don PPE when attending to direct patient care or r at risk of exposure to body substance. Education should be provided on appropriate donning, doffing and disposal of used PPE followed by hand hygiene.

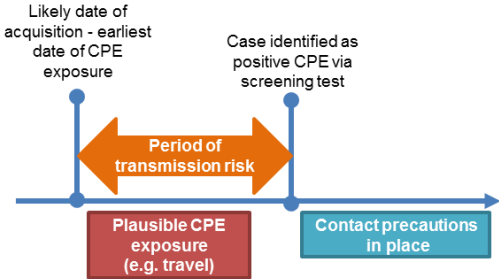
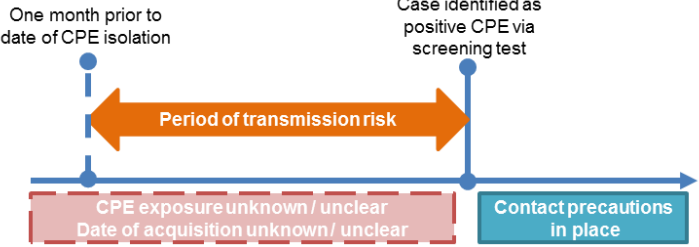
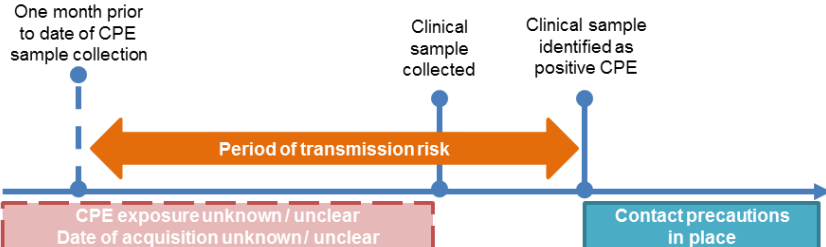
A risk assessment is advised to determine whether the child should attend school services in the hospital. Where attendance at school services is not possible, arrangements for the child to participate in school activities in their own room should be made available as possible. All surfaces in the school are to be cleaned and disinfected as per existing cleaning practices. If a parent/carer is rooming with the CPE positive child, they are to be allocated a single room with en-suite as able.

Parents/carers and visitors are not to use shared rooms/spaces, including the kitchen, beverage preparation areas, linen trolleys, expressing rooms, formula rooms. Alternative arrangements should be made available where possible.

Health facilities that have services such as Ronald McDonald house should also consider these as potential transmission sites and advise on appropriate infection prevention and control precautions.

When local transmission is suspected or confirmed: Further restrictions on visitors, using common spaces and school attendance, as well as PPE requirements for parents/carers may be reviewed by the CPE outbreak management team (CPE-OMT).

Attachment 3: Determining period of transmission risk

Period of transmission risk	
<p>Scenario One:</p> <ul style="list-style-type: none"> - Screening test returned as positive CPE - Date of likely acquisition is known 	<p>The period of transmission risk is from the date of likely acquisition until the time that the case is placed in contact precautions.</p> 
<p>Scenario Two:</p> <ul style="list-style-type: none"> - Screening test returned as positive CPE - Date of likely acquisition is unknown 	<p>The conservative estimate for the period of transmission risk is one month prior to the date that the positive sample was taken, until the contact is placed in contact precautions. This estimate should be reviewed with reference to the individual situation.</p> 
<p>Scenario Three:</p> <ul style="list-style-type: none"> - Clinical isolate is returned as positive CPE - Date of likely acquisition is known or unknown 	<p>The conservative estimate for the period of transmission risk is one month prior to the date that the clinical sample was taken, until the case is placed in contact precautions. This estimate should be reviewed with reference to the individual situation.</p> 

Attachment 4: Implementation Checklist

Note: This implementation checklist is not mandatory – it is a tool for health facilities to use to monitor implementation of this guideline locally.

LHD/Facility:	Assessed By:				Date:
Implementation Requirements	Not applicable	Not started	Partial compliance	Full compliance	Action Required
1. Local process in place for CPE risk assessment at admission (emergency, transfer to your facility and planned) for a patient with suspected or confirmed CPE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Development of a communication flowchart/plan for increasing cases, patient to patient transmission or outbreaks:					
a) When to escalate within the facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b) When to escalate within the LHD/SHN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c) When to escalate to Clinical Excellence Commission during outbreaks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Health facility has identified which units/wards are considered to have higher risk due to local risk assessment and/or epidemiological factors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Local process for identifying, collecting and following up screening specimens determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Local process for assessing for ongoing carriage of CPE determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Local procedure for application of alerts to patient electronic health record files determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Local plan for staff education on CPE determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Templates modified to suit local needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

9. Local procedure(s) for outbreak management reviewed to include CPE and the requirement for a CPE outbreak management team	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Local cleaning procedures for MROs reviewed to include CPE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Local AMS procedures reviewed to include management of CPE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Review of local policy for reprocessing of bronchoscopes and endoscopes to ensure they are aligned with appropriate policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Development of a surveillance plan for CPE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. Development of a reporting system to local infection prevention and control committee on:					
a) CPE surveillance trends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b) Barriers or challenges to implementation of the guideline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c) Incidents (including patient to patient transmission, outbreaks, breaches of infection prevention and control)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
d) Staff education programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e) Adherence to screening programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

11 REFERENCES

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