British Society of Rehabilitation Medicine

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Framework for Action to contain carbapenemase-producing Enterobacteriacae (CPE) - application in rehabilitation

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Background

- **Enterobacteriaceae** are a large family of bacteria that usually live harmlessly in the gut of all humans and animals. However, they are also some of the most common causes of opportunistic infection, including urinary, 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 to the bacteria that produce them. They are made by a small but growing number of Enterobacteriaceae strains, which are known to transmit readily from one patient to another.
- Future rapid spread of carbapenem-resistant bacteria poses an increasing threat to public health and modern medicine, as we know it in the UK.
- **Carbapenemase-producing Enterobacteriaceae (CPE**) are just one of the many types of multi-resistant organisms that circulate in hospital, which include methicillin-resistant Stahpylococcus aureus (MRSA), multi-resistant Acinetobacter - but many of the principles are more widely applicable to resistant organisms in general.

The Framework for Action

Public Health England (PHE) has produced toolkits for the early detection, management and control of CPE for both acute and non acute settings[1]. It is in the process of updating these and combining them into a single publication.

It is recognised that, both the requirements for containment of CPE and different approaches to management, will vary across different settings and patient populations. The purpose of the document is therefore not to produce a prescriptive national policy, but to develop a framework of actions and tools to support health and social care providers to develop their own local guidelines to identify CPE and contain spread so far as this is possible in the context of their services.

Key containment strategies include:

- Strict observance of hygiene including:
  - Hand hygiene
  - Cleaning and disinfection of equipment / facilities - avoiding shared or re-use where this is not possible
- Antimicrobial stewardship - avoiding over-use of broad spectrum antibiotics.
- Screening and surveillance to identify patients carrying CPE.
- Isolation and cohorting of patients to minimise contact.
- Active management of contacts to avoid spread.

[1] https://www.gov.uk/government/publications/carbapenemase-producing-enterobacteriaceae-early-detection-management-and-control-toolkit-for-acute-trusts
and https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/439801/CPE-Non-AcuteToolkit_CORE.pdf

Existing recommendations are for isolation of patients colonised or infected with CPE in side rooms with their own toilet/bathing facilities. However, this is not always possible within the current resources, and may not be compatible with the care requirements of certain patient groups. Such groups include those requiring rehabilitation (either in hospital settings or in slower stream / specialist nursing home facilities) and also other patients who require longer stays in hospital.

Rehabilitation

Specialist rehabilitation forms a critical component in the patient pathway following major illness or injury. In-patient rehabilitation provides a vital bridge in the transition from hospital back into the community, preventing bed-blocking within the acute care services.

By definition, the patients who require these services are severely disabled and have a number of the common risk factors for colonisation with multi-resistant organisms including:

- Prolonged hospital stay.
- Susceptibility to infections (especially of the respiratory and urinary tract) leading to multiple courses of antibiotics whilst in acute care.
- Stomas and tubes – eg gastrotomy, tracheostomy, indwelling catheters.
- Difficulty containing body fluids - due to incontinence, drooling, suction requirements
- Physical dependency requiring close bodily contact when handled by staff – eg for transfers and therapy sessions.
- Cognitive deficits, resulting in poor compliance with personal hygiene, a tendency to wander out of designated areas etc.

On grounds of equity, existing guidance from NHSEI/PHE stresses that patients should not be excluded from rehabilitation because of colonisation with resistant organisms. However, the practicalities of this advice need to be understood and properly thought through.

Preadmission screening:

All patients should be screened for CPE before they are admitted to a specialist rehabilitation unit. The results of this screening should be made available to the receiving unit before a patient's transfer. The presence of CPE in a patient should not affect their acceptance onto a rehabilitation unit but should be used to inform that patient's risk assessment.

Isolation and cohorting:

As described in the updated framework CPE guidance rehabilitation annex, a patient colonised with CPE should be admitted to an isolation room in the receiving unit. Such a facility is, as described in the main Framework, a single room with ensuite toilet and shower. If no such facility is available, then the patient should be accommodated in a single room without a toilet and shower, but this will make IPC measures more difficult to apply effectively.

Participation in a rehabilitation programme:

As part of functional and social reintegration into normal life, the essence of a rehabilitation programme requires engagement in group-based activities and the use of shared facilities (such as a day-room, gym, hydrotherapy, computer room and other treatment areas). Where patients are unable to access this range of equipment, interaction and activities, it is unlikely that they will achieve their rehabilitation goals and hence have poorer functional outcomes. If a patient carrying CPE is continent or their faeces can be contained, their care pathway and access to group rehabilitation treatment and therapies should not be affected.

