



Control of Transmission of Carbapenemase Producing Enterobacterales (CPE)¹ in the Acute Hospital Setting

CPE Expert Group

January 2020

National Guidance Document, Version 2.0

Scope of this Guidance

This guidance is intended for infection control specialists working in the acute hospital sector. For additional guidance or to confirm that you are using the most current version of this guidance, please go to www.hse.ie/infectioncontrol.ie and www.hpsc.ie

Next review of this guidance document

This guidance document will be reviewed in 12 months (January 2021).

Footnote¹ Recent changes in microbial nomenclature have altered the meaning of the term “*Enterobacteriaceae*” and mean that the term “Enterobacterales” now corresponds more closely to the former meaning of “*Enterobacteriaceae*”

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Glossary of Terms

AMAU = Acute Medical Assessment Unit

Cohorting = Cohorting refers to accommodation of two or more patients in a space that they share with each other, but which is separate from space used by other patients

CPE = Carbapenemase Producing *Enterobacterales**

The following in alphabetical order are some of the more common carbapenemase enzymes. There are a number of other carbapenemase enzymes.

IMP: Imipenemase

KPC: *Klebsiella pneumoniae* carbapenemase

NDM: New Delhi metallo-beta-lactamase

OXA: Oxacillinase-type carbapenemase (OXA-48 is the most common variant)

VIM: Verona Integron-encoded metallo-beta-lactamase

ED = Emergency Department

IPCT = Infection Prevention and Control Team

Isolation = Isolation refers to accommodation of one patient in a single room

***Note:** Recent changes in microbial nomenclature have altered the meaning of the term “*Enterobacteriaceae*” and mean that the term “Enterobacterales” now corresponds more closely to the former meaning of “*Enterobacteriaceae*”.

Summary of Key Recommendations

It is recommended that patients with CPE in an acute hospital are accommodated in an isolation room with an ensuite toilet and bathing facilities.

It is recommended that all patients with CPE should be placed in single rooms in proximity to each other on one ward.

It is recommended that patients who do not have confirmed CPE colonization should **NOT** be cohorted with patients with confirmed CPE colonization or infection.

It is recommended that patients with CPE should **NOT** be cohorted with other patients with CPE if they have different types of CPE.

It is recommended that one-to-one care is not generally required for care of patients with CPE provided there is adequate staffing to allow staff to comply fully with contact precautions.

It is recommended that patients identified as CPE contacts should ideally be accommodated as for patients with CPE (see qualifications below).

It is recommended that all hospitals review their antimicrobial stewardship programmes and plans to ensure that they are adequate to support control of CPE transmission.

It is recommended that acute hospitals have a complete and readily accessible inventory of drainage points and plumbing fixtures and fittings in clinical areas and food preparation areas.

It is recommended that acute hospitals have a process in place for periodic documented checking of all water drainage sites.

It is recommended that acute hospitals have processes in place to monitor and assure the effectiveness of cleaning programmes in clinical areas.

It is recommended that acute hospitals should monitor for environmental contamination with CPE where there is evidence of sustained CPE acquisition in the hospital.

It is recommended, in relation to CPE in an acute hospital, that an outbreak be declared if there are **two or more** linked cases of CPE or an increase in the incidence of CPE above the background rate for that institution.

It is recommended that an outbreak control team is convened promptly by the most senior manager (CEO or GM) of the institution if a CPE outbreak is suspected

Background

Managing transmission of antimicrobial resistant bacteria in an acute hospital setting is very challenging. This document is intended to support hospitals in focusing on those measures likely to be most effective in controlling the spread of CPE and other antimicrobial resistant bacteria. Implementing these measure may impact on continuity of overall clinical service.

Infection prevention and control activities, particularly in the context of an outbreak are usually multi-faceted or delivered as a bundle. This makes it difficult to determine which components of a response are most important. As in many other areas of healthcare, practice may be based, of necessity, on consensus and expert opinion; because formal research studies to evaluate the evidence as to the relative importance of individual components of a bundle of interventions is often not available.

It is important to note that, as with all infection prevention and control practice, outbreak control measures must be adapted to take account of the needs of individual patients in particular those approaching end of life.

This document replaces two previous CPE Expert Group documents, “*Interventions for Control of Transmission of CPE in the Acute Hospital Sector*” (2018) and “*Acute Hospital Carbapenemase Producing Enterobacterales (CPE) Outbreak Control Checklist*”. (2018). This document should be considered in association with related documents concerning CPE specifically “*Assessing Evidence of Transmission and end of Transmission of Carbapenemase Producing Enterobacterales (CPE), Version 1.0*”. and “*Requirements for Screening of Patients for Carbapenemase Producing Enterobacterales (CPE) in the acute hospital sector, Version 2.0, April 2019*” and “*Guidance relating to laboratory testing for CPE and Interpretation and Clinical Application of Results. Version 1.0 2019*. These documents are available at the following link:

<http://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/strategyforthecontrolofantimicrobialresistanceinirelandsari/carbapenemresistantenterobacteriaceaeacre/guidanceandpublications/>

Challenges with CPE

CPE is not a homogenous group of organisms. Although sub-classification of CPEs may be confusing, the distinctions are important. The more common categories of CPE, in alphabetical order, are IMP, KPC, OXA-48, NDM and VIM as listed above in the Glossary of Terms. Two of these, NDM and VIM, are metallo-beta-lactamases. This means the carbapenemase enzyme has a metal ion at the active site. The other three enzymes do not have a metal ion at the active site. Although treatment options are limited for all CPE, including IMP, KPC, OXA-48, the treatment options are frequently even more limited

for metallo-beta-lactamase-producing *Enterobacterales*, such as NDM and VIM. This means that cohorting patients who are colonised with different categories of CPE must be avoided to prevent spread of different categories of CPE between patients.

What is meant by isolation in the context of Infection Prevention and Control?

Isolation refers to the accommodation of one patient in a single room, ideally with *ensuite* toilet and bathing facilities.

If a single room does not have access to a dedicated toilet, a commode should be dedicated to that room and decontaminated after each patient use. The commode must be in good condition so that it can be cleaned effectively.

Note: Wherever possible, the equipment to be used for the care of the patient in isolation should be single-use or dedicated for that patient's use only, for example, blood pressure cuff, stethoscope.

