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A Clinical Guideline for the Prevention and Control of Multidrug Resistant Organisms (MDRO) including Multi-Resistant Gram-negative Bacteria (like ESBLs) and Glycopeptide resistant enterococci (GRE/VRE)

For Use in:	All Clinical areas within the Norfolk and Norwich University Hospital NHS Foundation Trust (NNUH)
By:	All staff with direct patient contact
For:	Prevention and control of multi-drug resistant organisms (MDRO)
Division responsible for document:	Corporate
Key words:	Multi-resistant Gram negative Bacteria (including ESBLs) and Glycopeptide resistant enterococci (GRE/VRE)
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Compliance links: *(is there any NICE related to guidance)*	Public Health toolkit
If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?	No deviation

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Version and Document Control:

Version Number	Date of Update	Change Description	Author
1.3	26/08/2021	Further extension given to 30/11/2021 to allow for review	IP&C Team
1.4	11/02/2022	Reviewed and remains current	IP&C Team

This is a Controlled Document

Printed copies of this document may not be up to date. Please check the hospital intranet for the latest version and destroy all previous versions.

1. Contents page

2. Quick reference

Key aspects of management

Why MDROs are important?

- Increasing clinical problem
- Difficult to treat
- Increase mortality
- Prolonged length of stay
- Recognition of outbreaks

Priorities

- Identification of these organisms by the lab
- Early Isolation

Infection Prevention & Control Strategies

- Hand Washing/ Decontamination
- Personal Protective Equipmnt
- Isolation
- Optimal Cleaning
- Education
- Antibiotic prescribing policies

Management of patients

- Differentiate colonisation from infection
- Remove/drain sources of infection (catheters, lines etc)
- Contact duty Medical Microbiologist for antibiotic advice

3. Objectives

The guidance provided in this document aims to identify the measures to be taken to minimise the risks of cross infection with these organisms, and the appropriate management of patients and the health care environment.

3.1 Staff groups

Chief Executive - has overall responsibility for ensuring there are effective procedures and resources in place to enable the implementation of this Management of MDRO Guideline.

DIPC - has strategic responsibility within the Trust for the development and implementation of IP&C guidelines for best practice.

Divisional Managers/Matrons/Ward Managers - are responsible for ensuring they have a process in place to reassure the organisation that all staff are aware and receive appropriate training. They also have the responsibility to ensure compliance and good IP&C practice during clinical care.

Operation Centre Team
Patients transferred from hospitals overseas must be routinely notified by site practitioner and clinical team to IP&C and isolated on admission until screening results exclude MDRO's.

IP&C Team (IP&CT) - is responsible for reviewing this guidance and amending infection control aspects as required at the review date, or prior to this following new developments to reflect current best practice. The IP&CT have a responsibility to offer specialist advice and support to staff regarding infection control aspects of the MDRO guideline.

Microbiology Department - is responsible for rapidly processing specimens, reporting the results, notifying the clinical team and IP&CT and offering advice regarding the treatment of patients with MDROs.

Microbiology lab routinely screens all clinical isolates for the presence of drug resistance.

The lab also has responsibility for reporting resistant isolates to Public Health England via the Cosurv system.

All Staff - have a responsibility to ensure they follow the advice in this Management of MDRO Guideline and must ensure they attend appropriate training. Any deviations from these guidelines must be discussed with a member of the IP&CT and clearly documented including risk assessments made.

It is the responsibility of each employee to be aware of the procedural documents which relate to their department/area of practice.

3.2 Exceptions/ contraindications

This document does not address issues of laboratory diagnosis and/or treatment of infection caused by these organisms:

a) Meticillin Resistant Staphylococcus aureus (MRSA). See MRSA Management Trustdocs Id: 6798

b) Carbapenemase-Producing Enterobacteriaceae (CPE's). See Carbapenemase-producing Enterobacteriaceae (CPE) (Trust Guidelines for the Management of) Trustdocs Id: 11549

This document doesn't refer to Neonatal Intensive Care Unit (NICU). For NICU there are separate MDRO guidelines. See Screening for Resistant Organisms Trustdocs Id: 7881

4. Rationale

Over the years bacteria have developed different mechanisms in order to resist the action of antimicrobial agents. Pathogens resistant to multiple antibiotics are considered MDRO and constitute a major global health problem.

Infection - results when micro-organisms capable of causing disease have gained access to the host multiplied and caused an adverse effect.