Group therapy and home visits:

Rehabilitation treatment involves participation in group activities (gym sessions, art groups, lunch groups and similar). If a patient carrying CPE is continent or their faeces can be contained, their care pathway and access to group rehabilitation treatment and therapies should not be affected. If a patient carries out supervised hand hygiene, either handwashing or handrub, then participation in group activities that involve food consumption (e.g. cooking and eating in a group) is acceptable. No special precautions are needed when a patient goes on a home visit.

Avoidance of shared equipment:

While hard surfaces may be cleaned and disinfected quite easily, this is not true for items made from fabric or stitched material from which it is harder to remove particles such as bacteria or the substrates on which they may grow. Immobile patients may require a variety of such items including hoists, wheelchairs, pressure cushions, standing frames etc. This group of patients is frequently incontinent, so the equipment is liable to be soiled on a frequent basis.

Patients progressing through a physical rehabilitation programme will typically need to transition through a range of different seating and wheelchair systems offering progressively less support, as they become more able to maintain their own posture and mobility. Such systems can cost several thousand pounds and a patient may progress from one to another within a matter of weeks. Most rehabilitation units maintain a fleet of wheelchairs and seating systems, which are lent in series to patients during these different stages.

All equipment used with that patient, particularly commodes, wheelchairs and shower trolleys, should be thoroughly cleaned and disinfected before use by another patient. Any shared facility where CPE dissemination to the environment is likely such as shower rooms or shared toilets, should be cleaned and disinfected after each use by a CPE patient with particular attention to all patient contact points or staff hand contact points.

Patients with CPE should have single-patient use hoist slings. These should either be disposable or only be used for other patients after decontamination by washing in a specialist healthcare laundry complying with Health Technical Memorandum 01-04[1].

Fabric washing: It will often be necessary to wash some items locally rather than in a specialist healthcare laundry. These will be patients' own clothing if relatives are unable to wash them at home. It is unlikely that patients' clothing will withstand thermal disinfection temperatures of 65°C or above. Any wash process at lower temperatures should use a chemical disinfection process that has been verified as being fully active during the wash cycle. It is important to have separate pathways for used clothes to go to the washing machine and clean clothes from the washing machine, for example different and clearly labelled laundry baskets.

Equipment: Equipment that is likely to become contaminated such as shower trolleys should be chosen with amenability to cleaning and disinfection as a priority. This applies to all such equipment acquisitions even when not via conventional routes, such as via charitable funds or donations. Where there is any doubt that locally available resources will be sufficient to achieve this, the local Infection Prevention & Control Team should be consulted prior to the equipment's acquisition.

Where environmental contamination with CPE may have occurred in areas used by more than one patient, such as from a shower trolley in a communal bathroom, there needs to be efficient environmental disinfection immediately that patient has vacated the area and before that area is used by another patient. . Please see attached table which outlines characteristics of routine equipment to be used in a rehabilitation setting. A more detailed example of this is provided in Appendix 1. It is

recommended that each rehabilitation unit, in liaison with local IPC teams reviews it equipment to produce local cleaning protocols. Ensuring that manufacturers guidelines on cleaning are followed.

Recommendations for the management of CPE positive patients in an inpatient rehabilitation setting

- All patients should be screened for CPE before they are admitted to a specialist rehabilitation unit and the results of this screening made available to the receiving unit before a patient's transfer.

- Positive CPE colonisation or infection status should not prevent access to rehabilitation services but should be used to inform that patient's risk assessment.

- All patients should be screened for CPE before they are admitted to a specialist rehabilitation unit.

- Patients colonised with CPE should be admitted to an isolation room in the receiving unit. This room should be a single room with ensuite toilet and shower. If no such facility is available the patient should be accommodated in a single room where all equipment should either be single use, dedicated for that patient's sole use or thoroughly decontaminated before use by another patient.

- Patients with CPE can access group activities if they are continent of faeces or their faeces can be contained and they carry out supervised hand hygiene.

- Patients with CPE can participate in group activities involving food consumption if they carry out supervised hand hygiene and they are continent of faeces or their faeces can be contained.

- No special precautions are required when a patient goes on a home visit.

- Equipment for use by patients with CPE should either be disposable where possible e.g. single use patient slings, or dedicated for that patient's use during their stay e.g. commode, wheelchair. These items should then be thoroughly cleaned and disinfected before use by another patient.

- Shared areas where CPE dissemination to the environment is likely such as shower rooms or shared toilets should be cleaned and disinfected after each use by a patient with CPE.