What is meant by cohorting in the context of Infection Prevention and Control?

Cohorting refers to the accommodation of two or more patients in a space that they share with each other, but which is separate from the space used by other patients. It is important to emphasise that within a cohort area contact precautions must be applied when moving between patients within the cohort area.

In the context of CPE, effective cohorting means

Cohorted patients have separate toilet and bathing facilities restricted to use by the patients in the cohort. One toilet per four cohorted patients is the minimum acceptable.

When a cohort of patients must share toilet facilities with each other the toilets must be cleaned at least 6 times per day between 6 am and midnight and whenever they are noted to be visibly dirty. In addition patients should have access to cleaning wipes so that they may wipe surfaces before use should they wish to do so. Access to wipes is not a substitute for scheduled adequate cleaning but is intended as an additional measure to empower patients who wish have an assurance that the surfaces they have contact with are clean.

If a cohort area does not have access to a toilet dedicated to use by the cohort,

a commode should be dedicated to each patient in the cohort area and decontaminated After each patient use

Cohort areas should have good spacing between beds (2.4 meters between bed centres). When choosing a cohort area the multi-bedded area chosen should ensure adequate space. An area with the minimum number of beds required to accommodate the cohort should be chosen to minimize the number of unused beds. For example, a two-bedded area for two patients, rather than a four or six-bed area,

Note: Equipment, for example commodes, blood pressure cuff and stethoscope, used for cohorted patients should be single-use or individual patient use only. If this is not feasible, for example, for larger items, equipment should be dedicated to the cohort area and must be cleaned and decontaminated after each patient use.

Patient Accommodation

In all acute hospitals, clinical areas used to accommodate patients, including areas for isolation or cohorting, should undergo periodic formal audit of the environment including of the toilet facilities by the Infection Prevention and Control Team (IPCT), with regard to the number of toilets and the general standard of available facilities including compliance with current Health Building Notes. For guidance on sanitary ware for healthcare see Health Building Note 00-10: Part C Sanitary assemblies 2013 (ref)

One toilet per four patients is the minimum acceptable number.

If toilet facilities are lacking, the provision of additional toilet facilities should be addressed as a matter of urgency.

Antimicrobial Stewardship

Antimicrobial consumption is the key driver of the global problem of antimicrobial resistance. There is some evidence that antimicrobial consumption is important at the hospital level in supporting transmission of CPE (Legeay and others 2018). A comprehensive antimicrobial stewardship addressing all antimicrobial use is important for the prevention and control of CPE in the acute hospital setting.

The role of the hospital environment and equipment as a reservoir or vectors for CPE

Recent experience in Ireland and elsewhere has resulted in increased focus on the hospital environment as a persistent reservoir for CPE and other multi-drug resistant Gram-negative bacteria (Enterobacterales and others). There is persuasive evidence that in a number of hospitals this may be an important source of CPE acquisition for patients.

If appropriately sensitive sampling and culture methods are used [see “*Guidance relating to laboratory testing for CPE and interpretation and clinical application of results*” 2019] CPE and other MDR Enterobacterales may be detected in some patient contact surfaces in particular at or near drainage points from sinks, shower trays and sluices. Detection of CPE on contact surfaces in these settings may reflect inadequate cleaning and decontamination after patient use. There is increasing concern that contamination of patient contact surfaces in the hospital environment may reflect retrograde contamination of contact surfaces with CPE organisms resident in the drainage system below the drainage point. CPE from the drainage system is more likely to gain access to the patient contact surfaces where the design and maintenance of fixtures and fittings are not optimal and where drainage is slow or incomplete. However, even when there are no readily identifiable problems with fittings and drainage there is evidence that retrograde contamination can occur [Kizny-Gordon 2015, Mathers 2019].

Note transmission of CPE in acute hospitals by other routes has also been reported including contamination of food from kitchen sinks in hospitals [Pletzl 2018]. Some reports have highlighted a role for endoscopes in the transmission of CPE in acute hospitals. [Marsh 2015, Kola 2015]

What CPE scenarios does this guidance cover?

This guidance will consider three of the most common CPE scenarios encountered in the acute hospital

1. CPE cases
2. CPE contacts
3. CPE outbreak

1. CPE Cases:

What is meant by the term CPE case?

A **CPE case** is a patient from whom CPE has been detected from a clinical specimen. (Invasive, non-invasive infection or colonisation) Note that detection of CPE from any site is now a notifiable disease.

A patient is considered as a **Suspect CPE case** when an isolate that is likely to be CPE has been detected but laboratory confirmation is not complete. Confirmation of an isolate as CPE should generally be available within 2 to 3 hours but there may be exceptional situations with unusual types of CPE where confirmation may be delayed. If there is delay in confirmation the precautions that apply to a CPE case should apply pending a definitive laboratory report.

The requirements for communication with patients with CPE are outlined in “*Discussing healthcare associated infection (HCAI) and specific antimicrobial resistant organisms (AMROs) with patients*”

Recommended inpatient accommodation for patients with CPE colonization or infection

It is recommended that patients with CPE in an acute hospital are accommodated in an isolation room with an ensuite toilet and bathing facilities. If this is not possible the patient should be accommodated in a single patient room with dedicated commode.

It is recommended that all patients with CPE should be placed in single rooms in proximity to each other on one ward. This minimizes risk of dissemination in the event of lapse in infection control practice. It is accepted that there may be exceptional circumstances where this is not clinically appropriate or where it is not possible because of hospital infrastructure.

Where placement in a single ensuite room is not possible with CPE may be placed in a designated multi-bed cohort area along with other patients with CPE of the same CPE type.

Note that contact precautions are required when moving between patients in a cohort area. If patients in cohort areas develop other conditions that require single room isolation in their own right (for example acute diarrhea) they should be moved from the cohort area to a single room as quickly as possible.

It is recommended that patients who do not have confirmed CPE colonization should **NOT** be cohorted with patients with confirmed CPE colonization or infection.

It is recommended that patients with CPE should **NOT** be cohorted with other patients with CPE **if they have different types of CPE**. For example, a patient with an OXA-48 CPE should not be cohorted with a patient with an NDM CPE.

Recommended nurse/healthcare worker allocations for the care with CPE

It is recommended that one-to-one care is not generally required for care of patients with CPE provided there is adequate staffing to allow staff to comply fully with contact precautions.

