Public Health England

Acute trust toolkit for the early detection, management and control of carbapenemase-producing Enterobacteriaceae

About Public Health England

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Contents

The amendment history is detailed below:

Date of amendment	Section/subsection(s) involved or additions

This toolkit incorporates, in an updated form, the January 2011 *'Advice on Carbapenemase Producers: Recognition, infection control and treatment'* issued jointly by Department of Health Advisory Committee on Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) and the Health Protection Agency (HPA) now Public Health England (PHE)[1].

For whom is this toolkit intended?

This toolkit provides practical advice for clinicians, and staff at the frontline in an acute care setting (a similar toolkit is being prepared for the non-acute care setting). It also provides some basic public health risk assessment tools and advice and information for the patient.

The advice in this toolkit is applicable to both the NHS and the Independent Sector, into which many high-risk patients are admitted from outside the UK[2]. If the infection, prevention and control (IP&C) advice in this toolkit does not 'fit' your situation, IP&C teams can obtain further advice and signposting, *particularly in relation to local risk assessment*, through their local PHE Centre [Tel:……] or Lead Public Health Microbiologist [Tel:……].

Format of toolkit

The toolkit is broken down into three distinct areas (Sections A-C) followed by a glossary (Section D):

A: The front section (pages 8-17) is designed for frontline staff, and provides a series of pull-out or print-off cards for ease of use. Information on the cards includes (1) general advice for healthcare settings, followed by (2) setting-specific advice.

B: The middle section (pages 18-26) provides a series of checklists for the trust board, executive and IP&C team.

C: The final section (pages 27-35) is designed to assist public health risk assessment, which may be undertaken both in the care setting and by the local PHE Centre, and also provides public information.

D: The glossary (page 36)

The cards have been written to allow print off as two- or four-sided documents. Please click on the hypertext link reference (eg A.1) to take you to the appropriate card or glossary term.

[1] On 1 April 2013 the Health Protection Agency became part of Public Health England

[2] See 'PHE Medical Transfers from Overseas: 'Guidance for receiving hospitals and clinicians in both the NHS and the Private Sector' and 'Guidance for local PHE Centres' available at: http://www.hpa.org.uk/AboutTheHPA/WhatTheAgencyDoes/PortHealth/PortHealthMedicalTransfersFromOverseas/

1.0 Introduction

1.1 What are carbapenemase-producing Enterobacteriaceae?

Enterobacteriaceae are a large family of bacteria that usually live harmlessly in the gut of all humans and animals. However, these organisms are also some of the most common causes of opportunistic urinary tract infections, intra-abdominal and bloodstream infections. They include species such as *Escherichia coli*, *Klebsiella* spp. and *Enterobacter* spp. Carbapenems are a valuable family of antibiotics normally reserved for serious infections caused by drug-resistant Gram-negative bacteria (including Enterobacteriaceae). They include meropenem, ertapenem, imipenem and doripenem. Carbapenemases are enzymes that destroy carbapenem antibiotics, conferring resistance. They are made by a small but growing number of Enterobacteriaceae strains. There are different types of carbapenemases, of which KPC, OXA-48, NDM and VIM enzymes are currently the most common.

1.2 Why provide this toolkit?

This toolkit has been written to provide expert advice on the management of colonisation or infection due to carbapenemase-producing Enterobacteriaceae in England, to prevent or reduce their spread into (and within) health and residential care settings. In the UK, over the last five years, we have seen a rapid increase in the incidence of infection and colonisation by multi-drug resistant carbapenemase-producing organisms. A number of clusters and outbreaks have been reported in England, some of which have been contained, providing evidence that, when the appropriate control measures are implemented, these clusters and outbreaks can be managed effectively.

The toolkit focuses on carbapenemase-producing Enterobacteriaceae, rather than all carbapenemase-producing organisms, to be consistent with guidance provided elsewhere in the UK[3]. The Working Group recognises the significance of other organisms with demonstrable carbapenemase activity, such as some strains of *Pseudomonas* and *Acinetobacter*[4]. These organisms are being considered elsewhere. That said, IP&C advice in this document will assist in the management of patients infected or colonised with other multi-drug resistant Gram-negative organisms, though each species merits individual consideration based on an understanding of how it spreads.

[3] http://www.hps.scot.nhs.uk/haiic/amr/publicationsdetail.aspx?id=55186
[4] Refer to http://www.hpa.org.uk/Topics/TopicsAZ/

1.3 Why does carbapenem resistance matter?

Carbapenem antibiotics are a powerful group of β-lactam (penicillin-like) antibiotics used in hospitals. Until now, they have been the antibiotics that doctors could always rely upon (when other antibiotics failed) to treat infections caused by Gram-negative bacteria. Unless we act now, learning from experiences elsewhere across the globe, rapid spread of carbapenem-resistant bacteria has great potential to pose an increasing threat to public health and modern medicine as we know it in the UK.

1.4 How can carbapenemase-producing Enterobacteriaceae be detected early and spread prevented?

Advice is provided in the following sections (A-D) to assist in the early detection, prevention and control of carbapenemase-producing Enterobacteriaceae, particularly for organisations that have had little or no experience of these organisms. For organisations that already have established or recurrent problems with the spread of these organisms, a more 'aggressive' approach may be needed according to number of cases (see Cards B.2, B.3 and B.4). The approach recommended in this toolkit is more rigorous for the acute setting where the risk of spread, and its consequences, is greater. A toolkit for non-acute care setting is to follow. It is acknowledged that care in non-acute settings cannot, nor need be, subjected to the same stringent measures.

NOTE - The Use of Acronyms: The authors recognise the need for brevity whilst undertaking day to day clinical duties; however, we strongly recommend that acronyms such as CPE (carbapenemase-producing Enterobacteriaceae), CRE (carbapenem-resistant Enterobacteriaceae), CPC (carbapenemase-producing coliform), CPO (carbapenemase-producing organism) are **NOT** used. The abbreviated version does not transfer the meaning of the information to the recipient, increasing the risk of miscommunication. We suggest that the full unabbreviated version should be used and is particularly important in situations when discharge / transfer letters and documentation are being prepared, whether in acute hospitals, primary care or community settings.

1.5 Countries and regions with reported high prevalence of healthcare-associated carbapenemase-producing Enterobacteriaceae[5]

Bangladesh	North Africa (all)
The Balkans	Malta
China	Middle East (all)
Cyprus	Pakistan
Greece	South East Asia
India	South/Central America
Ireland	Turkey
Israel	Taiwan
Italy	USA
Japan	

This is not an exhaustive list; admission to any hospital abroad should be considered when making a risk assessment. Lack of data from a country not included in this list may reflect lack of reporting / detection rather than lack of a carbapenemase problem (which may additionally contribute to an under-estimation of its prevalence)

UK regions / areas where problems have been noted in some hospitals:

North West especially:

