Aneurin Bevan University Health Board

Infection Prevention and Control Policy

Control of Multi-Drug-Resistant Gram-Negative Bacteria

N.B. Staff should be discouraged from printing this document. This is to avoid the risk of out of date printed versions of the document. The Intranet should be referred to for the current version of the document.

Status: Issue 4 | Issue date: Feb 2022
Approved by: RNTG | Review by date: Feb 2025
Owner: Infection Prevention Team | Policy Number: ABHB/IPAC/0128

Contents:

1 Introduction

The Gram-Negative Bacilli (GNB) are a large group of bacteria that includes coliforms (such as *E. coli* and *Klebsiella*), *Pseudomonas* and *Acinetobacter.* While some GNB regularly cause infections such as UTI in uncomplicated patients, they are especially important in patients undergoing intensive care, chemotherapy or complex medical and surgical procedures, when they may cause opportunistic infections such as wound infections, septicaemia and hospital-acquired pneumonia.

The ability of these organisms to acquire resistance to virtually all antimicrobial agents presents both a therapeutic problem and a hazard from cross-infection in the healthcare setting, as well as in the community at large. Such resistance is increasing worldwide and is a global concern. It is imperative that strains that have acquired multiple drug resistance (MDR) are controlled to prevent dissemination of potentially untreatable infections.

As well as being part of the normal bacteria of the body, Gram-negative bacilli may be found in moist environments and provide a source of organisms that can take advantage of failure of standard cross-infection procedures. During an outbreak, colonization without symptoms is more common than infection, but colonized patients may quickly become seriously ill. Staff may be transiently colonized during an outbreak but are rarely clinically infected themselves.

2 Policy Statement

The Organisation’s aim is to provide optimum treatment for patients with known or suspected MDR-GNB infection and ensure staff are aware of the required infection control procedures. The Organisation’s policy for control of MDR-GNB will be continually monitored and updated in line with current professional guidelines.

3 Aims

This policy’s aim is that any suspected or known case of infection caused by Multi-Drug-Resistant Gram-Negative Bacteria (MDR-GNB) is managed appropriately.

This policy will support the implementation of the Welsh Standards for Health Services, particularly standard number 13a: 'Organisations and services comply with legislation and guidance on Infection Prevention and Control and decontamination in order to eliminate or minimise the risk of healthcare-associated and community-acquired infections.'

4 Objectives

This document will build on existing policies available within the Health Board to minimise the risk of cross infection to our patients and staff. It sets out a minimum standard required for infection prevention and control practices.

5 Scope of Policy

The policy applies to all healthcare workers working within Aneurin Bevan Health Board.

6 Acknowledgments

The Health Board would like to acknowledge the support of the Infection prevention Society (IPS) and the Joint Working Party for their expertise in the development working recommendations of multi drug resistant gram-negative bacteria

7 Roles and Responsibilities

Aneurin Bevan University Health Board must ensure that:

- Systems and resources are in place to facilitate implementation and compliance monitoring with infection prevention and control amongst all staff, including all agency or external contractors
- All staff must have access to the policy via the Organisation intranet
- Every employee has a duty to adhere to the policy at all times.

- All Managers are responsible for ensuring the policy is implemented and adhered to within their sphere of influence.

- Failure to implement the recommendation would result in greater cost in terms on economics and quality life.

8 Resources

Screening and isolation will result significant cost pressures in areas that are not currently practiced but these costs are set against the reduced transmission and fewer patients requiring antibiotic treatment.

9 Training

Training will be carried out as part of Level One training where awareness of the Infection Control Manual and its Infection Control Policies will be promoted. Specific training (Level Two) on the management of patients with suspected or known MDR-GNB disease will be provided to staff on request and targeted for members of staff on wards where such patients will be cared for and for those Organisation staff who may encounter these patients in community-based practice.

10 Implementation

To ensure the implementation of an effective management of known or suspected resistant gram negative bacterial infection it is essential that the Health Board adopts the specific advice related to transmission based precautions. This should be routine to individuals practice and an ongoing process.

11 Further Information Clinical Documents

The policy reflects evidence based practice from Public Health Wales, Health Protection Agency and the recommendations from the Joint Working Party for the prevention and control of multi-drug-resistant Gram Negative bacteria.