Patients who are colonised or infected with CPE and who require high levels of personal care (for example patients with disturbed behavior or very high levels of dependency) should, wherever possible, be cared for by nursing and healthcare assistant staff who are **not** engaged with the care of non-CPE patients for the duration of their duty shift. If CPE patients in single rooms/cohort areas are in close proximity on a single ward area this reduces risk associated with staff caring for multiple patients during a shift.

2. CPE Contact

What is meant by the term CPE Contact?

A CPE Contact is defined as follows in *Requirements for Screening of Patients for Carbapenemase Producing Enterobacterales (CPE) in the acute hospital sector, Version 2.0, April 2019* and *Guidance relating to laboratory testing for CPE and Interpretation and Clinical Application of Results*.

“A CPE Contact is a person who has been assessed by an IPC Practitioner or Public Health Doctor as likely to be at a substantially higher risk as the general patient population of colonisation with CPE. Infection Prevention and Control Teams are required to use professional judgement in the designation of exposed people as CPE Contacts.

A person is considered as exposed to CPE if they have shared a multi-bed area or bay and/or are known to have shared toilet facilities with a person identified as colonised or infected with CPE. A person may also be exposed if they are accommodated in a room or are known to or are very likely to have used a toilet, shower or other facilities where CPE has been detected on touch surfaces.

In general designation as a CPE Contact will mean that the person has been assessed as having exposure that lasted for 12 hours or more. People who are identified as exposed for

periods shorter than 12 hours are generally not considered CPE Contacts.”

Being a CPE contact does **NOT** mean that the person has acquired CPE. Being a CPE contact **increases the chance** that a person has acquired CPE. The requirements for communication with a CPE Case are outlined in “*Discussing healthcare associated infection (HCAI) and specific antimicrobial resistant organisms (AMROs) with patients*”

Recommended inpatient accommodation for a CPE contact

It is recommended that patients identified as CPE contacts should ideally be accommodated as for patients with CPE colonization with the following qualifications.

Patients identified as CPE Contacts should not be cohorted with patients with colonization or infection with CPE.

Patients identified as CPE Contact patients do not require the same priority for isolation as patients with CPE colonization or infection.

The priority for isolation of patients identified as CPE Contact can be lowered if the patient has had 1 or more CPE screening samples reported as CPE not-detected.

If CPE is detected from a CPE Contact patient in a CPE Contact cohort area they must be transferred out of the CPE Contact cohort area to a single room with ensuite toilet and bathing facilities or a cohort area for patients with the same category of CPE as quickly as possible. The guidance for a patient with CPE colonisation or infection then applies.

Environmental hygiene and monitoring.

Given the experience that drainage systems and associated plumbing fixtures and fittings (sinks, showers, and sluices) may serve as persistent reservoirs for CPE and other multi-drug resistant Gram-negative bacteria

1. **it is recommended that** acute hospitals have a complete and readily accessible inventory of drainage points and plumbing fixtures and fittings in clinical areas and food preparation areas. Any plumbing fixture and fittings that do not conform to current UK Health Building Note 00-1 Part C should be prioritized for replacement. Substandard fittings should be taken out of use, removed or replaced.
2. **it is recommended that** acute hospitals have a process in place for periodic documented checking of all water drainage sites. This is to ensure that water drains freely and completely from all plumbing drainage points. Drainage points with poor drainage or evidence of backflow should be taken out of use until repaired.

3. **it is recommended that** patients and staff should be alerted to the risks associated with poorly draining plumbing fixtures. Patients and staff should be encouraged to report evidence of drainage problems or backflow and the relevant unit should be taken out of use until the problem has been resolved. (Taking a sink or shower out of use need not require restriction on admission to the associated bed spaces provided alternative arrangements to maintain hand hygiene, clinical services and patient's personal hygiene are in place.)
4. **it is recommended that acute** hospitals have processes in place to monitor and assure the effectiveness of cleaning programmes in clinical areas. In the context of CPE there is a need for a particular focus on hand hygiene sinks, toilets, sluices, bathing facilities and sinks used in food preparation areas. Fluorescent markers or ATPase are included in processes to monitor and assure the performance of cleaning in some countries and may merit consideration.
5. **it is recommended that** that acute hospitals should monitor for environmental contamination with CPE where there is evidence of sustained CPE acquisition in the hospital. Collection and processing of samples should be in accordance with the methods outlined in "*Guidance relating to laboratory testing for CPE and Interpretation and Clinical Application of Results*. Version 1.0 2019. Sampling should generally focus on sinks, shower trays and sluice/disposal areas.

Managing a CPE Outbreak

What is the definition of a CPE outbreak?

The World Health Organization states that a disease outbreak is "the occurrence of cases of a disease **in excess of what would normally be expected** in defined community, geographical area or season"

It is recommended, in relation to CPE in an acute hospital, that an outbreak be declared if there are **two or more** linked cases of CPE or an increase in the incidence of CPE above the background rate for that institution.

CPE outbreaks can be difficult to recognise early. Please see relevant guidance document on assessing if transmission of CPE has occurred in a hospital and on assessing whether transmission has ceased. Please see "*Assessing Evidence of CPE Transmission and end of Transmission of CPE.*"

Action in the event that a CPE outbreak is suspected or confirmed

1. **It is recommended** that an outbreak control team is convened promptly by the by the most

senior manager (CEO or GM) of the institution if a CPE outbreak is suspected.

2. Outbreaks of infectious diseases **MUST** be notified to the regional Department of Public Health under Irish Infectious Diseases Regulations. The hospital should follow the HSE Guidance for notification of an outbreak. [*Notification of Infectious Disease Outbreaks to Departments of Public Health in acute hospital settings, declaration of an outbreak and closure of an outbreak*]. The Department of Public Health should be invited to attend OCT meetings and included on circulation of minutes.
3. In addition to notifying the Department of Public Health of the CPE outbreak, the hospital should also inform one of the Consultants at the AMRIC Division of HPSC.
4. The OCT should carry out an assessment of the situation to determine if there is an outbreak and guide the management of situation.

What are key considerations for CPE outbreak control?

There is broad consensus in relation to many aspects of the management of outbreaks of antimicrobial resistant Gram-negative bacteria but also areas of difference between guidelines [Otter and others 2015]. This guidance seeks to define a reasonable but cautious approach in the context of limited available evidence.