- Additional resource will be required to allow patients to have dedicated access to equipment during their stay.

- Planned equipment purchases should involve the local IPC team and must include amenability to cleaning and disinfection as a priority including any equipment sourced through charitable means.

Implications for development of the PHE framework for CPE

The general document will set out the overall framework and principles of management for containment and management of CPE in acute and non-acute settings, and will provide a set of tools to support local delivery of these principles.

The British Society of Rehabilitation Medicine, together with Public Health England have been working on an annex to the PHE Framework for CPE guidance which is specific to rehabilitation

settings. This annex which is referenced in the Framework document will address the different requirements of patients in a variety of inpatient specialist rehabilitation settings.

The framework and the tools will help to deliver national policy, whilst aligning with the practical requirements of service delivery to ensure that the focus on containment of CPE does not either defeat the very purpose of inpatient rehabilitation , or lead to constraints that are impossible to apply within current NHS practice.

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APPENDIX 1 - Example of an itemised risk/cleaning assessment log for rehabilitation equipment used with patients with CPE*

Can be cleaned and disinfected after each use and shared between CPE positive and negative patients	Cannot be cleaned and disinfected after each use but can be retained and cleaned and disinfected for future use with other patients	Cannot be reliably cleaned and disinfected and so needs to stay with the individual patient for as long as they need it and then safely disposed of	After patient use:	Manufacturers recommendations for cleaning item Do/Do Not
Therapy bike (e.g. Motormed or similar alternative).	N/A	N/A	All wipe-able surfaces should be decontaminated.	Please follow specific items manufactures guidelines for cleaning item. E.g. Do: Wipe down with a damp cloth using hospital grade disinfectant. Do not: Use bleach or acid based solutions.
Electric standing frame (e.g. Quest standing frame).	Electric standing frame sling	N/A	Sling to be loaned to infectious patient while using item and kept with them in their room. Sling to be deep cleaned as per manufactures guidelines once no longer required by the patient.	Please follow specific items manufactures guidelines for cleaning item.
Full body hoist	N/A	Sling	All wipe-able surfaces should be decontaminated. Single use sling to be allocated to patient during stay and disposed of when no longer required by the patient.	Please follow specific items manufactures guidelines for cleaning item.

Plinth / Tilt table	Tilt table straps	N/A	All wipe-able surfaces should be decontaminated. Straps to be loaned to infectious patient while using item and kept with them in their room. Straps to be deep cleaned as per manufactures guidelines once no longer required by the patient	Please follow specific items manufactures guidelines for cleaning item
N/A	N/A	Non wipe able therapy items: cards, puzzles, paper, canvas's, therapy paper assessments, miscellaneous craft items.	Not to be used with infectious patients unless as single use items. Paper assessment to be photocopies for single use.	N/A
Wheelchair frames including standard chairs and tilt in space wheelchairs Wipe-able upholstered surfaces such as back rests and arms rests	All cushions with removal washable covers i.e. pressure cushions, custom back rest cushions.	Fabric surfaces that cannot be reliably disinfected or cleaned.	All wipe-able surfaces should be decontaminated. All cushions with removal washable covers need to be washed between patient use as per manufactures guidelines.	Please follow specific items manufactures guidelines for cleaning item Cushion covers: To be washed as per manufactures guidelines on label

*** Please note this table is to be used as a guide only for how to do a risk/cleaning assessment log of rehabilitation items, not all rehabilitation items are on this list. Please check individual products manufacture guidelines for cleaning instructions. A local risk/cleaning assessment should be completed by each individual ward/unit.**

APPENDIX 2

CASE STUDY 1

This clinical case describes the barriers to rehabilitation faced by one of our more complex patients as a result of restricted access rehabilitation interventions and equipment.

Medical history

Mrs T is a 51 year old lady was admitted after the most recent of a series of strokes. She has a history of diabetes, complex visual impairment as a result of a combination of diabetic retinopathy and occipital lobe infarction and right below-knee amputation due to diabetes. She had an indwelling catheter and was incontinent of faeces. She was *E. coli* CPE positive.

Impairments

Mrs T required the assistance of two nurses to hoist transfer her from bed to chair and two physiotherapists to assist her to step transfer with a walking frame. She had significant cognitive impairment with marked difficulties with recall and, although a highly sociable lady, was unable to remember and weigh information to allow her to make informed decisions. She was unable to use written prompts as a memory aid due to her visual deficits.