Colonisation - the presence of micro-organisms in or on the surface of the body with no adverse effect on the host.

Some bacteria exhibit intrinsic resistance to certain classes of antibacterial agents (e.g. *K.pneumoniae* to Ampicillin). In addition, bacteria that are ordinarily susceptible to antibacterial agents can acquire resistance. Acquired resistance is a major limitation to effective antibacterial chemotherapy.

4.1 Gram-negative Bacteria

The Gram-negative bacteria are a large, heterogeneous group of organisms. One of the biggest families is the *Enterobacteriaceae* (coliforms) whose natural habitat is the intestinal tract of humans and animals. This family includes many genera (*Escherichia, Klebsiella, Proteus, Serratia, Enterobacter, Citrobacter* and others).These bacteria are widely found in the environment and as part of normal skin flora. They may survive for many months at room temperature. They cause a wide range of infections in susceptible patients including urinary tract infections, pneumonia, gastrointestinal tract infections, wound infections and septicaemia. Some may also cause endocarditis or meningitis.

Other gram negative bacteria like *Pseudomonas* and *Acinetobacter* are opportunistic pathogens and are widely distributed in soil and water. *P. aeruginosa* can cause infections, particularly among immunocompromised people (HIV or cancer patients on treatment), neonates and persons with severe burns, diabetes mellitus and cystic fibrosis. *Acinetobacter sp tend to present mainly in the context of ITU and HDU (Critical Care Complex: CCC)* and can cause suppurative infections in almost every organ system.

4.2 Extended spectrum beta lactamases (ESBLs)

Enzymes (β lactamases) produced by gram negative organisms that confer resistance to β-lactam antibiotics: penicillins, cephalosporins, monobactams (aztreonam) and frequently to β-lactam/ β-lactamase inhibitor combinations (Co-amoxiclav, Tazocin etc). In addition these β-lactamase producing organisms may also be resistant to other groups of antibiotics like gentamicin and/or ciprofloxacin.

4.3 AmpCs

Enzymes (β lactamases) produced by gram negative organisms that confer resistance to the same substrates as ESBLs plus the cephamycins, a subset of the second generation cephalosporins.

4.4 Carbapenemases: (e.g Klebsiella pneumoniae carbapanemase-KPC, New Delhi metallo-beta-lactamase NDM etc)

Enzymes (β lactamases) produced by Gram- negative organisms called CPE that confer resistance to the same substrates as ESBLs plus the cephamycins and the carbapenems (Meropenem, Ertapenem, Imipenem etc.) CPE's have caused multiple outbreaks in the UK in the last 5 years. They are an increasing problem and have been identified as a priority in the new UK Antimicrobial Resistant Strategy Action Plan 2013-2-18 (HPA Feb 2013).

Resistance to this major group of antibiotics greatly limits the treatment options for infections caused by these Gram-negative bacteria.

4.5 Enterococci

Enterococci are gram positive bacteria commonly found in the bowel of normal healthy individuals. They can cause a range of illnesses including urinary tract infections, bacteraemia, endocarditis, meningitis, intra-abdominal infections and wound infections. They are relatively low grade pathogens, usually causing colonization rather than infection. Most enterococcal infections are endogenous.

4.6 Vancomycin-Resistant Enterococci (VRE)/Glycopeptide resistant enterococci (GRE)

*Enterococc*i (*Enterococcus faecalis, Enterococcus faecium* etc.) that are resistant to Vancomycin (VRE) and/or Teicoplanin (GRE). *E.faecalis* (causes about 90% of clinical isolates) usually demonstrates susceptibility to penicillins while *E.faecium* is intrinsically resistant.

Colonisation or infection with Vancomycin-resistant enterococci (VRE) have become common in many hospitals. Three major Vancomycin resistance phenotypes have been described: VanA, VanB and VanC. The VanA phenotype is associated with high level resistance to Vancomycin and to teicoplanin. VanB and VanC strains are resistant to Vancomycin but susceptible to Teicoplanin although Teicoplanin resistance may develop during treatment in VanB strains.

4.7 Transmission of MDRO

MDRO have an affinity for both warm moist places and dry environments. Outbreaks in critical care and high dependency areas have been related to damaged/ contaminated mattresses and pillows, and humidification chambers.

The main route of transmission is via the hands of healthcare workers, who have contact with colonised or infected patients, their secretions/excretions, contaminated equipment or environmental surfaces where these organisms are able to survive for long periods of time.