Determining the Factors Contributing to CPE Spread in an Outbreak.

Key steps in controlling a CPE Outbreak are recognizing the outbreak early and assessing and addressing the factors most likely to be contributing to the outbreak. Until recently, direct and indirect person to person spread has been considered as predominant factors in most CPE outbreaks. While managing the risk of direct and indirect spread remains important there is increasing evidence, as outlined earlier in this document, that persistent environmental reservoirs (in particular drainage points in plumbing fixtures) may be important in many outbreaks..

The Checklist provided below will support Hospital Managers and OCTs to ensure that key issues are considered and addressed.

What are the challenges in implementing these recommendations

Implementation of these recommendations will be difficult for all hospitals and incurs significant costs. Supporting adequate ward staffing required for full compliance with demanding infection prevention and control clinical practice and for environmental cleaning

and facilities maintenance can be challenging in relation to availability of staff and funding.

Many hospitals have limited facilities for optimal patient placement (single patient ensuite rooms) and have significant demand on available rooms for other reasons including other infection prevention and control requirements. The HSE document [Guide to prioritisation of patients for single room isolation when there are not sufficient single rooms for all those patients that require isolation] is available online for guidance. Specifically in relation to CPE, where access to isolation rooms or suitable cohort facilities is not adequate the following approach to prioritization is recommended in order of descending priority.

1. Patient with confirmed CPE with diarrhoea, incontinence of faeces, stoma bags, urinary catheters or behavioral disturbance that may increase likelihood of spread of faeces
2. Patient with confirmed metallo-beta-lactamase-type CPE (NDM, VIM)
3. Patient with confirmed CPE of non-metallo-beta-lactamase type (IMP, KPC, and OXA-48)
4. CPE Contacts. There is reason to consider that contacts with one or more recent screening swabs reported as “CPE not detected” may represent a lower risk for spread of CPE compared to contacts that have not been tested.

Particular challenges emerge when infection control recommendations require significant closure of general access to beds with impacts on sustaining clinical service. Where there is concern that other clinical concerns may take priority over adhering to infection prevention and control requirements the HSE “*Guidance on balancing competing demands in relation to restrictions on bed use related to infection prevention and control*” should be used to support decision making.

In situations where these recommendations are not fully implemented, control of onward CPE transmission is likely to be less effective, take longer to achieve and there is a higher likelihood of failure.

IMPORTANT

The management of CPE risk cannot be allowed to cause significant delay in patient access to investigations or interventions.

Outbreak Control Checklist Background Notes

Rationale for Checklist

This checklist is aimed to support the control of a CPE outbreak in an acute hospital setting. This checklist is not intended to be exhaustive nor is it intended to imply that every item on the checklist is relevant to every outbreak. The hospitals Outbreak Control Team will advise on the measures within the checklist that require implementation. This will be determined by the taking account of the specific context, extent of the outbreak, local resources, isolation capacity etc.

The hospital's outbreak control team (OCT) and infection prevention and control team (IPCT) will decide the priority associated with the features on the checklist and may decide that some measures recommended are not applicable or relevant or that additional control measures are required, depending on the particular circumstance. Those tasked with the measures will also be determined locally, except where clearly specified.

Note that as with all Infection Prevention and Control practice due regard must be given to adapting practice to the specific needs of individual patients, for example those approaching end of life.

A. Informing Key Stakeholders and Notification

1. Ensure that upon identification, the outbreak has been promptly communicated through the hospital's internal management and risk management structures and that all relevant staff and affected patients are informed.
2. Contemporaneously, the outbreak must be formally notified to the Department of Public Health, in keeping with the Infectious Diseases Regulations. Please use the HSE Procedure and form for documenting the opening of an outbreak. [*Notification of Infectious Disease Outbreaks to Departments of Public Health in acute hospital settings, declaration of an outbreak and closure of an outbreak*].
3. Inform one of the Consultant Microbiologists of the Antimicrobial Resistance and Infection Control Division of the HPSC (Dr Karen Burns: karen.burns1@hse.ie or Dr Joanne O'Gorman: joanne.ogorman4@hse.ie or Professor Martin Cormican martin.cormican@hse.ie)
4. If support in outbreak management from the AMRIC Division of HPSC is required the Consultant Microbiologist, Department of Public Health or GM/CEO should contact the HSE Clinical Lead to request support.

B. Surveillance

1. Convene a multi-disciplinary outbreak control team (OCT), which should be chaired by the most senior manager Chief Executive Officer (CEO) or General Manager (GM) and include active participation by the Clinical Director, representative clinicians and Director of Nursing. A representative of the local Department of Public Health should be invited to attend the OCT and receive copies of OCT meeting minutes.
2. The frequency of OCT meetings should reflect the epidemiology, the number of wards or services affected and the impact of the outbreak on activity. Daily OCT meetings may be required particularly in the early stages of an outbreak.
3. Latest surveillance and microbiology laboratory updates should be available at OCT meetings.
4. The OCT agenda should include a review of the latest available epidemiological data on new cases and the wards with which the new cases are linked. The latest prevalence and location of CPE cases by affected ward should also be noted. In a larger outbreak, the potentially large number of patient movements and contacts may necessitate regular and separate reviews of outbreak epidemiology conducted by the IPCT outside of the OCT meeting, with the findings presented at the OCT meeting.
5. Timely and latest available surveillance data should be shared with staff working on affected wards, so that they can see how they are doing (for example, a weekly run chart of new ward-acquired cases, weekly point prevalence of known CPE patients cared for on the ward, and compliance with ward's CPE screening policy).
6. Rapid on-site confirmation regarding CPE isolates and the type of CPE should be performed. Both rapid molecular and lateral flow (immunochromatographic) systems are available. If for any reason rapid local confirmation is not possible, suspect isolates should be referred immediately to the National CPE Reference Laboratory (NCPERL) for confirmation with an indication that urgent processing is requested.
7. The need for and practicality of performing a formal epidemiological evaluation such as a case control study should be considered by the OCT in the setting of a larger or complex outbreak. Capacity to perform a case control study with the OCT and the Department of Public Health may be a limiting factor.

