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)

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1.3	26/08/2021	IP&C Team	Further extension given to 30/11/2021 to allow for review
1.4	11/02/2022	IP&C Team	Reviewed and remains current
2	June 2024	IP&C Team	New template and updated references/other resources

Previous Titles for this Document:

Previous Title/Amalgamated Titles	Date Revised
None	Not applicable

Distribution Control

Printed copies of this document should be considered out of date. The most up to date version is available from the Trust Intranet.

Consultation

The following were consulted during the development of this document:

Matrons and Senior Nurses	HICC Members
Ward Sisters and Charge Nurses	Consultant Microbiologists
Health and Safety	IP&C Team
Workplace Health and Wellbeing	Consultant representatives from key high risk areas namely Critical Care Complex (CCC), Neonatal intensive care unit (NICU), Renal unit, Haematology/Oncology.

Monitoring and Review of Procedural Document

The document owner is responsible for monitoring and reviewing the effectiveness of this Procedural Document. This review is continuous however as a minimum will be achieved at the point this procedural document requires a review e.g. changes in legislation, findings from incidents or document expiry.

Relationship of this document to other procedural documents

This document is a clinical guideline applicable to Norfolk and Norwich University Hospital NHS Foundation Trust; please refer to local Trust's procedural documents for further guidance, as noted in Section 5.

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Key aspects of management

1. Introduction

1.1. Rationale

Over the years bacteria have developed different mechanisms 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. *Klebsiella 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.

1.1.1. 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. *Pseudomonas aeruginosa* can cause infections, particularly among immunocompromised people (Human Immunodeficiency Virus (HIV) or cancer patients on treatment), neonates and persons with severe burns, diabetes mellitus and cystic fibrosis. *Acinetobacter species tend to present mainly in the context of Intensive Therapy Unit (ITU) and High Dependency Unit (HDU)(Critical Care Complex: CCC)* and can cause suppurative infections in almost every organ system.

1.1.2. 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.

1.1.3. 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.

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

Enzymes (β lactamases) produced by Gram-negative organisms called Carbapenemase-producing Enterobacteriaceae (CPE) that confer resistance to the same substrates as ESBLs plus the cephamycins and the carbapenems (Meropenem, Ertapenem, Imipenem etc.).

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

1.1.5. 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.

1.1.6. 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). *Enterococcus faecalis* (causes about 90% of clinical isolates) usually demonstrates susceptibility to penicillins while *Enterococcus 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.

1.1.7. 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.

Transmission Based Precautions (TBP) may be required when caring for patients with known/suspected infection or colonisation, TBPs are categorised by route of transmission of infectious agents, some of which can be transmitted by more than one route. (NHS England, 2022)

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, percutaneous endoscopic gastrostomy (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.

1.2. Objective

The objective of the clinical guidelines is 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.

1.3. 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.

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
b) Carbapenemase-Producing Enterobacteriaceae (CPEs). See Carbapenemase-producing Enterobacteriaceae (CPE) (Trust Guidelines for the Management of)

This document doesn't refer to NICU. For NICU there are separate MDRO guidelines. See Screening for Resistant Organisms

1.4. Glossary

The following terms and abbreviations have been used within this document:

Term	Definition
CCC	Critical Care Complex
CPE	Carbapenemase-producing Enterobacteriaceae
DIPC	Director of Infection Prevention and Control
ESBL	Extended spectrum beta lactamases
GRE	Glycopeptide resistant enterococci
HDU	High dependency unit
HICC	Hospital Infection Control Committee
HIV	Human Immunodeficiency Virus
ICD	Infection Control Doctor
ICE	Comprehensive electronic pathology test-requesting system
ICnet	Clinical surveillance software used by the IP&C team
IP&C	Infection Prevention & Control
ITU	Intensive Therapy Unit
MDRO	Multi-drug resistant organisms
MRSA	Meticillin resistant Staphylococcus aureus
NICU	Neonatal intensive care unit
NNUH	Norfolk and Norwich University Hospital NHS Foundation Trust
PEG	percutaneous endoscopic gastrostomy
TBP	Transmission Based Precautions
UKHSA	UK Health Security Agency
VRE	Vancomycin-Resistant Enterococci

2. Responsibilities

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

IP&C Team - 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&C team have a responsibility to offer specialist advice and support to staff regarding infection control aspects of this guideline.