There are many complex factors which may be responsible for the spread of these organisms, such as patients being moved between units due to bed pressures, low staffing levels, lapses in hand hygiene and inadequate equipment decontamination.

Risk factors for acquisition of these organisms include:

- Frequent or prolonged hospitalisation.
- Stay in a nursing or residential home.
- Immunosuppression.
- Urinary catheterisation.
- Previous treatment with antibiotics.
- >60 years of age.
- Transfer from other healthcare facilities.
- Contact with healthcare overseas in previous 12 months.
- Presence of devices e.g. intravascular catheters, PEG tubes etc.
- History of previous colonisation or infection with MDRO.
- History of close contact with individual who is/has been colonised or infected with MDRO.

5. Scope

IP&C requires prudent antibiotic use by medical staff, education of staff regarding the problem of resistance, early detection and reporting resistant strains by the microbiology department and implementation of appropriate infection control measures to prevent transmission.

6. Processes to be followed

The procedures outlined below identify the specific measures required for the control of these organisms.

Appropriate use of antibiotics will greatly reduce the selection pressure for infection with MDROs. Those prescribing antibiotics should adhere to the Trust's Antibiotic Guidelines.

The clinical assessment of these patients is paramount, and if deemed to require antibiotic treatment for infection, the Consultant or Specialist Registrar in charge of the case should contact the duty medical microbiologist on ext. 4587, Monday to Friday 09:00 – 17:00 and out of hours, weekends and bank holidays via the NNUH switchboard.

6.1 IP&C Measures

Alert organism surveillance

All clinicians are notified electronically via ICE for all MDROs. They may also be telephoned by the microbiologist to the clinical team depending on significance and site of infection. The IP&CT will be notified via the lab Tpath system through ICnet. The DIPC reviews all alert organisms with the IP&CT regularly; data is reported Trust wide via the IP&C monthly report.

Precautions in Operating Departments

All operating department personnel having direct patient contact should wear gloves and aprons, and should wash their hands following removal of protective clothing and before contact with the next patient.

Theatre staff should be notified in advance of a patient's positive MDRO result. The patient should be bathed/showered, and have clean laundry and gown prior to admission to the Theatre Suite. The bed may then be stored outside theatre without changing laundry. The bed should be labelled with the patient's name.

The patient should be admitted to anaesthetic room for their anaesthetic/preparation. Patients may be brought into the anaesthetic room whilst the previous case is in theatre as long as the doors to the anaesthetic room remain closed.

Dedicated staff must be identified to look after the patient until the other patient has left the theatre. The number of personnel in theatre for infected cases should be kept to a minimum. Staff not in theatre dress should not enter the suite. The telephone should be used to contact staff rather than opening theatre or anaesthetic room doors.

Following the operative procedure the patient is recovered in a designated recovery area for 'infected patients'. Recovery staff must be notified in advance of a patient's positive MDRO result. The allocated recovery staff member must remain with that patient until s/he is returned to the ward. If the patient has open wounds where containment of fluids is not possible, e.g. burns, they should be recovered in the theatre prior to transfer back to ward.

Staff members, who have open wounds/lesions, particularly on the hands/forearms, should keep wounds covered and seek advice from Workplace Health and Wellbeing.

It is preferable that MDRO positive patients go at the end of morning or afternoon lists to allow staff time to undertake thorough cleaning, i.e. change clinical waste bins, clean surfaces and items that have been in direct contact with the patient.

Large items of equipment not in use may be pushed to the edge of the theatre, although staff must take care not to contaminate them with gloves. It is not necessary to empty this equipment out of the theatre for cases with confirmed MDRO.

6.1.1 Type of Infection/Infecting Agent: Multi-Resistant Gram-negative Bacteria (including ESBLs). For CPE's see Carbapenemase-producing Enterobacteriaceae (CPE) (Trust Guidelines for the Management of) Trustdocs Id:11549