C. Screening and patient placement

1. Closure of an outbreak ward to new admissions should be considered. Closure is generally appropriate, at least initially, if there is evidence of extensive or very rapid transmission on a specific ward. After the risk has been assessed and control measure implemented it is appropriate to review the need for ward closure at each

OCT meeting. If, for any reason the hospital management form a view that the advice of the Infection Prevention and Control Team on ward closure or other restrictions on bed use cannot be implemented the hospital should follow HSE *“Guidance on Balancing Competing Demands in Relation to Restrictions on Bed Use Related to Infection Prevention and Control.”*

2. Patients who are colonised with CPE and patients who are CPE Contacts should be accommodated as outlined earlier in this document.

3. Check that outbreak control measures are adapted to have regard for the needs of individual patients in particular those approaching end of life.

4. Where possible, there should be dedicated equipment for use on affected patients. If this is not possible, a robust system to ensure adequate cleaning and decontamination between patients is required and must include a system for documenting that the required cleaning and decontamination has taken place.

5. Review and check compliance with local CPE screening policy and identify any gaps with regard to national policy. *‘CPE Expert Group guidance on screening of patients for CPE in the acute hospital sector Version 2 April 2019’*. Consider if a level of screening beyond that specified in national guidance is required in the context of the outbreak.

6. Identify contacts of confirmed CPE cases in accordance with current guidance. Check that CPE contacts are informed that they are CPE contacts and are that inpatient CPE Contacts are promptly offered screening for CPE.

7. Where CPE contacts have been discharged home, they should be informed that they are CPE contacts and a paper or electronic alert should be created to identify them as needing CPE screening in the event that they represent to the hospital.

8. When CPE contacts have completed the recommended screening protocol and have been assessed as no longer requiring designation as CPE Contacts, the paper or electronic alert should be discontinued.

9. Ensure the microbiology laboratory has the required resources needed to deliver both the routine CPE screening programme, and to support the additional recommended screening requirements for outbreak investigation and control.

10. Check that laboratory capacity is adequate to provide the support required at weekends and that it has the capacity to provide environmental monitoring for CPE as appropriate in the context.

D. Patient movement

1. Patient movements off the ward for non-clinical reasons (hospital shop, chapel visits) should balance risk of transmission with the impact on patient morale of limitation of movement. The risk associated with mobile continent patients leaving the ward to go to the hospital shop or chapel or to go for a walk outside is very low if they perform

hand hygiene before leaving the ward and refrain from using toilets in public areas. Patient should be asked to check with staff before leaving the ward. If patients wish to leave the ward staff should advise and facilitate the patient to perform hand hygiene before leaving the ward, they should avoid direct contact with other patients and they should be advised not to use public toilets when off the ward.

2. Transfer of patients with CPE between wards should be avoided, unless based on clinical need (for example, escalation or de-escalation of care) or to facilitate single room placement or cohorting. Transfer requires advance and clearly documented communication with the receiving ward nurse manager.
3. Transfer of patients between departments (for example, to operating theatre, or radiology) requires advance and clearly documented communication with the nurse manager of the receiving department, who in turn must ensure adequate precautions and an up-to-date local policy are followed to minimise the risk of transmission. There should not be undue delays in patient access to investigations or interventions attributable to their CPE status.
4. Transfer of patients between services (for example, between acute hospitals, from acute hospital to primary care or from acute hospital to residential care) requires advance and clearly documented communication with patient transport services and the receiving service. The receiving service must take all practical measures to minimise the risk of transmission.
5. There should not be undue delays in patient transfer and patients or residents should not be denied care in any facility because of their CPE status. Please also refer to latest version of the *'HSE policy on inter-facility transfer of patients colonised or infected with antimicrobial resistant organisms (AMRO), including CPE'*.

E. Staff education on hand hygiene, precautions, and PPE

1. Check that all staff training records are up to date including induction and periodic retraining on Standard and Transmission Based Precautions. In the setting of an outbreak, additional refresher training on Standard Precaution and Transmission Based Precaution may be required for all clinical staff. IPC Teams will normally be responsible for delivery of training and line managers for ensuring that staff, in particular nursing and medical staff attend training provided. Hand hygiene training may be provided through a train the trainers programme.
2. Additional audits of staff compliance with standard (in particular, hand hygiene technique and opportunities taken) and transmission based precautions may be required on all wards,
3. Wards affected by an outbreak should be supported to provide real-time feedback on non-compliance with hand hygiene and other elements of Standard Precautions and Transmission Based Precautions to staff and others involved in direct or indirect patient contact.

4. Ensure there are sufficient stocks of personal protective equipment (PPE) to meet additional demands, along with increased frequency of waste disposal.
5. Provide sufficient IPCN resources to deliver staff CPE education and audit of Standard Precautions and Transmission Based Precautions.
6. Assess hand hygiene facilities: Hand hygiene sinks should be used for hand hygiene only and not for disposal of fluids.
7. Consider, in consultation with management and staff, posting the environmental audit score and hand hygiene audit score of every ward on the entrance door to the ward.

F. Communication about the outbreak with staff

1. Ensure that all staff members have been formally notified by the CEO, Director of Nursing or Lead Clinical Director that there is an outbreak ongoing. The line manager of every staff member, including contract staff must communicate what is required. Communication should be by e-mail, by letter attached to pay slips, by text message: whatever mechanism is needed to ensure all staff members are aware. The frequency is best determined locally and will depend on the extent of the outbreak, amongst other things.
2. Town hall meeting series chaired by senior managers for all staff may be appropriate and should provide key facts on the outbreak organism and ensure that they can answer most patient queries. Attendance should be recorded.
3. All staff including ward managers, nurses, medical staff, allied health professionals, healthcare assistants, porters, clerical, cleaning, maintenance and catering staff working on affected wards need to be supported to take ownership of the outbreak control measures and must understand their critical role in the successful control of the outbreak, in partnership with the OCT.
4. A designated shared IT folder or intranet location accessible by all hospital staff may be created as an easy-to-find repository of all documents associated with CPE and the outbreak response.
5. The Occupational Health Department should be resourced to address potential staff fears or to address queries in conjunction with the OCT. In particular staff should be aware that screening of staff for CPE is very rarely appropriate.
6. Ensure all signage complies with the agreed measures for CPE cases, CPE contacts and patients with other transmissible organisms. It should also be up-to-date, clear and placed where it is visible to staff entering an isolation room or cohort area, so they know what precautions are required.
7. Update signage at entrance to wards affected by the outbreak, so that it is evident there is an outbreak on the ward.
8. Ensure swipe card access is activated on doors linking wards, with signage

telling staff and visitors not to take shortcuts between affected and unaffected wards.