Information with regard to patients infectious status must be recorded within their notes and communicated appropriate on transfer and discharge

12 Health and Care Standards

The control of multi drug resistant gram negative policy will reflect the Health and care Standards for Wales. The framework will be assessed ensuring the standards are maintained and areas for improvement noted. This policy will be assessed by the Divisions via their annual review process identify best practice and areas of improvement that needs to be addressed.

13 Equality

Each patient and situation is required to be assessed on an individual bases recognising the potential risks to themselves, other patients, staff and the organisation**.** By undertaking this process of eliminating prejudice and discrimination, the Health Board can deliver services that are personal, fair and diverse and sustain safety and minimise the risk of cross infection.

14 Environmental Impact

Waste from patients with a known or suspected infection should be treated as Clinical Waste if generated in hospital, clinic or GP premises and must be put into an orange plastic bag. Higher risk waste may need to be disposed of into a yellow lidded rigid container for incineration – consult the Clinical waste Policy for details. Bags must be securely fastened when three-quarters full and taken to a designated storage area for clinical waste from which it should be collected for incineration. Clinical waste generated within patients' homes and residential homes can be disposed of in domestic refuse provided it is not known to contain pathogenic organisms such as a resistant gram-negative bacteria.

15 Audit

The Infection Prevention and Control Team will monitor compliance through surveillance and audit.

16 Further Information

16.1 Coliforms

Coliforms (such as *E coli, Klebsiella, Enterobacter*) are part of the normal colon bacteria and patients may become infected with organisms derived from their own bowel flora (or that of their mother for newborn babies who become colonized during delivery). Some patients, especially those receiving antibiotics and those who are severely ill, may acquire extensive colonization of their skin, particularly with *Klebsiella,* and their skin then acts as a source of organisms for the contamination of staff hands and transmission to other patients. Colonization of the stomach and upper airway can follow administration of Proton Pump Inhibitor or H_2 histamine antagonist drugs, and the susceptible patient may then develop pneumonia.

Resistance to gentamicin is often a marker for resistance to many other antibiotics and potential for epidemic spread. Coliforms that show gentamicin or broad-spectrum cephalosporin or carbapenem antibiotic resistance need to be prevented from becoming disseminated amongst patients. Once on staff hands, coliforms survive well and thus it is important that staff hand disinfection is carried out between patient contacts. Epidemic coliform infection may be due to bacterial contamination of an item of equipment or fluid, which acts as a common source of infection for several patients. Examples include contaminated enteral feeds or inadequately disinfected bedpans or other equipment that is reused by different patients. Aerosols from infected body fluids may cause cross-infection.

16.2 ESBL and AmpC – Producing Bacteria

"ESBL" stands for Extended Spectrum Beta-Lactamases, which are enzymes produced by certain bacteria that destroy, and so confer resistance to, a wide range of antibiotics. ESBL enzymes are most commonly produced by two types of bacteria – *E coli* and *Klebsiella* – making the infections they cause much more difficult to treat.

"AmpC" is another enzyme that causes similar concerns, particularly in *Enterobacter, Citrobacter, Serratia* and some *Proteus* species.

ESBL or AmpC-producing bacteria are mainly resistant to penicillins and cephalosporins, two of the most important and widely used

classes of antibiotics. They may also be resistant to other antibiotics such as gentamicin and ciprofloxacin. Serious infections often require the use of potent carbapenem antibiotics such as imipenem.

There is evidence that ESBL and AmpC-producing bacteria are carried in faeces, which may imply spread via the food chain, thereby producing a reservoir of multi-resistant bacteria in the gut. It is also possible for these bacteria to be passed from person to person on contaminated hands or by poor practice in urinary catheter care. It is urinary infections that happen most commonly with ESBL bacteria (both in hospital and in the community), though wound and chest infections and septicaemia also occur.

The infection control principles for ESBL and AmpC are the same as for other multiresistant bacteria transmissible by touch – i.e. 'contact' precautions in addition to routine 'standard' precautions and scrupulous hand hygiene.