Manchester

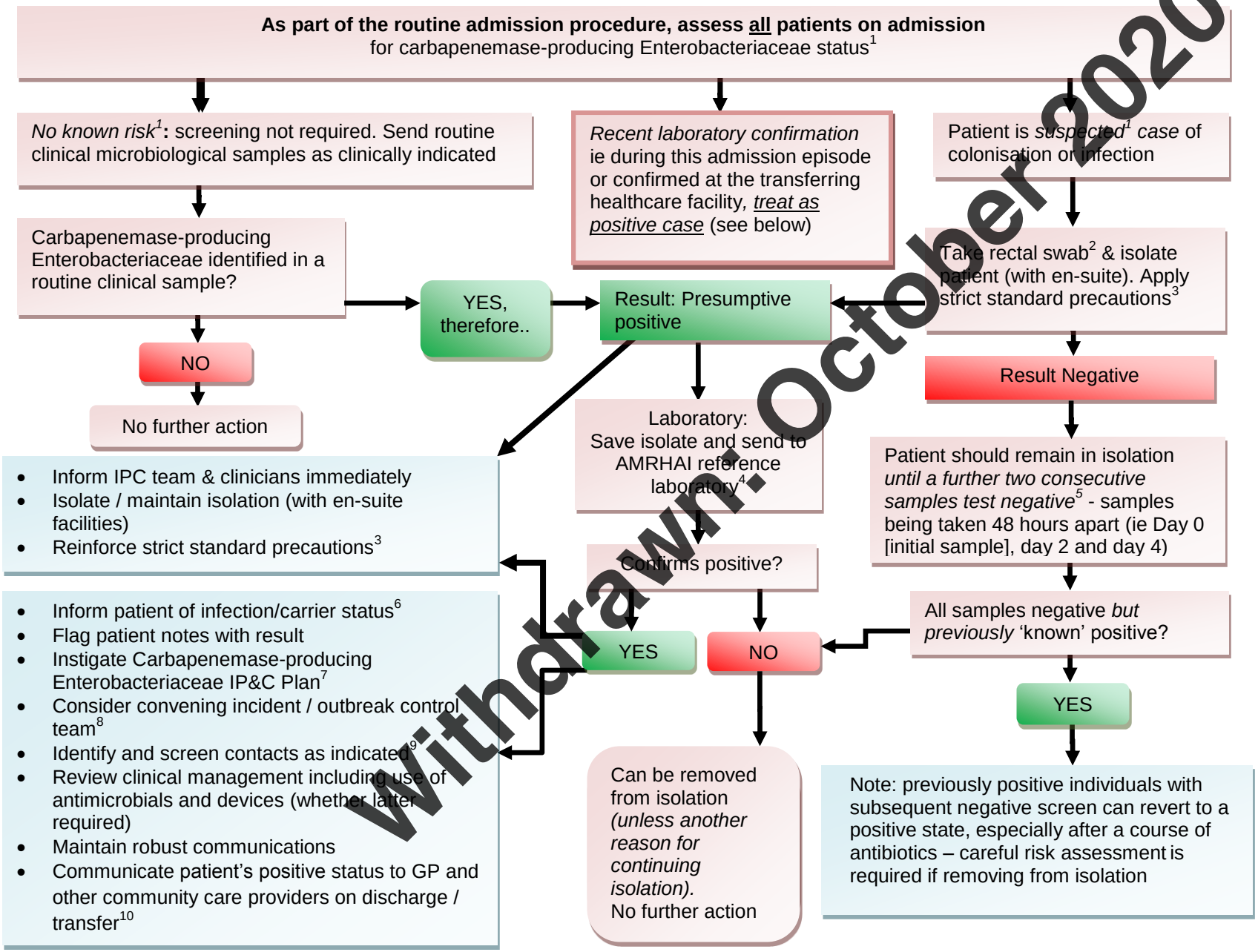
London

IMPORTANT: Healthcare providers have a 'duty of care' to proactively communicate any problems they are experiencing with carbapenemase-producing Enterobacteriaceae, not only with colleagues in healthcare settings which are co-terminus, but with any organisation they deal with on the patient pathway, either routinely or sporadically (see Card A.8)

[5] Based on reported prevalence, correct as known [19 November 2013]. Please refer to www.hpa.org.uk for updates.

Section A – intended for use by frontline staff in acute healthcare settings

A.1 Acute trust – patient admission flow chart for infection prevention and control (IP&C) of carbapenemase-producing Enterobacteriaceae



1. A suspected case is defined as a patient who, in the last 12 months, has been (a) an inpatient in a hospital abroad or (b) an inpatient in a UK hospital which has problems with spread of carbapenemase - producing Enterobacteriaceae (if known) or (c) is a 'previously' positive case (see 1.5 and Card A.2)

2. There should be visible faecal material on the swab. Alternative is stool sample (see Card A.4)

3. See Cards A.5, A.6 and A.7 for IP&C measures

4. Except if it is a repeat isolate of same species with same antibiogram (see SOP reference Card B.1)

5. Should any sample test positive, treat as positive

6. See Section C for patient information leaflets

7. Refer to template (see Card B.1)

8. See Card B.3 for outbreak checklist

9. Screen any current inpatient contacts who shared an open ward / bay with non-isolated case (see Card A.4)

10. See Card B.4 for Inter-healthcare transfer form

A.2 Early recognition of individuals who may be colonised / have an infection

KEY MESSAGE: Include this risk assessment as part of the routine admission procedure to identify suspected cases of colonisation or infection with carbapenemase-producing Enterobacteriaceae
Assess each patient on admission, readmission *OR* on transfer from another healthcare facility
NOTE: if the patient is a recent laboratory confirmed case of carbapenemase-producing Enterobacteriaceae infection / colonisation (ie during this admission episode or confirmed at a transferring healthcare facility [UK facility only]) bypass this step, isolate the patient immediately and treat as a positive case (see Card A.3). IN THE LAST 12 MONTHS HAS THE PATIENT: Been an inpatient in a hospital abroad[6] *OR* Been an inpatient in a UK hospital known to have had problems with spread of carbapenemase-producing Enterobacteriaceae[7] *OR* Previously been colonised or had an infection with carbapenemase-producing Enterobacteriaceae or close contact (see glossary) with a person who has, if known
If one or more of above applies then:
The patient is considered to meet the criteria for being a suspected case of carbapenemase-producing Enterobacteriaceae colonisation or infection (as applicable) AND REQUIRES IMMEDIATE ISOLATION PLUS • instigation of *strict standard precautions* to prevent possible spread (Card A.3 and Card A.6) • screening to assess current status for colonisation or infection (Card A.4) • assessment for appropriate treatment (applies to infection only) (Card A.5)
Acute setting management advice
ENSURE THAT assessment takes place and it is effective by: • including risk assessment in routine admission and transfer documentation • providing training for all relevant staff in: ○ taking an effective admission history ○ recognising patients who meet the criteria for a recent laboratory confirmed case or suspected case the content of your Carbapenemase-producing Enterobacteriaceae Management Plan (Card B.1) • the need to act promptly if a recent laboratory confirmed or suspected case presents

[6] See 1.5 PLUS 'PHE Medical Transfers from Overseas: 'Guidance for receiving hospitals and clinicians in both the NHS and the private Sector' available at: http://www.hpa.org.uk/AboutTheHPA/WhatTheAgencyDoes/PortHealth/PortHealthMedicalTransfersFromOverseas/

[7] See 1.5. It is recognised that this may not be known so will be based on 'best available information.' However, some UK hospitals that have had cases are using a 'patient-held' card system or documentation to inform other healthcare personnel of possible exposure / patient status

A.3 Early isolation of suspected and laboratory-confirmed cases

KEY MESSAGE: If you have a suspected case or laboratory confirmed case[8] this step is needed to prevent spread within your organisation

If the patient already has laboratory-confirmed infection or colonisation with carbapenemase-producing Enterobacteriaceae *OR* meets the criteria for a suspected case (Card A.2) then:

Advise the patient (and relatives if appropriate) of the positive result or your suspicions (whichever applies) and your management plan – provide patient information leaflet (Card C.4)

AND

Immediately place the patient into a single room with en suite facilities and send screening samples (Card A.4)

AND

Apply strict standard precautions in all settings

Acute setting management advice

All suspected (including previously positive[9]) patients should be isolated until screening results are known. If the patient is **POSITIVE** on screening (Card A.4) for carbapenemase-producing Enterobacteriaceae or is a laboratory-confirmed case (colonisation or infection):

- they should remain in isolation for the duration of their hospital stay
- the hospital Carbapenemase-producing Enterobacteriaceae Management Plan (Card B.1) should be revisited
- comprehensive awareness raising of the plan should take place amongst staff including doctors, nurses, physiotherapists, domestics and others with patient contact

Strict standard precautions must be practiced (whether the patient has infection or colonisation) including:

- good hand hygiene (Card A.6)
- where any part of a staff uniform, not protected by an ordinary apron, is expected to come into contact with the patient, a long-sleeved disposable gown should be used eg when assisting movement for a dependent patient
- use of personal protective equipment (PPE) in line with standard precautions
- environmental cleaning and decontamination, with an enhanced focus on frequent cleaning of hand contact areas (Card A.7)

If **NEGATIVE** a further two negative samples need to be achieved and a risk assessment undertaken before removing from isolation (Card A.4).