Precaution / measure	YES/NO or N/A	COMMENTS
Isolation	**Yes**	Isolate patient in single room with enteric precautions
Can be cohorted (multiple patients in one bay)	**No**	Unless in special circumstances as directed by the DIPC/ICD
Gloves	**Yes**	Wash hands with soap and water after removing gloves. Change gloves and decontaminate hands when moving from a contaminated site to a clean site of the same patient.
Aprons	**Yes**	Remove before leaving room
Mask	**Occasionally**	Only if patient is sputum positive with productive cough, especially if staff performing aerosol generating procedures.
Special cleaning measures	**Yes**	Clinical clean ext. 3333, after discharge/transfer code 2 (refer to clinical clean guidelines).
Patient / relatives information	**Yes**	Ward staff/Drs need to explain the result, treatment and advise patient about hand hygiene, not touching catheter, wound etc. ESBLs (Extended-spectrum beta-lactamases) information for patients, relatives and carers Trustdocs Id:3004
Precautions in operating theatres	**Yes**	See section 6.1
Antibiotic Management	**If clinically indicated**	If signs of infection, contact Duty Medical Microbiologist for clinical review and advice.
Repeat Screening	**Not routinely**	If patient being transferred to another Healthcare Institution, or as directed by IP&CT. Routine admission screening is carried out in NICU.
Inform Workplace Health & Wellbeing	**No**	Unless when managing an outbreak in which staff screening is required as directed by the DIPC/ICD.
Inform others	**Yes**	Ensure other departments/wards are notified as appropriate when patient is transferred for diagnostic/therapeutic purposes.

6.1.2 Type of Infection/Infecting Agent: Glycopeptide resistant enterococci/ Vancomycin-Resistant Enterococci (GRE/VRE)

Precaution / measure	YES/NO or N/A	COMMENTS
Isolation	**Yes**	Isolate patient in a single room with enteric precautions.
Can be cohorted (multiple patients in one bay)	**No**	Unless special circumstances as directed by the DIPC/ICD.
Gloves	**Yes**	Wash hands with soap and water after removing gloves. Change gloves and decontaminate hands when moving from contaminated site to a clean site of the same patient.
Aprons	**Yes**	Remove before leaving room.
Mask	**Occasionally**	Only if patient is sputum positive with productive cough, especially if staff performing aerosol generating procedures.
Special cleaning measures	**Yes**	Clinical clean ext. 3333, after discharge/transfer code 2 (refer to Clinical Clean Codes Guide Trustdocs Id:10706)
Patient / relatives information	**Yes**	Ward staff/Drs need to explain the result, treatment and advise patient about hand hygiene, not touching catheter, wound etc. Q&A information available from the Trust Website Vancomycin-resistant enterococci Page.
Precautions in operating theatres	**Yes**	See section 6.1
Antibiotic Management	**If clinically indicated**	If signs of infection, contact Duty Medical Microbiologist for clinical review and advice.
Repeat Screening	**Not routinely**	If patient being transferred to another Healthcare Institution, or as directed by IP&CT.
Inform Workplace Health & Wellbeing	**No**	Unless when managing an outbreak in which staff screening is required as directed by the DIPC/ICD.
Inform others	**Yes**	Ensure other departments/wards are notified as appropriate when patient is transferred for diagnostic/therapeutic purposes

7. Clinical audit standards

Clinical Audit Standards derived from Guideline, please refer to the attached Monitoring Effectiveness Table (page 13).

8. Summary of development and consultation process undertaken before registration and dissemination

This Management of Multiple Resistant Bacteria Guideline was sent out for consultation to the following groups:

Matrons and Senior Nurses	HICC Members
Ward Sisters and Charge Nurses	Consultant Microbiologists
Health and Safety	IP&CT
Workplace Health and Wellbeing	Consultant representatives from key high risk areas namely CCC, NICU, Renal unit, Haematology/Oncology.

9. References

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10. Associated Documentation

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Department of Health [2011] Isolating patients with healthcare associated infection: A summary of best practice. Available at: http://webarchive.nationalarchives.gov.uk/20120118171850/http://hcai.dh.gov.uk/files/2011/03/Document_Isolation_Best_Practice_FINAL_100917.pdf

11. Equality Impact Assessment (EIA)

This policy has been screened to determine equality relevance for the following equality groups: race, gender, age, sexual orientation and religious groups. This policy is considered to have little or no equality relevance.

Element to be monitored	Lead Responsible for monitoring	Monitoring Tool / Method of monitoring	Frequency of monitoring	Lead Responsible for developing action plan & acting on recommendations	Reporting arrangements	Sharing and disseminating lessons learned & recommended changes in practice as a result of monitoring compliance with this document
Compliance with isolation for patients positive for MDRO	IP&CT	Business Objects Report.	Annual	IP&CT	HICC, Clinical Governance. IP&C monthly report	The Lead responsible for developing the action plans will disseminate lessons learned via the most appropriate committee e.g. Clinical Effectiveness; Clinical Governance, Patient Safety.