16.3 Carbapenemase Producers (CPE)

Carbapenem antibiotics (imipenem, meropenem, ertapenem and doripenem) are invaluable for the treatment of infections due to MDR-GNB, including those with ESBL or AmpC. Carbapenem-resistant coliform bacteria remain rare but are emerging worldwide, including in Wales. *Please see HB policy for CPE for further information*

16.4 Multi-resistant Acinetobacter baumannii (MRAB)

Acinetobacters are environmental organisms that are widespread both in and outside healthcare premises. The main species associated with human infection is *Acinetobacter baumannii*. It is widely prevalent in static water and is frequently found in the hospital environment and easily cultured from fomites and other equipment, particularly in an outbreak.

Acinetobacters are generally organisms of low virulence. Most commonly, they are found colonising the skin, respiratory tract and urine of patients. Those who are most susceptible are: immunosuppressed; in intensive care and similar high-density environments; and/or on broad spectrum antibiotics, particularly those with little activity against *A. baumannii.*

Acinetobacters are occasionally invasive, causing wound infections, nosocomial pneumonia and urinary infection. Multi-antibiotic

resistant forms of *A. baumannii* (MRAB) occur and can be difficult to treat. It is important to distinguish colonisation from infection to avoid the unnecessary use of antibiotics, which may make the clinical situation worse, as well as reinforcing the selective pressure that allows multi-resistant organisms to propagate in the environment.

A. baumannii is intrinsically resistant to most commonly available antibiotics. Hence it is able to survive in the hospital environment, and also to colonise susceptible patients being treated with broad-spectrum antibiotics. Strains that cause infection are liable to be even more resistant than colonising strains. Injudicious use of antibiotics, particularly fluoroquinolones (e.g. ciprofloxacin) or carbapenems (e.g. imipenem) leads to the emergence of more resistant forms of colonising strains.

Occasional strains are resistant to ALL antibiotics currently available. Recommended management is – when possible and prudent – to withhold antibiotics and hopefully allow the patient to recover their normal colonising flora. Close liaison between the clinical team and the Microbiologists is essential if this course of action is to be followed.

16.5 Pseudomonads

Pseudomonas species and related organisms such as *Stenotrophomonas maltophilia*, unlike the coliforms, are only occasionally found in the normal gut, although hospital patients may become colonized. Moist equipment such as ventilators, suction catheters and contaminated fluids constitute a reservoir of pseudomonads which can provide a source of organism for the direct colonization and infection of patients. Pseudomonads are intrinsically resistant to many antibiotics and multi-resistant strains can be extremely difficult to treat. Invasive disease is associated with a high mortality.

16.6 Candida auris

Candida auris is an emerging fungus that presents a serious global health threat. Healthcare facilities in several countries have reported that *C. auris* has caused severe illness in hospitalized patients. Some strains of *C. auris* are resistant to all three major classes of antifungal drugs. This type of multidrug resistance has not been seen before in other species of *Candida*. *C. auris* can

persist on surfaces in healthcare environments and spread between patients in healthcare facilities.

17 Special Units

Areas of particular concern in relation to risk of transmission of coliforms, acinetobacters and pseudomonads are neonatal, paediatric and adult critical care units; ophthalmology clinics and surgery; units caring for burns and neutropenic patients; endoscopy units; and hydrotherapy pools.

18 Preventive and Control Meaasures

As there are a number of different types of MDR-GNB that are of greater or lesser concern, the appropriate response is flexibly applied as judged by the Consultant Microbiologists / Infection Prevention and Control Team.

18.1 Health Board engagement

It is critical that the Board and its Executive make it a high priority to minimise spread of MDR-GNB and are supportive of all prevention and eradication measures. A containment plan is outlined below.

18.2 Laboratory methods

The microbiology laboratory will continuously review and optimise its methods for the detection of the various types of MDR-GNB and refer suspected bacterial strains for confirmation and for epidemiological purposes to appropriate reference laboratories of Public Health Wales or the Health Protection Agency. Screening specimens for MDR-GNB will be examined from associated patients and the environment when cases occur, as deemed appropriate by the Medical Microbiologist / Infection Control Doctor.

Patients with a travel history (i.e., countries or known endemic areas visited within the previous year) should be screened for with carbapenemase-producing gram negative bacteria.

18.2.1 Definitions of problem resistance

Organisms with the following resistance problems are of particular concern:
Coliforms resistant to carbapenems.