[8] This relates to recent laboratory confirmation only ie during this admission episode or confirmed at the transferring healthcare facility (UK facility only)

[9] A previously positive case would fall into the 'suspected' group

A.4 Early detection – screening of suspected cases and contacts

KEY MESSAGE: Screening[10] of cases and contacts (based on the likelihood of exposure) will direct management, allow early instigation of IP&C measures and help assess whether spread has occurred

If the patient meets criteria for a suspected[11] case of infection or colonisation with carbapenemase-producing Enterobacteriaceae:

SCREEN THE PATIENT (CASE):

Immediately arrange for the patient to be screened - provide explanation & factsheet (Card C.4)

AND

Ensure that the necessary laboratory personnel and health professionals have been informed

WHAT SAMPLES TO TAKE:

Take a rectal swab (NOTE: this is the best sample type to achieve speedy results; to ensure detection of the organism there must be visible faecal material on the swab)

OR

Collect a stool sample

AND

Send to laboratory as soon as possible marking request form: 'Possible carbapenemase-producing Enterobacteriaceae 'colonisation or infection' (or 'exposure' if a contact – see below)

ALSO

If patient is known to have been hospitalised in the last 12 months in a country with reported high prevalence (or area known to have a carbapenemase-producing Enterobacteriaceae problem)[12] include samples from any wounds and device-related sites.

SCREENING OF CONTACTS:

Provide contact leaflet (Card C.5) and undertake screening for contacts of a positive case (see page 13) based on the likelihood of exposure as follows:

1. *Screening of patients in the same setting* is NOT normally required if the case was identified on admission and isolated immediately
2. *Screening of patient contacts* of a positive case SHOULD be undertaken if the case had spent time (or remained) in an open ward or bay with other patients before (or despite) having a positive result for carbapenemase-producing Enterobacteriaceae (see restrictions page 13)
3. *Screening of household contacts and healthcare staff* is NOT required – there is no compelling evidence to suggest that screening the household or healthcare staff to check for colonisation will provide additional benefit in controlling spread in the healthcare setting. The main focus should remain on promotion of strict standard precautions throughout, especially hand hygiene.

[10] NOTE**:** These screening recommendations are a minimum requirement; some trusts may wish to take a more aggressive approach to contact screening when there is a positive case on a ward (including screening on readmission of contact). Where there is evidence of lapses in good IP&C and / or *evidence of likely transmission* (eg a suspected secondary or unexpected case is identified some time later) then item 2) 'screening of patient contacts' should apply and *an outbreak control team should be convened immediately*

[11] 'suspected' includes 'previously' positive cases but not *recent* laboratory confirmed cases (see glossary).

[12] See 1.5 for countries / regions with reported high prevalence

Acute setting management advice

ACTING ON RESULTS OF SAMPLES (Card A.3):
If **NEGATIVE** on screening – the patient should remain in isolation *until a further two consecutive samples test negative* samples being taken 48 hours apart ie day 0 (the initial sample), day 2 and day 4 (the further samples). Once achieved they can be removed from isolation with no further screening required. The patient should be advised / supervised to practice good hand hygiene. Should any sample test POSITIVE – manage patient as positive case (below).

If **POSITIVE** (either from a screening sample OR from a routine clinical sample from this admission episode) the patient should remain in isolation, preferably for the duration of their hospital stay – see discharge advice (Card A.8). The patient should be advised to practice good hand hygiene especially after using the toilet. Whilst in hospital, weekly screening samples are advised to maintain an understanding of the patient's current status. Ensure:

- patient, and family (as appropriate), have been informed of positive result and factsheet provided (Card C.3)
- patient's notes are flagged with positive result
- information about positive result is included on all transfer / admission documents (if moved to another healthcare setting or referred for community care)

Careful risk assessment is required should it be deemed necessary to consider removing a previously positive or a colonised patient from isolation. A patient with an infection should not be removed from isolation.

Experience from other areas in the UK / abroad has shown that, on some occasions, an apparently cleared carbapenemase-producer can re-grow to a detectable level in the gut flora. A previously positive individual with subsequent negative screening results can revert to a positive state, especially after a course of antibiotics.

Should a patient who is colonised or has an infection require a diagnostic test or procedure which cannot be undertaken in the patient's room, the procedure should be planned at the end of the day's list and the room and equipment terminally cleaned after use (Card A.7).

OUTPATIENTS AND RENAL DIALYSIS PATIENTS: similarly, known positive outpatients should be planned at the end of the day's list; known positive renal dialysis patients should be isolated.

FOR CONTACTS: If screening is indicated (see page 12):

- It is not necessary to isolate contacts whilst awaiting screening results – cohort such contacts if possible and / or reiterate strict hand hygiene for staff and patients
- screen all patients in the bay (or ward, if patient has occupied more than one bay) on a weekly basis for a period of 4 weeks after the last case was detected
- restrict screening to patient contacts remaining in hospital

However, *should any contact screen positive, manage as positive case* (see above)
AND
In discussion with your PHE Centre, consider screening the whole ward *PLUS* discharged patients who occupied the bay (or ward, if case occupied more than one bay) at same time as case

A.5 Effective treatment – antibiotics and a view on decolonisation

KEY MESSAGE: Treatment[13] *of the patient with an infection caused by carbapenemase-producing Enterobacteriaceae should be undertaken under the advice of the microbiologist*

Firstly, establish whether the patient has an infection or is colonised with carbapenemase-producing Enterobacteriaceae as confirmed on laboratory testing:

If the patient has an infection, *under the advice of the microbiologist*, consider:

Monotherapy (not recommended for treatment of severe infection):

- Polymyxins (eg colistin)
- Tigecycline
- Fosfomycin[14] (i.v. or, for lower UTI only, oral), is active against most carbapenemase-positive *E. coli,* but variable against other genera
- Aminoglycosides (less consistent)

Combination therapy (supported by outcome analyses for treatment of severe infections):

- Polymyxin + carbapenem
- Polymyxin + tigecycline
- Polymyxin + aminoglycoside

For further advice about treatment please refer to section 5.2 'Other antibiotics' in: *UK Standards for Microbiology Investigations: Laboratory Detection and Reporting of Bacteria with Carbapenem-Hydrolysing β-lactamases (carbapenemases)* (2013) published at: http://www.hpa.org.uk/

Please also please refer to Start Smart, Then Focus: Department of Health's advisory committee on Antimicrobial Resistance and Healthcare-associated Infection (ARHAI): https://www.gov.uk/government/publications/antimicrobial-stewardship-start-smart-then-focus

Acute setting management advice

If the patient is colonised:

- no antibiotic treatment is required for colonisation
- decolonisation is *NOT* advised for the following reasons:
  - Skin decolonisation – not advised as these bacteria generally colonise the gut rather than the skin
  - Gut decolonisation (by prescribing antibiotics) – not advised as although antibiotics may provide some benefit, there is concern that their use would contribute to increasing resistance in the longer term.
- advise patient of the need for good hand hygiene, especially if they develop loose stools or diarrhoea (for any reason)

If the patient develops an infection:

- ensure treatment is started promptly
- treatment should be guided by susceptibility results

[13] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3552987/

[14] NOTE: Fosfomycin is not marketed in the UK and requires import arrangements by a pharmacist

A.6 Early instigation of effective infection prevention and control (IP&C) measures

KEY MESSAGE: Alert and well-trained staff are the key components to preventing spread