G. Communication with patients, visitors and the public

1. Ensure that patients who are colonised with CPE and those identified as CPE Contacts are promptly informed in accordance with national guidance. The hospital should have a clearly defined pathway and accountability for patient communication and it should be documented in the clinical notes that the patient has been informed. As with other clinical information, the primary clinical team responsible for care of the patient is responsible for informing the patient.
2. Patients could be provided with a durable wallet/purse-sized card indicating that they have had a positive test for CPE and advised to use the card to alert healthcare providers to their CPE status when they present for future care. Patients should be provided with a patient information leaflet or frequently-asked question (FAQ) document or card.
3. Check healthcare records of patients confirmed CPE positive for evidence of documentation that the patient has been told of their status.
4. To facilitate the process, the pro-forma alert sticker could include space for the clinical team to sign/confirm that the patient has been told about their status.
5. Ensure there is an adequate stock of relevant patient information leaflets on all wards and in areas where public and patient information is provided.
6. Ensure that patients receive information on the importance of hand hygiene (after using the toilet, bedpan or commode and before eating) and additional hand hygiene opportunities, as deemed appropriate to their clinical situation. Ensure that patients who require support to perform hand hygiene (for example those who cannot independently access hand hygiene facilities) are appropriately supported.
7. Ensure that visitors receive information on the importance of hand hygiene and have access to alcohol-based hand rub dispensers. Consider the provision of portable alcohol-based hand rub dispensers or hand-sanitising wipes to patients, families and visitors on affected clinical areas, to support good hand hygiene practice.
8. Prepare a short written message to be given to every patient by the clinical staff on their ward telling the patient that there is an outbreak ongoing and the actions the hospital is taking to keep them safe, and prevent them acquiring infection. Use the text available in information leaflets at www.hse.ie/infectioncontrol to guide development of local letters or leaflets.
9. The hospital communications department should be pro-active in ensuring open

and transparent communication with patients, families and the community they serve. Engagement with print, broadcast and social media may be appropriate to disseminate information.

H. Communication between healthcare facilities of a patient's CPE status

1. Communication should be on a need to know basis and consistent with the patients right to dignity and privacy. Use an electronic IPC flag system to flag the patient's record if available.
2. Implement a formal healthcare record alert for all patients with CPE.
3. Regarding the healthcare record alert:
 - o Consider applying to the front cover of the healthcare record, a fluorescent sticker indicating an infection prevention & control alert
 - o The inside of the front cover should have a written description of the alert, the date of the positive result and the date of the alert
 - o In the event of a new healthcare record being created or the existing healthcare record being split, it is recommended the medical records department places a new sticker on the new healthcare record with the information from the previous version
 - o The pro-forma alert sticker can be filed chronologically in the patient's healthcare record on the date the alert was created
4. If all confirmed CPE cases have not had a formal healthcare record alert created, retrospective placement of alerts should be performed when charts are used.
5. Check discharge letters to general practitioners (GPs) for evidence that the GP has been told about their patient's CPE status.
6. Develop a pro-forma communication to be systematically sent to the admitting consultant and GP of every patient once confirmed as colonised with CPE. This serves as a safety net if the patient has since been discharged, or it is not certain that the GP was told, or if an electronic discharge letter or copy of discharge letter does not exist for review. The communication should include or provide a link to patient information.
7. A local secure electronic database of all confirmed CPE cases would be helpful, including confirmation that an alert was placed on the healthcare record, an electronic IPC alert flag active, and confirmation of patient and GP communication status.
8. Where a newly-detected CPE case is identified and there is reason to believe that acquisition may be related to another healthcare facility the appropriate staff (IPC Team or relevant Nurse Manager) should be informed promptly. This information should also be included when the case is notified to the Department of Public Health.

I. Environmental hygiene

1. Ensure that hygiene services (cleaning) staff members are represented on the OCT and are included in any ward-based briefings and educational interventions.
2. Environmental cleaning and disinfection should be carried out at least twice daily. Cleaning six times per day between 7am and midnight is required for toilets and bathing facilities shared by CPE positive patients. This should apply to also to immediately adjacent toilets accessible to CPE positive patients even those toilets are not specifically designated for their use.
3. Check that the technique of cleaning is correct and that the sequence of cleaning is correct particularly for sink cleaning, so taps don't get contaminated from drains.
4. Use environmental microbiological sampling to assess for environmental reservoirs of CPE. Consider also using to verify efficacy of cleaning, based on OCT advice. This may not be necessary in very small or short-lived outbreaks. Sampling should be performed before and after cleaning.
5. In consultation with cleaning staff, consider the use of tools such as test soils prior to cleaning, ultraviolet (UV) light after cleaning or adenosine triphosphate (ATP) to evaluate efficacy of cleaning.
6. Equipment disinfection. Consider use of test soils prior to cleaning and UV light after cleaning or ATP to evaluate efficacy of cleaning.
7. The use of novel decontamination systems may be considered in certain circumstances the 2019 Australian Guidelines for the Prevention and Control of Infection recommendations include the following "*The effectiveness of hydrogen peroxide vapor disinfection as an adjunct to routine cleaning in healthcare facilities is yet to be established. Therefore routine use is not suggested in healthcare facilities. Hydrogen peroxide vapor may be considered in high risk settings and during outbreaks when other disinfection options have proven ineffective*".
8. Ensure multi-disciplinary hygiene audit teams are conducting audits on all areas on an ongoing basis and that improvement action plans are in place and followed-up, where indicated by audit findings. Consider increasing the frequency of such audits for affected ward areas.
9. Check the integrity of surfaces of all floors, walls and fixtures to ensure that there is no exposed plaster, bare wood or corrosion of surfaces or fittings that precludes effective cleaning.
10. Check the integrity of chair coverings and furniture under surfaces.
11. Check the integrity of mattresses and pillows: remove coverings to evaluate insides, especially if seams are not sealed.
12. Check toilets to ensure they can be properly cleaned and that the fittings and fixtures are of cleanable quality.
13. Ensure that all drains in showers, baths and other facilities conform to relevant

Health Building Note and function so as to allow free downward flow of water and that there is no back flow or pooling of water. Fittings that do not meet the requirements should be taken out of use, removed or replaced.