Coliforms resistant to drugs from two or more the classes of fluoroquinolones, aminoglycosides, or third generation cephalosporins.
Pseudomonads resistant to three or more classes of antibiotics
Acinetobacters resistant to carbapenems.

18.3 Antibiotic stewardship policies

Excessive use of broad-spectrum antimicrobials will encourage the emergence of multi-resistant organisms. A Health Board Antimicrobial Working Group will ensure that stewardship measures are in place to promote optimal and safe usage to minimise the acquisition and spread of resistance. Antimicrobial prophylaxis for surgery should be as narrow spectrum as clinically possible, preferably restricted to a single dose, in all but the most exceptional circumstance.

18.4 Disinfection of equipment

An effective decontamination strategy is required. Moist respiratory equipment, (such as ventilator tubing, nebulizers and humidifiers that come into direct contact with the patient) is easily contaminated. It is important that the correct procedures for decontamination are followed and that the equipment is properly dried before use for subsequent patients. Follow the manufacturer's instructions or consult the Cleaning and Disinfection section of the Infection Control Manual. Disinfectors such as bedpan washers must be maintained and checked regularly to ensure that adequate temperatures are being reached (normally 80°C for at least one minute), and records of maintenance must be kept.

18.5 Cleaning and Environment

Environmental screening should be considered where there are unexplained transmissions of MDR gram negative organisms or a possible common source outbreak which will be requested by the IPT if required.

Following discharge of a patient with confirmed MDR gram negative bacteria the environment/isolation cubicle will be required to undergo hydrogen peroxide vapour clean

18.6 Reusable drugs

All creams, ointments and gels and liquids used with medical equipment (e.g. nebulizers) must be stored in such a way as to prevent contamination and patient-to-patient spread of Gram-negative organisms. Single-use disposables are preferred if they are available.

18.7 Hand hygiene

All staff who have contact with patients must employ good hand disinfection practices and use disposable gloves and aprons when hand contamination is likely. The routine use of alcohol-based hand rubs will generally be replaced by use of soap and water for hand hygiene for critical resistance events. Monitoring of standard precautions is essential during patient care or cohort nursing.

18.8 Healthcare environment

Spread can be minimised by effective enhanced and terminal cleaning with chlorine-based disinfectants. All shared services and high-contact areas such as lavatories, bathrooms, etc., should be cleaned at least daily and kept dry. Sink traps inevitably harbour organisms which cannot be completely removed by disinfectants. It is therefore important not to splash water from the sink to adjacent areas.

18.9 Pharmaceutical preparations

Drugs and other products should be reconstituted or prepared according to the guidance of the Medicines and Healthcare Products Regulatory Agency (MHRA) or other professional institutions. Suspected contamination of commercially purchased products must be reported to the MHRA for investigation. Further guidance on reporting pharmaceutical contains full guidance on reporting pharmaceutical product defects: http://howis.wales.nhs.uk/sitesplus/866/document/230082

18.10 Infection surveillance

The Infection Prevention and Control Team undertake surveillance of all laboratory reports to identify patients who are colonized or infected with resistant coliforms, acinetobacters or pseudomonads. Resistance to gentamicin, broad-spectrum cephalosporins (e.g. cefotaxime, ceftazidime) or carbapenems are the usual markers for multi-resistance, which will require measures to prevent

colonization or infection of other patients. Incident tracking, epidemiological graphs and tables will be prepared if transmission is detected.

In the event of secondary cases of CPE, standard infection control precaution and contact precautions should be monitored and reinforced among clinical staff.

18.11 Patient isolation

The Infection Prevention and Control Team in conjunction with appropriate clinical managers will identify places for effective isolation, e.g., en-suite rooms and cohort areas with dedicated commodes and consider criteria for any ward closure and re-opening to new admissions. In some circumstances it will be necessary implement the containment action immediately, with meticulous adherence to 'Standard' and 'Contact' Precautions that will be advised.

In many sporadic cases, there will be no evidence of cross-infection, as resistant strains can arise through selective antibiotic pressure. Restriction of admissions to the unit may be necessary, depending on the number of patients affected and the number of infections compared with colonization.