Regardless of <u>when</u> the suspected or confirmed case is identified, be it on admission or later:

All relevant staff should be made aware that suspected / recent laboratory confirmed case(s) of carbapenemase-producing Enterobacteriaceae colonisation or infection has / have been identified

AND

An immediate initial risk assessment should be undertaken to investigate the likely source(s)

AND

Rapid promotion of strict adherence to your Carbapenemase-producing Enterobacteriaceae Management Plan (Card B.1) should take place, including the need for compliance with its recommendations

ENSURE THAT:

1. All staff fully understand isolation procedures and adhere to standard precautions *as a norm* including:
   - hand hygiene
   - personal protective equipment
   - aseptic technique
   - laundry management
   - safe use of sharps
   - waste disposal (especially faeces)
2. Scrupulous IP&C practices are emphasised as being particularly important when using and caring for devices / equipment such as:
   - intravenous / peripheral line
   - central venous catheter line
   - urinary catheter
   - ventilators
   - renal dialysis equipment
   - enteral feeding equipment
   - colostomy or ileostomy
   - any re-usable diagnostic equipment (Card A.7)

NOTE: Loose stools or diarrhoea (for any reason) increase the risk of spread of the bacteria from the gut, therefore:

- observe strict IP&C measures
- provide assistance to patients where effective hand hygiene is in doubt

Acute setting management advice

<u>Further advice can be found at:</u>

The Health and Social Care Act 2008: Code of Practice on the prevention and control of infections and related guidance (2010)
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216227/dh_123923.pdf

epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England (due for publication in the Journal of Hospital Infection January 2014)

A.7 Cleaning and decontamination

KEY MESSAGE: No increased frequency of cleaning is required (unless there is evidence of transmission[15]) – but scrupulous routine cleaning is required

Carbapenemase-producing Enterobacteriaceae can be eliminated from the environment by stringent application of normal standards of cleaning and decontamination

THIS INCLUDES THE FOLLOWING:

- adherence to high standards of cleaning should be promoted and audited
- routine but stringent decontamination of equipment is required after use with an affected patient, especially when the equipment may be shared with other patients
- dedicated / single-patient or single-use equipment is preferable

Acute setting management advice

TERMINAL DECONTAMINATION:

Decontamination is most crucial following a patient leaving a specific area – for example from an isolation room or bed space. This will need coordination between domestics, healthcare assistants, nurses and other specialties, as appropriate.

Should the patient require a diagnostic test or procedure, ideally it should be undertaken in the patient's room (if appropriate or feasible). If not, it should be planned at the end of the day's list and the room, where the procedure was undertaken, and equipment terminally cleaned after use.

Surface cleaning and hand-touch / contact areas:

- scrupulous cleaning and disinfection of all surfaces is required with particular attention to those that may have had patient or staff hand contact

Mattresses are of particular importance:

- conventional mattress covers should be cleaned and disinfected
- dynamic mattresses should be disassembled, cleaned and disinfected – usually by specialist external contractors or in specialist facilities within the hospital

Other close-patient contact equipment and items

- pulse oximeters require normal cleaning and disinfection or single-patient use only
- blood pressure cuffs should be single-patient use only
- stethoscopes and thermometers should be single-patient use only
- there are no extra decontamination requirements for endoscopes above the normal organisational procedures. Any attached cameras / equipment which cannot be steam sterilised, should be protected using a single-use covering and thoroughly chemically disinfected between patients once the covering has been removed
- privacy curtains should be removed and laundered or single-use only
- unused wrapped single-use items in the patient's immediate vicinity (that may have become contaminated by hand contact) should be discarded. The burden of this may be minimised by keeping limited stocks near the patient
- tubes of ointment and lubricant should be disposed of

NOTE: No special type of disinfectant is required - use that which is in line with your organisational policy

[15] Enhanced cleaning should be instigated if there is either suspicion or evidence of transmission

A.8 Early communication on discharge or medical transfer of patients

KEY MESSAGE: Robust healthcare communications (within and between acute, non-acute / community settings) are crucial to a successful concerted effort to prevent and control spread

Commence communications as soon as the first suspected or confirmed case comes to light

Maintain communications within your organisation from board level down (including the local laboratory and between departments)

AND

Alert neighbouring trusts and providers to allow them to put the necessary precautions and level of alertness in place to prevent spread

AND

Ensure good communication with receiving organisations *prior to* patient transfer or discharge and with all healthcare professionals along the patient pathway

INCLUDE

The family and / or care facility to which the patient is to be discharged[16] providing an accurate explanation of risk in a non-acute / community setting, IP&C management advice and an opportunity for questions

BY

Carefully planning *well in advance* of the patient's movements and discharge / transfer (Card B.4)

Acute setting management advice

Communication is required between and with:

The patient so that they understand on discharge:

- their current status (eg infection cleared but may still be a carrier), and the need for good hand hygiene
- that, should a close contact be admitted to hospital / healthcare setting for any reason, they need to inform healthcare staff of their exposure

Internal colleagues

- the microbiologist and laboratory personnel
- the IP&C team to remind ward staff (including domestic and visiting staff) of IP&C measures within your Carbapenemase-producing Enterobacteriaceae Management Plan (Card B.1)

Healthcare colleagues:

- microbiologists, IP&C teams in neighbouring healthcare trusts and the community
- hospitals, care homes, primary care services *especially* the patient's GP plus any other relevant care provider along the patient pathway.
- any trusts where there is regular inter-trust transfer from one unit to another eg liver units (where one unit is affected)

Key partners such as:

- Public Health England, particularly your local PHE Centre [Tel:……...]
- clinical commissioning groups
- the local Director of Public Health
- the local Health and Wellbeing Board

[16] NOTE: There is no reason for discharge to be delayed once an infection has been resolved even if the patient is still colonised. Good communications will prevent unnecessary anxiety, misunderstanding or confusion for the family or healthcare facility receiving the patient

Section B – intended for use and consideration during the planning and implementation phases at board / executive level

B.1 Early preparation – The Carbapenemase-producing Enterobacteriaceae Management Plan (template for local adaptation)

B.2 Hospital / trust checklist of actions to prevent and minimise spread of carbapenemase-producing Enterobacteriaceae

B.3 Planning checklist for hospital / trust IP&C teams for the management of an outbreak, suspected outbreak or cluster of cases colonised or infected with carbapenemase-producing Enterobacteriaceae

B.4 Inter-healthcare transfer form – notification of a patient colonised or infected with a carbapenemase-producing Enterobacteriaceae or other multidrug-resistant organism

B.1 Early preparation – The Carbapenemase-producing Enterobacteriaceae Management Plan (template for local adaptation)

KEY MESSAGE: A dedicated pre-prepared plan is required to prevent the spread of carbapenemase-producing Enterobacteriaceae

The board should take note that the plan should be in place before the first case is detected or as a matter of urgency if cases have already been admitted to / occurred within the Trust

THE PLAN SHOULD INCLUDE:

1. Resource and capacity arrangements

The following arrangements for resources should be considered so that they are available / in place to support the plan including:

- staff to provide capacity when the ward / bays have been closed; patients are in isolation or cohort nursing is underway; enhanced cleaning is required
- equipment to facilitate the above
- facilities to undertake effective patient screening and access to a laboratory which undertakes recommended tests and provides efficient turnaround of results
- a system to flag the positive result (colonisation or infection) of carbapenemase-producing Enterobacteriaceae on the patient's record

2. Staff training and update arrangements

Initial training and routine updates should be in place for all relevant healthcare and domestic staff to enable a *full understanding* of:

- your Carbapenemase-producing Enterobacteriaceae Management Plan
- the potential threat of multi-drug resistant organisms, including carbapenemase-producing Enterobacteriaceae
- the clinical implications of such resistant organisms
- prudent antimicrobial prescribing
- effective risk assessment as part of the routine admission procedure ie the right questions to elicit any suspicion that the patient *could be* positive for carbapenemase-producing Enterobacteriaceae
- the actions required if a patient is suspected of having an infection with or colonisation by carbapenemase-producing Enterobacteriaceae
- excellent IP&C practices to prevent spread
- excellent two-way communications internally from board to ward and externally with other healthcare professionals and organisations
- being alert to the increased risk of infection or colonisation with patient transfers / admissions from high risk overseas countries, including Bangladesh, China, Cyprus, Greece, India, Israel, Italy, North Africa (all), Malta, the Middle East (all), Pakistan, Taiwan, Turkey and the USA
- maintain staff awareness of the changing national and international picture

3. ‘Building a picture’ to provide a baseline and monitor trends

To support the development and implementation of the Carbapenemase-producing Enterobacteriaceae Management Plan:

- an understanding is required of the history / epidemiology of carbapenemase-producing Enterobacteriaceae and other multi-drug resistant organisms within your organisational setting(s).
- this work should be part of an ongoing activity to maintain an overview of trends in your organisation. This will provide a baseline, which for most should be zero for carbapenemase-producing organisms ie no cases (or at least no transmission) has occurred within the organisation. This baseline will assist in speedy recognition of an emerging problem.

4. Early detection and effective infection prevention and control practices

Plans should be in place to ensure that early management of a suspected / confirmed case prevents on-going transmission to other patients / staff. This plan should cover:

- screening – patient and patient contacts
- provision of single rooms with ‘en suite’ facilities (or designated commode if no en suite)
- effective hand hygiene with soap and water and appropriate use of alcohol hand rub
- effective use of personal Protective Equipment (PPE)
- safe disposal of waste and sharps
- cleaning and decontamination
- patient movement – as an inpatient or on medical transfer / discharge
- management of visitors

5. Robust diagnostics / arrangements for laboratory services[17]

Trusts should be aware of / agree local arrangements to ensure that the following steps occur in a timely way for the management of patient specimens:

- transport – forewarning laboratory of suspicion of carbapenemase-producing Enterobacteriaceae
- receipt of specimens – how this will be managed over a weekend / bank holiday
- processing specimens - how this will be managed over a weekend / bank holiday
- review laboratory policies on screening, detection and referral to the reference laboratory
- reporting of results to the right people in a timely way

6. Antimicrobial stewardship and treating infections (Card A.5)

- prudent use of antimicrobials
- antimicrobial choice when managing patients with carbapenemase-producing Enterobacteriaceae infection

[17] see *UK Standards for Microbiology Investigations: Laboratory Detection and Reporting of Bacteria with Carbapenem-Hydrolysing β-lactamases (Carbapenemases) (2013)* published at: http://www.hpa.org.uk/ProductsServices/MicrobiologyPathology/UKStandardsForMicrobiologyInvestigations/TermsOfUseForSMIs/AccessToUKSMIs/SMIUKProtocols/smiP08LaboratoryDetectionandReportingofBacteria/

7. Planning for dealing with the first case or an increase in cases

Plans need to be in place to coordinate the response on recognition of a problem; the following should be included in the plans:

- how the problem can be communicated rapidly to the right people
- trust consideration of trigger(s) for Serious Incident (SI) reporting, particularly in relation to spread
- rapid promotion of strict adherence to the Carbapenemase-producing Enterobacteriaceae Management Plan
- criteria and procedure for instigating and convening an incident / outbreak team – this will depend on:
  - the scale of the problem
  - whether transmission / spread has occurred in the trust
  - the 'state of readiness' of the organisation

8. Effective communications, including discharge and medical (inter-healthcare) transfers

The trust discharges its 'duty of care' by ensuring that the right people, in the right place, have the right knowledge through planning early communications (Card A.8):

- within the trust
- with the laboratory
- between healthcare professionals, specialist units and neighbouring healthcare facilities – hospital and non-acute / community
- with healthcare providers *outside* of the area/region which the trust liaises with on the patient pathway, sporadically or routinely, including other acute trusts or specialists units
- with the family and / or care home to which the patient is to be discharged – to provide an accurate explanation of risk in a non-acute / community setting, provide an opportunity for questions and signposting for further advice

NOTE: Communication needs to occur *prior to* the affected patient's transfer (Card B.4) or discharge (Card A.8). It is essential that the transfer is carefully planned well in advance.

Acute care setting management

TO ENSURE THAT THIS PLAN CAN WORK:

1. Maintain or develop a robust surveillance system
   - if required, your local PHE Field Epidemiology Unit can provide advice and support [Tel:……]
   - discuss outputs routinely at your IP&C meeting to monitor for signs of spread
   - *repeat independent / sporadic cases* may be a feature in some care settings eg admission from abroad to UK referral centres or to UK private hospitals. Keeping a running tally may be helpful (Card C.2)

2. Assess each case for source*:* whether colonisation or infection *could have been* acquired in *your trust*. Consider whether the patient:
   - met the criteria for a suspected case on admission (Card A.2)
   - has recent history of being an inpatient in another hospital

If not, consider:

- whether the positive sample was collected more than 48 hours after admission (particularly if a previous pre-48 hour screen or culture was negative) *and / or* the patient has been an inpatient in your trust recently
- undertaking *root cause analysis* for in-depth investigation; communicate rapidly to the inward transferring healthcare facility (if appropriate) if your risk assessment indicates that facility was the possible / likely source for the patient's infection or colonisation

3. Review IP&C practices: especially if 2 above *suggests* that the infection / colonisation was acquired within your organisation

4. Review laboratory arrangements & diagnostics
   - alert laboratory biomedical scientist(s) to be vigilant for carbapenemase-producing Enterobacteriaceae isolates
   - alert neighbouring laboratories to a potential problem
   - review laboratory policies on screening, detection and referral to the reference laboratory

5. Ensure electronic system is in place for flagging the patient's carbapenemase-producing Enterobacteriaceae status; avoid acronyms that may be misconstrued by others who use different acronyms

6. Prepare to detect & deal with an increase in cases or a *suspected cluster*
   - maintain effective surveillance and scrutiny of data relating to unusual isolates and trends
   - identify effective cascade methods, if one or more cases are detected, for rapid reminders of strict adherence to Carbapenemase-producing Enterobacteriaceae Management Plan
   - include in plan, local arrangements for convening an incident / outbreak team (see Card B.3)

SEE: The Health and Social Care Act 2008: Code of Practice on the prevention and control of infections and related guidance published at:
https://www.gov.uk/government/publications/the-health-and-social-care-act-2008-code-of-practice-on-the-prevention-and-control-of-infections-and-related-guidance

NICE public health guidance 36 - Prevention and control of healthcare-associated infections (HCAIs): quality improvement guide. Issued November 2011, published at:
http://guidance.nice.org.uk/PH36/Guidance/pdf/English

UK Standards for Microbiology Investigations: Laboratory Detection and Reporting of Bacteria with Carbapenem-Hydrolysing β-lactamases (Carbapenemases) (2013) published at:
http://www.hpa.org.uk/ProductsServices/MicrobiologyPathology/UKStandardsForMicrobiologyInvestigations/TermsOfUseForSMIs/AccessToUKSMIs/SMIUKProtocols/smiP08LaboratoryDetectionandReportingofBacteria/

UK Five Year Antimicrobial Resistance Strategy 2013 to 2018 (2013) published at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244058/20130902_UK_5_year_AMR_strategy.pdf

