AUSTRALIAN COMMISSION
ON SAFETY AND QUALITY IN HEALTH CARE

Carbapenemase-producing Enterobacterales (CPE)

Information for clinicians

Carbapenems are a group of broad spectrum β-lactam antimicrobials that are effective against many bacteria, including Gram-negative infections. They are the last line of treatment for serious infections caused by Enterobacterales, including *Escherichia coli*, *Klebsiella pneumoniae*, *Enterobacter cloacae* and *Proteus mirabilis*. Recent taxonomic studies have narrowed the definition of the family Enterobacteriaceae. Some previous members of this family are not included in other families within the order Enterobacterales.

Enterobacterales that are resistant to most, or even all, types of antimicrobials have emerged as a significant global public health threat. Resistance to carbapenems is of particular concern.

Carbapenem antimicrobials include: Meropenem, Imipenem and Ertapenem

Multidrug-resistant Gram-negative bacteria, including carbapenemase-producing Enterobacterales (CPE), place patients at greater risk of potentially untreatable infection.

Carbapenemases are enzymes produced by Enterobacterales that have acquired the ability to hydrolyse almost all β-lactam agents (penicillins, cephalosporins, monobactams and carbapenems), making them inactive. Such bacteria are referred to as CPE.

CPE are resistant to almost all β-lactam antimicrobials, including penicillins, cephalosporins and carbapenems. They are usually also resistant to most aminoglycosides and 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 rate than infections with otherwise similar non-CPE bacteria.

Antimicrobial stewardship

The optimal use of antimicrobials is critically important to reduce the emergence and spread of antimicrobial-resistant pathogens such as CPE. A number of classes of antimicrobials have been associated with colonisation of, or infection by, CPE.

Control strategies for CPE should include antimicrobial stewardship (AMS) measures that aim to minimise inappropriate antimicrobial use and ensure that antimicrobials such as third generation cephalosporins, fluoroquinolones and carbapenems are only used when necessary.

It is essential that all clinicians ensure the use of antimicrobials is consistent with national guidelines such as *Therapeutic Guidelines: Antibiotic* and considers local susceptibility information when prescribing.

CPE in Australia: Who is at risk?

Australia has seen many CPE cases since the first reported outbreak in 2012. Most of the cases have been associated with international travel or outbreaks in health facilities.

Since the introduction of the National Alert System for Critical Antimicrobial Resistances (CARAlert) by the Commission in 2016, approximately half of the critical antimicrobial resistances (CARs) reported 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 an extended time**
- **Have been hospitalised and/or had surgery overseas**
- **Received treatment in a hospital with a known CPE outbreak or endemic transmission**
- **Have had multiple, or recent exposure(s) to different antimicrobial agents, especially cephalosporins, fluoroquinolones and carbapenems**
- **Received chemotherapy in the previous 12 months**
- **Have diabetes mellitus**
- **Have vancomycin-resistant Enterococcus (VRE) colonisation**
- **Are on mechanical ventilation**
- **Are, or have been, 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

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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. Standard precautions should be used for all patients, regardless of their infection status.

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. 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
- When patients are waiting for the results of screening swabs.

If single rooms are not 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 service organisation (Table 1). 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. Open wounds should also considered for CPE screening. All patients being screened for CPE should be provided with information on why they are being screened and the process of 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 of contact with a confirmed case of CPE - however, they should also meet additional criteria for increased risk of transmission or acquisition of CPE. Examples of patients at increased risk of acquisition include patients with immuno-suppression 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 urinary or faecal incontinence.

Table 1: Summary of screening strategies, by burden of CPE

Screening Strategy	Burden of CPE		
	No cases	Sporadic Cases	Local transmission established or CPE endemic
Admission from high-risk settings	Yes	Yes	Yes
Admission to high-risk unit(s)	Yes	Yes	Yes
Single or periodic point prevalence surveys	Consider	Consider	Yes
Repeated prevalence surveys in high-risk unit(s)	No	Consider	Yes
Screening of contacts of confirmed cases	Not applicable	Yes	Yes
Opportunistic screening (e.g. all diarrhoeal specimens)	Consider	Consider	Yes

CPE = carbapenemase-producing Enterobacterales; yes = screen; no = do not screen; consider = consult infection control team.

For more information on CPE:
www.safetyandquality.gov.au/cpe-guide