14. Environmental sampling for CPE targeting in particular drainage points from plumbing fittings (showers, sinks, sluices) should be generally be performed as part of the assessment of CPE outbreaks except where the number of cases involved is very low and the outbreak is of short duration.
15. Audit sluices, bed pan washers (temperature controls, service records, test soils etc.), bed pans and commodes.

J. Minimise clutter

1. Confirm that all PPE is easy to access and stored in a manner that minimises contamination of PPE, that it is wall-mounted outside the patient room and contains all of the required PPE safely and minimises clutter.
2. Ensure that any unused or unnecessary equipment is removed from wards. Declutter days are recommended.
3. Ensure that used equipment awaiting decontamination is stored in a designated area away from clean equipment.
4. Dispose of old, damaged equipment.
5. Ensure there are sufficient chairs, so that people aren't sitting on patient beds where they are at risk of contaminating their clothing.
6. Keep isolation room doors closed, unless patient need dictates otherwise. Document risk assessment regarding doors needing to stay open. If a door cannot be closed, ensure that signage regarding the required Transmission Based Precautions is in place so that it remains clearly visible to staff prior to room

K. Minimise traffic

1. A decision should be made as to whether additional controls on visiting should be applied to support staff in controlling the outbreak. However note that there is no reason to believe that visitors are important in sustaining spread of CPE in the hospital setting. Visitor traffic on wards can create additional challenges for staff in the very demanding context of responding to an outbreak. Additional restrictions on visiting should be balance the risk that this will may impact on patient morale with the likely value in helping to control the outbreak.
2. Consider temporarily limit or cease non-essential services on outbreak ward (for example, mobile services: hairdresser, mobile shop, mobile library). Restriction on these services should balance the risk that this will may impact on patient morale with the likely value in helping to control the outbreak.

3. Patients with CPE who have borrowed books from a hospital library should be allowed to keep the books. The books should not be returned to the library stock.
4. Pastoral care services to patients should be reviewed to ensure that they are provided in a manner that does not contribute to perpetuation of the outbreak.
5. Consider discontinue for a period volunteer services that have direct patient contact or deliver patient care on affected wards. Ensure any volunteers in this category have received formal training on Standard and Transmission Based Precautions prior to the re-introduction of services.
6. Visitors and volunteer services that visit patients but do not deliver personal care or have direct contact should be requested to visit one patient only per visit and not to move between patients during visiting times.
7. Restrict nursing, medical and allied health professional student activities on affected wards to supervised work placement, with confirmation that training on Standard and Transmission Based Precautions has been undertaken prior to placement.
8. Clinical team ward rounds should end on CPE affected wards, but the individual patient's clinical needs should **not** be compromised when they require review. The number of team members entering the patient zone should be limited to those absolutely necessary and all staff entering the patient zone of an isolation room or cohort area must perform hand hygiene and don recommended PPE prior to entry.

L. Antimicrobial stewardship

1. Review latest antimicrobial consumption data for the hospital and provide feedback to prescribers. In particular, focus on consumption of classes that are most strongly-associated with selection of CPE, namely:
 - Carbapenems
 - Fluoroquinolones
 - Third generation cephalosporins
 - Anti-pseudomonal penicillins
2. All prescribers should be communicated with by the Consultant Microbiologist and Lead Clinical Director on classes of antimicrobials that are restricted and reserved for use only on approval by Clinical Microbiologist or Infectious Diseases (ID) Physician. Refer to the latest version of the '*HSE national policy on restricted antimicrobial agents*'.
3. Depending on local compliance with the '*HSE national policy on restricted antimicrobial agents*', there may be a need to remove restricted agents as stock items from affected wards and dispense on named-patient only basis from pharmacy.
4. The antimicrobial pharmacist should be on the OCT and report the following

findings of stewardship ward rounds to Clinical Directors and OCT:

- Patients prescribed broad spectrum agents as listed above
 - Patients prescribed restricted agents without documented approval from microbiology/ID
 - Antimicrobial prescriptions non-compliant with empiric local guidelines
 - Evidence of regular antimicrobial prescription review for suitability for de-escalation, IV to oral switch or discontinuation of antimicrobials, as per the 'Start Smart & Then Focus' Antibiotic Care Bundle
 - Patients who are on antimicrobials for more than 7 days
5. Pharmacy may need to allocate additional resources for increased frequency of stewardship rounds on affected wards.
 6. Assess for evidence a decline in the inappropriate consumption of restricted antimicrobials.
 7. Patients with CPE who require antimicrobial therapy for suspected or confirmed CPE infection must be discussed with an infection specialist in accordance with national guidance. See "*A guide to treatment of infection with carbapenem resistant organisms*"
 8. Capture data on patients who are being treated for suspected infection due to CPE.
 9. This data should be provided by clinical microbiology, infectious diseases and pharmacy for inclusion in the outbreak report and this should be provided to the OCT
 10. Data on patients who are commenced on treatment for suspected CPE infection could be a standing agenda item at OCT meetings.

M. Resources

1. Confirm the adequacy of resources available to manage the outbreak with particular focus on the provision of single rooms, numbers of nursing and healthcare assistants on affected ward(s), resources for cleaning, infection prevention and control, surveillance, pharmacy, equipment, IT and clerical support for the outbreak.
2. Confirm that there is sufficient consultant microbiologist, IPCN, pharmacist, microbiology laboratory scientist, surveillance scientist resources to support the increased demand on the microbiology laboratory and antimicrobial stewardship, IPC and outbreak control. Take into account requirement for 24/7 access to clinical microbiologist advice, potential need for 7/7 on-site IPCN presence during an outbreak and whether or not daily OCT meetings including weekends are necessary, dependent on size and extent of outbreak.

N. Outbreak Closure

1. To determine if the outbreak is over refer to the latest version of CPE Expert Group Guidance "*Assessing evidence of transmission and end of transmission of CPE*" which outlines criteria for determining whether CPE transmission has ceased in a hospital

2. Use the template in the HSE policy “Notification of Infectious Disease Outbreaks to Departments of Public Health in acute hospital setting- declaration of an Outbreak and Closure of an Outbreak.