Increased patient risk group:-

- Multiple hospital admissions
- Transfer from a hospital outside of the United Kingdom
- Transfer from hospitals within the United Kingdom who are known to have a high prevalence of MDRO cases
- Recent history of close contact with a person who has been within one of the identified 'high risk' hospitals
- Previous history of MDRO colonisation or infection
- Known exposure to MDRO and/or contact with a confirmed case
- Prolonged in-patient stays or long-term care facility
- Indwelling devices, e.g. urinary catheter or central venous catheter
- Severe disease and multiple co-morbidities
- Admission to a critical care unit
- Open wounds
- Dialysis
- Structural lung disease/bronchiectasis
- Conditions that cause skin breakdown

- Multiple courses of broad-spectrum antibiotics

18.12 Screening

Identification of further asymptomatic colonized and infected cases may need screening of patients in the affected unit – both index patients and secondary case contacts – with the intention of immediate isolation of cases found, determining the extent of spread and to enable flagging, when appropriate, both of case records and electronically on PAS systems. If flagged patients are re-admitted they must be placed in isolation pending discussion with the Infection Prevention and Control Team and re-screened at time of admission.

Weekly screening of continuing patients and patient screening on discharge from affected units until the MDR-GNB organism is eliminated may be advised. Typically, rectal swabs (with visible material) and urine, together with oropharyngeal or respiratory secretions from intensive care patients, and skin swabs from burns patients will be required. Occasionally it may be necessary to screen staff and close household contacts of cases.

Patients at high risk for being positive for carbapenemase-producing MDR-GNB should be screened on admission, e.g. known positives, those with prior hospitalization or dialysis in countries where such strains are prevalent – currently: India, Pakistan, Greece, USA, Israel, Turkey, Middle East and North Africa.

18.13 Patient transfer

Adequate communication to other healthcare providers is essential to ensure that, if required, appropriate isolation is maintained if patients are transferred between units, with prior notification to the receiving care team. The transportation service must also be informed to allow for post-transfer decontamination by the procedures in their internal policy.

19 References

Management of Multi-Drug Resistant Organisms in Healthcare Settings. Healthcare Infection Control Practices Advisory Committee, Centers for Disease Control and Prevention, 2006. http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf

Wilson APR, et al. Prevention and control of multi-drug-resistant Gram-negative bacteria: recommendations from a Joint Working Party. Journal of Hospital Infection 2016, Volume 92, Supplement 1, Pages S1–S44
http://www.journalofhospitalinfection.com/article/S0195-6701(15)00314-X/pdf

Center for Disease Control and Prevention (CDC) Management of MDROs in healthcare settings (CDC 2006): https://www.cdc.gov/infectioncontrol/guidelines/mdro/recommendations.html

Department of Health, 2013, *UK Five Year Antimicrobial Resistance Strategy 2013 to 201*8. Department of Health
NHS Scotland's National Infection Prevention and Control Model Policies NIPCM) on-line: www.publichealthwales.org/nipcm and www.iechydcyhoedduscymru.org/nipcm

Public Health England: Guidance for the laboratory investigation, management and infection prevention and control for cases of *Candida auris,* August 2017 (v2.0): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/637685/Updated_Candida_auris_Guidance_v2.pdf

Hospital Infection Society: Prevention and control of multi resistant Gram negative bacteria – recommendations from a Joint Working Party(2016):http://www.journalofhospitalinfection.com/article/S0195-6701(15)00314-X/pdf

Loveday, H.P., Wilson, J., Pratt, R.J., Golsorkhi, M., Tingle, A., Bak, A.,Browne, J., Prieto, J. and Wilcox, M., 2014. epic3: national evidence based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *Journal of Hospital Infection*,

86,pp.S1S70.https://www.his.org.uk/files/3113/8693/4808/epic3_National_EvidenceBased_Guidelines_for_Preventing_HCAI_in_NHSE.pdf

Welsh Government: Prudent Healthcare, December 2016. https://gov.wales/topics/health/nhswales/about/prudenthealthcare/?lang=en

NHS Shared Services Partnership: Welsh Health Building Notes (WHBN) and Health Building Notes (HBN). Access to web link (last updated 30th June 2017): http://www.wales.nhs.uk/sites3/page.cfm?orgid=254&pid=64096

Public Health Wales: Multi Drug Resistant Organisms (MDRO) resource page:http://howis.wales.nhs.uk/sitesplus/888/page/72809