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

The lab also has responsibility for reporting to United Kingdom Health and Security agency as required.

All Staff - have a responsibility to ensure they follow the advice in this guideline and must ensure they attend appropriate training. Any deviations from these guidelines must be discussed with a member of the IP&C team 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. 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 ext. 4589, Monday to Friday 09:00–17:00 and out of hours, weekends and bank holidays via the NNUH switchboard.

3.1. IP&C Measures

Alert organism surveillance

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

Precautions in Operating Departments

Reducing the risk of introducing MDROs into the theatre environment is crucial to minimise the risks of clinical infection and surgical site infection with these highly antimicrobial resistant organisms.

Theatre staff must be notified in advance of a patient's MDRO status (i.e. screen in progress/colonised /infected) which should be identified in pre-assessment or from the inpatient ward. 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 they return 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.

3.1.1. Multi-Resistant Gram-negative Bacteria (including ESBLs).

For CPEs see Carbapenemase-producing Enterobacteriaceae (CPE) (Trust Guidelines for the Management of)

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	**Risk assess**	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). Cleaning and Disinfection (Trust Guideline)
Patient/relatives information	**Yes**	Ward staff/Doctors need to explain the result, treatment and advise patient about hand hygiene, not touching catheter, wound etc. ESBL information for patients, relatives and carers ESBLs (Extended-spectrum beta-lactamases) information for patients, relatives and carers
Precautions in operating theatres	**Yes**	See section 3.1
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&C. 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.

3.1.2. 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	**Risk assess**	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).
Patient/relatives information	**Yes**	Ward staff/Doctors 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 3.1
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&C.
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.

4. Related Documents

- IV to Oral Antibiotic Switch Guideline
- Antibiotic Policy (Adults)
- Paediatric Antibiotic Policies
- Duration of Antibiotic Course
- Diagnosis Specific Precautions A-Z Guide
- Cookson, B.D. et al., 2006. Guidelines for the control of glycopeptide-resistant enterococci in hospitals. *The Journal of hospital infection*, 62(1), pp.6–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/16310890 (Accessed March 2023).
- Gov.UK (Last updated 1st July 2022) *Antimicrobial Resistance*, Available at https://www.gov.uk/government/collections/antimicrobial-resistance-amr-information-and-resources (Accessed 14th June 2023).

5. References

NHS England (2022) *National infection prevention and control manual for England.* Available from: https://www.england.nhs.uk/national-infection-prevention-and-control-manual-nipcm-for-england/ (Accessed 14th June 2023).

6. Monitoring Compliance

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring

Compliance with isolation for patients positive for MDRO	Business Objects Report	IP&C	HICC, Clinical Governance. IP&C monthly report	Annual

The audit results are to be discussed at relevant governance to review the results and recommendations for further action. Then sent to HICC who will ensure that the actions and recommendations are suitable and sufficient.

7. Appendices

There are no appendices for this document.

8. Equality Impact Assessment (EIA)

Type of function or policy	Existing

Division	Clinical Support Services	**Department**	Infection Prevention and Control
Name of person completing form	Dawn Cursons	**Date**	June 2023

Equality Area	Potential Negative Impact	Impact Positive Impact	Which groups are affected	Full Impact Assessment Required YES/NO
Race	N/A	N/A		NO
Pregnancy & Maternity	N/A	N/A		NO
Disability	N/A	N/A		NO
Religion and beliefs	N/A	N/A		NO
Sex	N/A	N/A		NO
Gender reassignment	N/A	N/A		NO
Sexual Orientation	N/A	N/A		NO
Age	N/A	N/A		NO
Marriage & Civil Partnership	N/A	N/A		NO
EDS2 – How does this change impact the Equality and Diversity Strategic plan (contact HR or see EDS2 plan)?				

- **A full assessment will only be required if: The impact is potentially discriminatory under the general equality duty**
- **Any groups of patients/staff/visitors or communities could be potentially disadvantaged by the policy or function/service**
- **The policy or function/service is assessed to be of high significance**

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

The review of the existing policy re-affirms the rights of all groups and clarifies the individual, managerial and organisational responsibilities in line with statutory and best practice guidance.