<https://www.hse.ie/eng/about/who/healthwellbeing/our-priority-programmes/hcai/resources/general/>

3. The final outbreak summary report should be forwarded to the local Department of Public Health, to senior management in the hospital and hospital group and to the hospital board (where appropriate), along with formal notification of the local Department of Public Health of closure of the outbreak.

• Selected Supporting Material

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2. Australian Guidelines for the Prevention and Control of Infection 2019. <https://www.nhmrc.gov.au/about-us/publications/australian-guidelines-prevention-and-control-infection-healthcare-2019>
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5. HSE. Notification of Infectious Disease Outbreaks to Departments of Public Health in acute hospital settings, declaration of an outbreak and closure of an outbreak. <https://www.hse.ie/eng/about/who/healthwellbeing/our-priority-programmes/hcai/resources/general/>
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10. Pletz MW, Wollny A, Dobermann UH and others. A nosocomial foodborne outbreak of a VIM Carbapenemase-Expressing *Citrobacter freundii*. *Clinical Infectious Diseases* 2018 DOI 10.1093/cid/ciy034
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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/148497/HBN_00-10_Part_C_Final.pdf

Appendix 1. Checklist For CPE Outbreak Control

Note this checklist is included in this document for illustration purposes. The checklist can be downloaded as a modifiable word document from the CPE Guidance section of the HPSC website.

Number	Checklist point (brief)	Check/Note
Section A. Informing Key Stakeholders and Notification		
A1	Relevant internal communication	
A2	Notification to the Dept of Public Health	
A3	Inform AMRIC Team	
A4	If AMRIC support is required – requested	
Section B. Surveillance		
B1	Convene OCT	
B2	Are OCT meeting sufficiently frequent?	
B3	Are surveillance and microbiology updates available?	
B4	Does OCT Agenda cover key points?	
B5	Do ward staff have updates on status?	
B6	Rapid on site lab confirmation of CPE	
B7	Consider need for epi evaluation	
Section C. Screening and Patient Placement		
C1	Is ward closure necessary?	
C2	Are patients appropriately accommodated?	
C3	Are individual patient needs considered?	
C4	Dedicated equipment for CPE patients	
C5	Check CPE screening practice	
C6	Contacts identified and screened?	
C7	Discharged contact are informed	
C8	CPE contacts delisted after 4 samples	
C9	Microbiology laboratory has resources	
C10	Laboratory capacity adequate for weekends	
Section D. Patient Movement		
D1	Review patient movements	
D2	Limit patient transfers	
D3	Transfers between departments are planned	
D4	Transfers to other facilities planned and communicated	
D5	No undue delays in transfers	
Section E. Staff Education		
E1	Training records checked	
E2	Additional hand hygiene/IPC audits	
E3	Real time feedback on performance	
E4	Adequate PPE stocks	
E5	Adequate IPC Nursing resources for education	

E6	Assess hand hygiene facilities	
E7	Consider posting audit scores	
Section F. Communication with staff		
F1	Staff members notified of outbreak	
F2	Town hall meetings considered	
F3	Support for ownership of outbreak	
F4	Designated shared folder considered	
F5	Occupation health resourced to support	
F6	Appropriate on-ward signage	
F7	Appropriate signage at ward entry	
F8	Swipe card access activated	
Section G. Communication patients, visitors and public		
G1	Patients are informed promptly	
G2	Patients given CPE/Contact Card	
G3	Check documentation on patient communication	
G4	Consider pro forma to support documentation	
G5	Adequate stock of leaflets and cards	
G6	Patient information on hand hygiene	
G7	Visitor information on hand hygiene	
G8	Short written message for patients	
G9	Hospital communications department proactive	
Section H. Communication between healthcare facilities		
H1	Communication is "need to know"	
H2	Formal record alert for all patients	
H3	Appropriate components to ensure function of formal alert process are in place	
H4	Retrospective placement of alerts if required	
H5	Check discharge letters to GP	
H6	Preformat communication for lead Consultant and GP	
H7	Consider local secure CPE database	
H8	Inform other healthcare facilities of CPE apparently acquired there	
Section I. Environmental Hygiene		
I1	Hygiene services on OCT	
I2	Adequate cleaning and disinfection	
I3	Check cleaning technique	
I4	Microbiological sampling of the environment	
I5	Consider tools to assess cleaning	
I6	Consider tool to assess equipment cleaning	
I7	Consider novel decontamination systems	
I8	Multidisciplinary hygiene audit teams	

I9	Check integrity of surfaces & fittings	
I10	Check integrity of chair and furniture coverings	
I11	Check integrity of mattresses & pillows	
I12	Check toilets – ease of cleaning	
I13	Check plumbing conforms to health building note & free draining	
I14	Sampling of drainage points for CPE	
I15	Audit of sluice, bed pan washers etc.	
Section J. Minimise Clutter		
J1	PPE is easy to access and properly stored	
J2	Unnecessary equipment removed	
J3	Equipment for decontamination appropriately stored	
J4	Old equipment disposed off	
J5	Adequate chairs	
J6	Single room doors closed	
Section K. Minimise Traffic		
K1	Consider additional controls on visiting	
K2	Consider cease non-essential services	
K3	Guidance of book return to library	
K4	Review pastoral care services	
K5	Consider volunteer services	
K6	Limit volunteer visits to one person	
K7	Restrict student activity	
K8	End ward rounds on affected ward	
Section L. Antimicrobial Stewardship		
L1	Review consumption data of critical groups	
L2	Ensure communication re restricted and reserved antimicrobials	
L3	Consider removal of certain antibiotics from ward stock	
L4	Report from AMS Pharmacist to OCT	
L5	Consider pharmacy resource allocation	
L6	Assess for decline in use of restricted agents	
L7	Consult on treatment of infection	
L8	Capture date on outcome of CPE infection	
L9	Provide all data for inclusion in outbreak report	
L10	OCT Agenda to included patients commenced on treatment for CPE	
Section M. Resources		
M1	Confirm adequacy of ward resources (human and other)	
M2	Confirm adequacy of IPC and AMS resources (human and other)	
Section N. Outbreak Closure		

N1	Refer to guidance on assessing end of transmission	
N2	Use templates to inform public health	
N3	Send outbreak report to the Dept of Public Health	