Limitations due to CPE

The ward only had side rooms without ensuite shower/toilets and she was nursed in one of these side rooms. as a result of the need for contact isolation but found it difficult to understand why she could not come out to the day room to meet with other patients. She was unable to recall the need for isolation and became increasingly despondent. She remarked that it was 'difficult to socialise with others when I could only press the call bell for toileting, not to meet with the other patients'.
As a result of her CPE status, she could not go to the day room nor engage in group activities. Most of her therapy sessions were provided in the side room but she was unable to access the hydrotherapy pool or use equipment which would have been helpful for her including a standing frame or treadmill using a ceiling-tracked hoist. When Mrs T did have physio and OT sessions she engaged well and managed to achieve some physical improvements so that she could walk 10m with assistance in the gym, the furthest distance she had ever walked since her stroke. However she could only attend the gym at the end of the day which meant that she received physio and occupational therapy once or twice a week whereas other patients received these four times per week. As a result of this, Mrs T was unable to build on the gains she made.

Mrs T became increasingly withdrawn and began to refuse help with washing or feeding. She said that she felt 'like a leper' as a result of the IPC measures in place. She refused her insulin medication and her blood sugar levels became dangerously high. She became agitated and aggressive so that security was called on several occasions to help calm her down. She insisted that she wanted to go home where at least she could 'see people and go out with friends'.

Mrs T was discharged home 2.5 weeks after admission when the plan had been for an 8 week rehab programme. Despite having the potential to make significant physical gains, she had made little improvement and had become depressed and disengaged. On discharge she required 24 hour support at home provided by a full package of care and family involvement. This level of support could have been reduced had she been able to make the predicted gains after a period of intensive rehabilitation.

Possible solutions to address limitations:

- The provision of an isolation room with en-suite shower & toilet would have made infection control measures easier to implement. (Infection control in the built environment (Health Building Note 00-09, 2013). Mrs T needed to use a designated bathroom away from her room, which reduced toilet access for the other ward patients who also had mobility and cognitive needs.
- Use of single-patient use slings could have allowed her to use the treadmill using the support of a ceiling track hoist.
- Replacement of un-cleanable straps by fastenings which could be laundered or were single use would have allowed Mrs T to use the standing frame and assistive exercise bike.

CASE STUDY 2

Medical history

CM is a 48 year old gentleman with a longstanding history of alcohol and drug addiction. He had a diagnosis of HIV and was non-compliant with anti-retroviral medications. He was admitted in status epilepticus and was intubated in accident and emergency. He had brain imaging which showed a soft tissue abscess around the temporal area with was incised and drained. He had a prolonged stay on the intensive care unit with additional complications of Staph aureus bacteremia which was attributed to a scrotal abscess (which was incised and drained), aspiration pneumonia and renal failure requiring haemofiltration. He was stepped down onto the neurology ward and underwent a brain biopsy which was suggestive of inflammatory encephalitis. He was started on immunosuppression with intravenous methylprednisolone and rituximab.

Impairments

He was admitted to the specialist neurological rehabilitation unit in the same large inner London teaching hospital. On formal assessment he presented with right sided inattention, impaired coordination of right hand, with significant impact on dexterity. He was incontinent of urine especially at night. His balance was impaired which put him at high risk of falls. He had dysphagia requiring PEG feeding. In addition he had severe expressive and receptive dyshasia. Cognitive function was impaired with reduced memory, distractibility and confabulation.

Limitations due to CPE

This gentleman had a prolonged hospital stay of six months. During that time he was transferred twice back to the acute neurology ward due to seizures. He required extensive support from the Rehabilitation consultant-led MDT including nursing, SALT, Psychology, OT, PT, RA, SW for intensive rehabilitation and complex discharge planning. Limitations to accessing appropriate environments and groups (upper limb, conversation, newspaper, breakfast, lunch) was significantly impacted by his CPE status. This meant the intensity of his therapy was adversely affected as it was not possible to complement 1:1 sessions with group based therapy which is core to the rehabilitation setting. As a consequence he was unable to build on his functional gains to optimise his ability to return to the community setting.

Actions to address limitations

In order to address this, close liaison with infection control and microbiology team was initiated. Strict supervision of hand hygiene and continence management was put in place. He was able to participate in groups (additional 5-6 hours per weeks of therapy) and made good progress, enabling him to mobilise independently, navigating familiar environments, gaining more independence in washing, dressing and domestic activities. He was discharged home with our specialist community rehabilitation team and twenty-four hour carers, where the knowledge gained was shared in terms of the ongoing management of CPE to continue with his rehabilitation in the community.