Information for clinicians
Carbapenemase-producing Enterobacteriaceae (CPE)

Carbapenems are a group of penicillin-related (broad spectrum beta-lactam) antibiotics that are effective against most gram-negative infections. They are the last line of treatment for serious infections caused by Enterobacteriaceae, including *Escherichia coli*, *Klebsiella pneumoniae*, *Enterobacter cloacae* and *Proteus species*.

Enterobacteriaceae that are resistant to most, or even all, types of antibiotics have emerged as a significant global public health threat. Resistance to carbapenems is of particular concern. Multidrug-resistant gram-negative bacteria, including carbapenemase-producing Enterobacteriaceae (CPE), place Australian patients at greater risk of potentially untreatable infection.

Carbapenem antibiotics include: Meropenem, Imipenem, Ertapenem

Carbapenemases are enzymes produced by Enterobacteriaceae that have the ability to hydrolyze certain antibiotics (penicillins, cephalosporins, monobactams and carbapenems). Such bacteria are referred to as carbapenemase-producing Enterobacteriaceae.

CPE are resistant to all beta-lactam antibiotics, including penicillins, cephalosporins and carbapenems. They are usually also resistant to most aminoglycosides and to fluoroquinolones.

CPE increase the risk of potentially untreatable infections in patients following invasive procedures or other hospital care. CPE infections are associated with a much higher mortality than infections with otherwise similar non-CPE bacteria.

**Antimicrobial stewardship**

Antimicrobial stewardship (AMS) is critically important to reduce the emergence and spread of antibiotic-resistant pathogens such as CPE. It is essential that clinical practice ensures that use of antibiotics is consistent with *Therapeutic Guidelines: Antibiotic*, taking into consideration local susceptibility information.

**CPE in Australia: Who is at risk?**

Australia has not seen a significant number of CPE cases to date. Most of the identified cases have been associated with international travel or outbreaks in health facilities. A small number of outbreaks of CPE have occurred in Australian health facilities; the first was recorded in 2012. The reported mortality rate was 40%, although the overall number of CPE cases was small. In the period between March and December 2016, approximately half of the critical antimicrobial resistances reported in the Commission’s CARAlert system have been CPE.

Patients with significant comorbidities have a greater risk of CPE infection. CPE are more likely to affect patients who:

- Are hospitalised for a long time
- Have been hospitalised or had surgery overseas, especially in high-burden regions or countries¹
- Have had multiple, or recent exposure to different antibiotic agents, especially cephalosporins, fluoroquinolones and carbapenems
- Have diabetes mellitus
- Are on mechanical ventilation
- Are admitted to the intensive care unit
- Have an indwelling medical device (such as a central venous catheter, urinary catheter or biliary catheter).

How should CPE patients be managed?

A combination of standard and transmission-based (contact) precautions should be used.

**Standard precautions** include hand hygiene, use of personal protective equipment and effective cleaning of all equipment and the healthcare environment.

**Contact precautions** include: isolation in a single room, use of personal protective equipment (gloves and gowns), dedicating equipment to patients where possible and enhanced cleaning and disinfection in selected instances.

¹ South Asia, parts of Southern and Eastern Europe and North America
Contact precautions should be used in the following circumstances:
- When patients are known to be colonised with CPE
- When patients are identified as being at high risk of colonisation with CPE
- While waiting for the results of screening swabs.

If there are insufficient single rooms available, patient placement should be discussed with the infection control team.

Contact precautions should be used for patients with a history of CPE colonisation or infection at least for the duration of the initial episode of inpatient care.

**Screening for CPE**

Screening strategies should be based on the burden of CPE within a health facility. Consideration should be given to the number of cases identified and whether there are sporadic cases of CPE, or ongoing transmission is occurring. Identification of colonised patients on entry to the health facility is important, because transfer of colonised patients has been identified as a major risk factor for the introduction and spread of CPE.

**Recommended screening specimens** include rectal swabs or faeces. Urine from catheterised patients should also be included in screening. Perianal swabs are not recommended except in some situations, such as anal pathology or in some neutropenic patients. Screening open wounds or urine from indwelling urinary catheters should also be considered for CPE screening.

**Additional patient groups to be considered in a CPE screening strategy**

Screening may be considered for patients who have had less than 24 hours’ contact with a confirmed case of CPE but where there may be increased risk of transmission or acquisition of CPE. Examples of patients at increased risk of acquisition include patients with immunosuppression and patients in haematology/oncology, transplant and intensive care units. Patients at increased risk of transmission include those with intellectual or cognitive impairment (such as dementia) and those with incontinence of urine or faeces.

**Summary of screening strategies, by burden of CPE**

<table>
<thead>
<tr>
<th>Screening strategy</th>
<th>Outbreak phase</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No cases</td>
<td>Sporadic cases</td>
</tr>
<tr>
<td>Admission from high-risk setting(s)</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Admission to high-risk unit(s)</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Single or periodic point prevalence surveys</td>
<td>Consider</td>
<td>Consider</td>
</tr>
<tr>
<td>Repeated prevalence surveys in high-risk unit(s)</td>
<td>No</td>
<td>Consider</td>
</tr>
<tr>
<td>Screening of contacts of confirmed cases</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Opportunistic screening (e.g. all diarrhoeal specimens)</td>
<td>Consider</td>
<td>Consider</td>
</tr>
</tbody>
</table>

Clinicians should also refer to state or territory CPE guidelines. N/A = Not Applicable