B.2 Hospital / trust[18] checklist of actions to prevent and minimise spread of carbapenemase-producing Enterobacteriaceae	Number of cases		
Trust engagement	0	1	>1
Board to make it a high priority to minimise spread and to support all infection prevention and control (IP&C) measures	✓	✓	✓
Prepare a dedicated management plan (Card B.1) including IP&C measures	✓		
Hospital-wide			
Run awareness / training campaign for staff especially, but not exclusively, medical and nursing staff; *maintain* staff awareness of high-prevalence countries and UK problem areas	✓	✓	✓
On admission screen suspected cases eg previously positive cases OR history of hospitalisation abroad in last 12 months OR in a UK hospital with a known problem in last 12 months (if known)	✓	✓	✓
Implement isolation strategy at triage / admission for suspected or recent laboratory-confirmed patients	✓	✓	✓
Hold regular incident management team meetings to review epidemiology and IP&C strategies, including root cause analyses where applicable		✓	✓
Implement communication strategy; report as a Serious Incident (SI) and inform PHE Centre if evidence of onward transmission			✓
Ensure that any transmission becomes a top trust priority, with leadership from board to ward			✓
Laboratory			
Optimise and review laboratory methods to detect producers (refer to Standard Operating Procedure)[19]	✓	✓	✓
Screen by plating rectal swabs (or faeces) and manipulated site swabs eg from skin breaks / catheter sites onto either a) proprietary chromogenic agars designed to be selective for carbapenemase-producing Enterobacteriaceae or onto b) MacConkey or CLED agar with meropenem or ertapenem discs. Examine for colonies on the selective plate or within the zone. Prior broth enrichment may be useful: use a rectal swab to inoculate 5 -10 ml broth containing a 10 µg ertapenem disc, then subculture as above		✓	✓
Infection prevention and control			
It is recommended that Directors of IP&C ensure that the incident / problem is raised at Board level		✓	✓
Implement the Carbapenemase-producing Enterobacteriaceae Management Plan immediately, with strict adherence to standard precautions; affected patients should be isolated in a single room with en suite facilities or dedicated commode		✓	✓
Optimise care bundles and clinical practice for indwelling devices (review the need for the latter)	✓	✓	✓
Reinforce and optimise hand hygiene with soap and water or, *on visibly clean hands only*, an alcohol hand rub as an alternative		✓	✓
Minimise spread by effective routine and terminal cleaning including all hand-contact and sanitary areas (increase frequency if evidence of spread); review procedures for effective decontamination of equipment		✓	✓
Designate cohort staffing depending on risk assessment, number of cases and feasibility			✓
Ensure effective incident tracking via a robust surveillance system, with an incident / outbreak management team, full epidemiological investigation, maintaining line list and epidemic curve		✓	✓
Prepare a readmission, discharge and transfer strategy for affected patients and contacts	✓	✓	✓
Plan and facilitate adequate communication to other healthcare providers (intra- and inter-regionally)	✓	✓	✓
Screening			
Screen index case and case-contacts as per criteria; case find and isolate immediately; determine the extent of spread; convene an outbreak control team if spread suspected; electronically flag affected patient(s) record		✓	✓
Instigate weekly and discharge screening of all patient contacts (as identified) in affected units / wards for a period of 4 weeks after the last case was detected; cohort contacts if possible / feasible		✓	✓
Screening of staff or household members for carriage is *NOT* routinely recommended as it is unlikely to provide additional benefit to control measures, whereas promotion of strict standard precautions will		✓	✓

[18] NOTE: it may be appropriate for a Mental Health Trust to follow this checklist rather than that for a non-acute setting

[19] UK Standards for Microbiology Investigations: Laboratory Detection and Reporting of Bacteria with Carbapenem-Hydrolysing β-lactamases (Carbapenemases) (2013) published at: http://www.hpa.org.uk/ProductsServices/MicrobiologyPathology/UKStandardsForMicrobiologyInvestigations/TermsOfUseForSMIs/AccessToUKSMIs/SMIUKProtocols/smiP08LaboratoryDetectionandReportingofBacteria/

B.3 Planning checklist for hospital / trust[20] Infection Prevention & Control (IP&C) teams for the management of an outbreak, suspected outbreak or cluster of cases colonised or infected with carbapenemase-producing Enterobacteriaceae

1) Early communications
   - Ensure senior managers, the board, and key senior clinical / ward staff are made aware of the case(s)

2) Instigation of immediate control measures
   - Immediately refer to *your* dedicated plan (Card B.1) for the management of carbapenemase-producing Enterobacteriaceae
   - Refer to the PHE acute trust toolkit to ensure all early control measures to prevent spread have been instigated

3) Convene an incident / outbreak control team (OCT) – consisting of:
   - Infection control leads – clinician and nurse
   - Microbiologist
   - Infectious disease physician (if available / appropriate)
   - Trust executive representation
   - Clinical representation and senior nurse manager
   - Estates / domestic service representation
   - Communications department
   - Pharmacy / medicines management team
   - Senior representative from the local Public Health England (PHE) Centre

4) OCT review:
   - Line list of cases – produce and maintain an epidemic curve (or running tally for repeat sporadic cases – Card C.2)
   - Microbiological investigations to date – diagnostic and screening, plus results
   - Epidemiological investigations to date
   - Current hypothesis(es) for incident / outbreak / cluster
   - Control measures to date and effectiveness, include compliance / audit history
   - Antimicrobial practices and compliance to policies
   - Staff training and awareness

5) OCT produce incident / outbreak control plan including:
   - Agreement on leadership, roles and responsibilities
   - Frequency of meetings and reporting schedule (may change over time)
   - Action plan for ongoing investigations and control measures (include timelines)
   - Plans for maintaining and reinforcing enhanced cleaning schedule (increased frequency and terminal cleaning for rooms of affected patients), if evidence of transmission
   - Transfer and discharge arrangements for affected patients
   - Additional expert advice required
   - Consideration of external expert or peer support visit in 'difficult to control' outbreaks
   - Communications strategy including patients, relatives, the media and additional professionals / organisations as outlined in 6)

[20] NOTE: it may be appropriate for a Mental Health Trust to follow this checklist rather than that for a non-acute setting

6) Communications

- Inform / update IP&C teams and microbiologists of neighbouring trusts, and trusts where there is regular inter-trust transfer from one unit to another eg liver units (where one unit is affected)
- Inform other healthcare providers / trusts *outside* of the area / region which the trust liaises with on the patient pathway, sporadically or routinely
- Maintain regular liaison with local PHE Centre [Tel:…….....]
- Ensure no affected patient is transferred to another healthcare facility without verbal advice and an inter-healthcare transfer form being provided – this includes transfers to care homes, intermediate care or hospices[21]
- Ensure no affected patient is discharged without receiving documentation on his / her status for future reference for other healthcare providers

[21] There is no reason for non-acute settings to refuse admission / readmission of patients on the grounds that they are colonised with carbapenemase-producing Enterobacteriaceae *provided they have been given good supporting information*

B.4 UK Inter-healthcare transfer form – notification of a patient colonised or infected with a carbapenemase–producing Enterobacteriaceae or other multidrug-resistant organism

(For local adaptation: for use in conjunction with full discharge / transfer planning)

Patient / client details: *(insert label if available)* Name: Address: Date of birth: NHS number:	Consultant: Contact no: GP: Contact no:
Transferring facility: *(hospital, ward, care home, other)* Contact name: Contact no:	Receiving facility: *(hospital, ward, care home, district nurse [if applicable], GP)* Contact name: Contact no:
Diagnosis: *(confirmed organism)*	Infection: Yes / No Colonisation: Yes / No

Microbiological identification (specimen results):

Specimen & Results	Specimen type	Date	Result
Screen/diagnostic			
Confirmatory			
Other			

Treatment information (if appropriate): *(including type of medication, dose and duration)*

Infection prevention & control precautions required / in place:

Other information relevant to patient's care:

Has ambulance service been informed? Yes / No *(if no, give reason)*

Is the patient / client aware of their colonisation / infection status? Yes / No *(if no, give reason)*

Has patient received information about their status? (Patient Leaflet) Yes / No

Name of staff member completing form:

Print name: Contact number:

Section C: intended for risk assessment and public information

C.1 Single patient risk factor questionnaire for exposure to carbapenemase-producing Enterobacteriaceae

C.2 Case / contact spreadsheet

C.3 Patient Information Leaflet: Carbapenemase-producing Enterobacteriaceae – I am colonised / have an infection – what does this mean?

C.4 Patient Information Leaflet: Carbapenemase-producing Enterobacteriaceae – I may be a carrier (or have an infection) – what does this mean?

C.5 Contact Information Leaflet: Carbapenemase-producing Enterobacteriaceae – I am a contact of someone who is a carrier or has an infection – what does this mean?

C.1 Single patient risk factor assessment for exposure to carbapenemase-producing Enterobacteriaceae

This form is to assist in the assessment of the likely source / transmission route and appropriate interventions. It should be used in conjunction with collaborative working between the healthcare provider and the PHE centre.		
Name: DOB: Referral date: Address: GP:	Hospital or healthcare setting where inpatient currently residing: Date of admission: Confirmatory laboratory result details: Result date:	
QUESTIONS *(if yes to any, please give details)*	Y / N	COMMENTS / NOTES
Does the patient have a history of previous carbapenemase-producing Enterobacteriaceae colonisation or infection? *If yes*, *include dates of positive results (if known)*		
Has the patient *(please give all relevant details)*:		
Travelled abroad in the last 12 months?[22] *If yes, whilst abroad did the patient:*		
1. Visit friends and / or relatives - if so, where?		
2. Visit as a tourist - if so, where?		
3. Go abroad to work - if so, where?		
4. Receive hospital treatment or medical care? If so, which town / city & country?		
5. Undergo direct *inter-healthcare* transfer from the hospital abroad to a UK hospital? (see 1.5)		
6. Other?		
Has the patient *(please give all relevant details)*:		
Been in a UK hospital which Trust / PHE Centre is aware has a problem with spread of carbapenemase-producing Enterobacteriaceae?[23] *If yes, state hospital name and dates of stay*		
Been in *any other* UK hospital? *If yes, state hospital name and dates of stay*		
Had any other known exposure?		
Additional information		

[22] See 'PHE Medical Transfers from Overseas: 'Guidance for receiving hospitals and clinicians in both the NHS and the Private Sector' and 'Guidance for local PHE Centres' available at: http://www.hpa.org.uk/AboutTheHPA/WhatTheAgencyDoes/PortHealth/PortHealthMedicalTransfersFromOverseas/

[23] It is accepted that in some circumstances this will not be known

C.2 Case / contact spreadsheet (template for local adaptation)

Date first case identified:	Trust / Hospital name and address:	Key Contact details:

Tally of cases (colonised or infected) as of ____/____/_____ (*insert date*)				
Total number of presumptive (locally confirmed) cases	Total number of cases confirmed by reference laboratory	Total number of deaths	Total number (suspected and confirmed) remaining as inpatients	Comments

Case details								
Name	DOB	Sex	Ward	Status Alive (A) Died (D)	Criteria for suspected case (see key below)[24]	Result *plus* Infection (I) Colonised (C)	Number of contacts screened	Number of contacts positive for same strain as case

[24] Abroad – hospitalised abroad in last 12 months; UK Hospital – hospitalised in a UK hospital (with known transmission problems) in last 12 months;
Case – history of being a confirmed case (colonised or infected) in last 12 months; Contact - contact with a known case (whether colonised or infected) in last 12 months

C.3 Carbapenemase-producing Enterobacteriaceae: I am colonised / have an infection – what does this mean?

What does ‘carbapenemase-producing Enterobacteriaceae’ mean?

Enterobacteriaceae are bacteria that usually live harmlessly in the gut of humans. This is called ‘colonisation’ (a person is said to be a ‘carrier’). However, if the bacteria get into the wrong place, such as the bladder or bloodstream they can cause infection. Carbapenems are one of the most powerful types of antibiotics. Carbapenemases are enzymes (chemicals), made by some strains of these bacteria, which allow them to destroy carbapenem antibiotics and so the bacteria are said to be resistant to the antibiotics.

Why does carbapenem resistance matter?

Carbapenem antibiotics can only be given in hospital directly into the bloodstream. Until now, doctors have relied on them to successfully treat certain ‘difficult’ infections when other antibiotics have failed to do so. In a hospital, where there are many vulnerable patients, spread of resistant bacteria can cause problems.

Does carriage of carbapenemase-producing Enterobacteriaceae need to be treated?

If a person is a carrier of carbapenemase-producing Enterobacteriaceae (sometimes called CPE), they do not need to be treated. However, if the bacteria have caused an infection then antibiotics will be required.

How did I ‘pick up’ carbapenemase-producing Enterobacteriaceae?

Do ask your doctor or nurse to explain this to you in more detail. As mentioned above, sometimes this bacteria can be found, living harmlessly, in the gut of humans and so it can be difficult to say when or where you picked it up. However, there is an increased chance of picking up these bacteria if you have been a patient in a hospital abroad or in a UK hospital that has had patients carrying the bacteria, or if you have been in contact with a carrier elsewhere.

How will I be cared for whilst in hospital?

You will be accommodated in a single room with toilet facilities whilst in hospital. You may be asked to provide a number of samples, depending on your length of stay, to check if you are still carrying the bacteria. These will probably be taken on a weekly basis. The samples might include a number of swabs from certain areas, such as where the tube for your drip (if you have one) enters the skin, a rectal swab ie a sample taken by inserting a swab briefly just inside your rectum (bottom), and / or a faecal sample. You will normally be informed of the results within two to three days.

How can the spread of carbapenemase-producing Enterobacteriaceae be prevented?

Accommodating you in a single room helps to prevent spread of the bacteria. Healthcare workers should wash their hands regularly. They will use gloves and aprons when caring for you. The most important measure for you to take is to wash your hands well with soap and water, especially after going to the toilet. You should avoid touching medical devices (if you have any) such as your urinary catheter tube and your intravenous drip, particularly at the point where it is inserted into the body or skin. Visitors will be asked to wash their hands on entering and leaving the room and may be asked to wear an apron.

What about when I go home?

Whilst there is a chance that you may still be a carrier when you go home quite often this will go away with time. No special measures or treatment are required; any infection will have been treated prior to your discharge. You should carry on as normal, maintaining good hand hygiene. If you have any concerns you may wish to contact your GP for advice.

Before you leave hospital, ask the doctor or nurse to give you a letter or card advising that you have had an infection or been / are colonised with carbapenemase-producing Enterobacteriaceae. This will be useful for the future and it is important that you make health care staff aware of it. Should you or a member of your household be admitted to hospital, you should let the hospital staff know that you are, or have been a carrier and show them the letter / card.

Where can I find more information?

If you would like any further information please speak to a member of your care staff, who may also contact the Infection Prevention and Control Team for you. The Public Health England website is another source of information:
http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/CarbapenemResistance/

C.4 Carbapenemase-producing Enterobacteriaceae: I may be a carrier (or have an infection) – what does this mean?

What does 'carbapenemase-producing Enterobacteriaceae' mean?

Enterobacteriaceae are bacteria that usually live harmlessly in the gut of humans. This is called 'colonisation' (a person is said to be a 'carrier'). However, if the bacteria get into the wrong place, such as the bladder or bloodstream they can cause infection. Carbapenems are one of the most powerful types of antibiotics. Carbapenemases are enzymes (chemicals), made by some strains of these bacteria, which allow them to destroy carbapenem antibiotics and so the bacteria are said to be resistant to the antibiotics.

Why does carbapenem resistance matter?

Carbapenem antibiotics can only be given in hospital directly into the bloodstream. Until now, doctors have relied on them to successfully treat certain 'difficult' infections when other antibiotics have failed to do so. Therefore, in a hospital, where there are many vulnerable patients, spread of these resistant bacteria can cause problems.

Does carriage of carbapenemase-producing Enterobacteriaceae need to be treated?

If a person is a carrier of carbapenemase-producing Enterobacteriaceae (sometimes called CPE), they do not need to be treated. As mentioned, these bacteria can live harmlessly in the gut. However, if the bacteria have caused an infection then antibiotics will be required.

How will I know if I am at risk of being a carrier or having an infection?

Your doctor or nurse may suspect that you are a carrier if you have been in a hospital abroad, or in a UK hospital that has had patients carrying these bacteria, or if you have been in contact with a carrier elsewhere. If any of these reasons apply to you, screening will be arranged for you and you will be accommodated in a single room with your own toilet facilities at least until the results are known.

How will I be screened for carbapenemase-producing Enterobacteriaceae?

Screening usually entails taking a rectal swab by inserting it just inside your rectum (bottom). Alternatively, you may be asked to provide a sample of faeces. The swab / sample will be sent to the laboratory and you will normally be informed of the result within two to three days. If the result is negative, the doctors or nurses may wish to check that a further two samples are negative before you can be accommodated on the main ward. These measures will not hinder your care in any way. If all results are negative no further actions are required.

Advice for patients who have a positive result

What happens if the result is positive?

If the result is positive, do ask your doctor or nurse to explain this to you in more detail. You will continue to be accommodated in a single room whilst in hospital. If you have an infection, you will need to have antibiotics. However, if there are no signs of infection and you are simply 'carrying' the bacteria, no treatment is required.

How can the spread of carbapenemase-producing Enterobacteriaceae be prevented?

Accommodating you in a single room, if the result is positive, helps to prevent spread of the bacteria. Healthcare workers should wash their hands regularly. They will use gloves and aprons when caring for you. The most important measure for you to take is to wash your hands well with soap and water, especially after going to the toilet. You should avoid touching medical devices (if you have any) such as your urinary catheter tube and your intravenous drip, particularly at the point where it is inserted into the body or skin. Visitors will be asked to wash their hands on entering and leaving the room and may be asked to wear an apron.

What about when I go home?

Whilst there is a chance that you may still be a carrier when you go home, quite often this will go away with time. No special measures or treatment are required; any infection will have been treated prior to your discharge. You should carry on as normal, maintaining good hand hygiene. If you have any concerns you may wish to contact your GP for advice.

Before you leave hospital, ask the doctor or nurse to give you a letter or card advising that you have had an infection or been colonised with carbapenemase-producing Enterobacteriaceae. This will be useful for the future and it is important that you make health care staff aware of it. Should you or a member of your household be admitted to hospital, you should let the hospital staff know that you are, or have been, a carrier and show them the letter / card.

Where can I find more information?

If you would like any further information please speak to a member of your care staff, who may also contact the Infection Prevention and Control Team for you. The Public Health England website is another source of information:
http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/CarbapenemResistance/

C.5 Carbapenemase-producing Enterobacteriaceae – I am a contact of someone who is a carrier or has an infection – what does this mean?

What does ‘carbapenemase-producing Enterobacteriaceae’ mean?

Enterobacteriaceae are bacteria that usually live harmlessly in the gut of humans. This is called ‘colonisation’ (a person is said to be a ‘carrier’). However, if the bacteria get into the wrong place, such as the bladder or bloodstream they can cause infection. Carbapenems are one of the most powerful types of antibiotics. Carbapenemases are enzymes (chemicals), made by some strains of these bacteria, which allow them to destroy carbapenem antibiotics and so the bacteria are said to be resistant to the antibiotics.

Why does carbapenem resistance matter?

Carbapenem antibiotics can only be given in hospital directly into the bloodstream. Until now, doctors have relied on them to successfully treat certain ‘difficult’ infections when other antibiotics have failed to do so. Therefore, in a hospital, where there are many vulnerable patients, spread of resistant bacteria can cause problems.

Does carriage of carbapenemase-producing Enterobacteriaceae need to be treated?

If a person is a carrier of carbapenemase-producing Enterobacteriaceae (sometimes called CPE), they do not need to be treated. As mentioned, these bacteria can live harmlessly in the gut. However, if the bacteria have caused an infection then antibiotics will be required.

How is carbapenemase-producing Enterobacteriaceae spread?

If a patient in hospital is carrying this bacteria it can get into the ward environment and can also be passed on by direct contact with that particular patient. For that reason, the patient will normally be accommodated in a single room. Effective environmental cleaning and good hand hygiene by all staff and patients, can reduce the risk of spread significantly.

Do I need to be screened?

Occasionally, it isn’t immediately known that a patient is carrying this bacteria and so they may not be placed into a single room straight away. Screening will be offered if you have shared the same bay (or ward) with a patient who has been found to be carrying carbapenemase-producing Enterobacteriaceae. This screening is offered as there is a *slight* chance that you could have picked up the bacteria and are carrying it too.

How will I be screened for carbapenemase-producing Enterobacteriaceae?

Screening usually entails taking a rectal swab by inserting it just inside your rectum (bottom). Alternatively, you may be asked to provide a sample of faeces. The swab / sample will be sent to the laboratory and you will normally be informed of the result within two to three days. If the result is negative nothing further is required unless you are staying in hospital for some time. In that case, you will probably be asked to provide a sample on a regular basis eg once a week, as a precautionary measure.

What if the result is positive?

If the result is positive do ask your doctor or nurse to explain this to you in more detail and to provide a leaflet relating to positive results (Card C.4).You will be given a single room until you leave hospital. No treatment is necessary unless you have an infection when antibiotics will be given.

Where can I find more information?

The Public Health England web site is another source of information:
http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/CarbapenemResistance/

Section D: Glossary

acute care setting	A healthcare setting, usually a hospital, that provides short-term treatment or care for an illness, urgent medical condition, injury or surgical procedure
carbapenemases	Enzymes (such as KPC, OXA-48, NDM and VIM) produced by some bacteria which cause destruction of the carbapenem antibiotics, resulting in resistance
close contact	A person living in the same house; sharing the same sleeping space (room or hospital bay); or a sexual partner
colonisation	The presence of micro-organisms living harmlessly on the skin or within the bowel and causing no signs or symptoms of infection
community-acquired infection	An infection that *is not* related to a healthcare intervention in a hospital
healthcare-associated infection	An infection that occurs following or during a healthcare intervention undertaken either in the community (including the patient's home) or in a healthcare setting
hospital-acquired infection	An infection that occurs following or during a healthcare intervention in a hospital
infection	The presence of micro-organisms in the body causing adverse signs or symptoms
laboratory confirmed case- *for the purposes of this guidance*	Recent laboratory confirmation of carbapenemase-producing Enterobacteriaceae infection / colonisation during this admission episode or confirmed at a transferring healthcare facility (UK facility only)
non-acute care setting	Usually applies to healthcare settings that provide non-acute care, such as in care homes and mental health trusts, also rehabilitation and palliative care services including hospices
rectal swab	A rectal swab is a specimen taken by *gently* inserting a swab inside the rectum 3-4cms beyond the anal sphincter, rotating *gently* and removing. Normal saline can be used to moisten the swab prior to insertion. The swab should have visible faecal material to enable organism detection in the laboratory. A rectal swab *should not* be mistaken for a perineal swab.
suspected case- *for the purposes of this guidance*	A patient who has been one or more of (i) an inpatient in a hospital abroad; (ii) an inpatient in a UK hospital known to have had problems with spread of carbapenemase-producing Enterobacteriaceae; (iii) previously colonised or had an infection with carbapenemase-producing Enterobacteriaceae; (iv) close contact with a person who has.

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Dr Bharat Patel, PHE, Consultant Medical Microbiologist, Public Health Laboratory – London

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Further advice:

If the IP&C advice in this toolkit does not ‘fit’ your situation, IP&C teams can obtain further advice and signposting, *particularly in relation to local risk assessment*, through their local PHE Centre [Tel:…….] or Lead Public Health Microbiologist [Tel:…….]