Policy for the Prevention, Control and Management of Multi-Drug Resistant Organisms (MDRO)

[Including Gram Positive (MRSA), Gram Negative (ESBL) Bacteria]

EXECUTIVE SUMMARY

Infection Prevention & Control Precautions for Multi-drug resistant organisms (MDRO).

All Healthcare workers (HCW) caring for Multi-drug resistant organisms (e.g. MRSA, VRE, ESBLs and *Acinetobacter* species) affected patients must be aware of and adhere to the following measures;

Prevention of Spread

Hand washing, adequate cleaning and disinfection of environment are important issues;.

I. Hand washing
   - Thorough hand washing with soap & water and drying is the most important activity in the prevention of transmission. Hands should be washed before and after patient contact, between patients and after removing the gloves.

II. Isolation
   - Patient infected with multi-drug resistant Gram negative bacilli can be treated in an open ward with suitable precautions against contact spread, but single room is preferable in critical areas (SICU, MICU, NICU, CCU). MDRO contact isolation card must be displayed outside the door or above the bed.

III. Protective Clothing
   - Clean latex gloves should be worn for direct patient contact. Gloves must be changed between patient care in cases of gross contamination e.g. faeces, wound, exudates etc.

IV. Gown, Apron and Face mask
   - Disposable plastic apron should be used for patient care. All staff and visitors must wear apron when in close contact with the patient. Face Mask is NOT required.

V. Patient Care Equipment and Linen
   - Patient care equipment such as Stethoscope, thermometer and BP apparatus should stay in Isolation room. If equipment has to be shared, it must be disinfected thoroughly.
   - Reusable items such as ventilation tubing should be sent to CSSD for appropriate processing. All soiled/wet linen must be treated as infected. Place into the yellow plastic bag for transport to the laundry.

VI. Staff & Visitors
   - The number of staff taking care of patient with MDRO should be kept at minimal to reduce the chances of cross transmission.
   - Visitors should wear plastic apron ONLY if involved in direct patient care. Hands should be washed with soap & water after close contact.

VII. Transferring Patient
   - Transfer of patient with MDRO to other wards / department must be kept to minimal. Relevant ward staff must be notified prior to transfer of such patients.

VIII. Routine cleaning
   - General purpose detergent and warm water should be used for routine cleaning. There is no need for separate cleaning equipment for isolation room.

IX. Terminal Cleaning
   - All surfaces and non disposable should be washed with detergent and warm water. Following cleaning, all surfaces should be allowed to dry. Rooms can be used for the next patient when the surfaces are dry.

1. Aims

The aim of this policy is to provide guidance on the prevention, management and control of multi-drug resistant organisms (MDRO) which includes gram positive, gram negative and extended spectrum beta-lactamase (ESBL) bacteria.

2. Objectives

- To provide hospital staff with an understanding of these organisms to inform and enable appropriate management of affected patients;

- To prevent the spread of infection through the application of appropriate infection prevention and control measures.

3. Responsibilities

3.1 All Staff

Are responsible for:

- Awareness of the policy and compliance with it;
- Awareness of cross infection risk associated with MDRO;
- Applying appropriate infection prevention and control measures to prevent Cross-infection;
- Using this policy in conjunction with local policies and other relevant infection control policies.

3.2 Managers

Are responsible for:

- Ensuring that staff are aware of and comply with the policy;
- Ensuring that staff attend or undertake relevant courses related to infection prevention and control;
- Providing appropriate resources are available to minimise the risk of cross infection.

3.3 Infection Control Team

Are responsible for:

- Keeping this policy up to date;
- Providing education/training on MDRO, their prevention, management and control which includes antimicrobial stewardship;
- Surveillance of alert organisms which includes MDRO.

4 Infection Prevention & Control Precautions for MDRO

All staff caring for MDRO affected patients must be aware of and adhere to the following measures.

4.1 Prevention of Spread

Hand washing, adequate cleaning and disinfection of environment are important issues.

I. Hand washing:

- Thorough and effective hand washing using an antiseptic agent and proper hand drying is considered to be the most important activity in the prevention of transmission.

- Hands should be washed before and after contact with the patient, after removing the gloves and between patients

- Rings should be removed to avoid contamination and to enable adequate hand washing.

II. Isolation

- Patient infected with antibiotic resistant gram negative bacilli can be treated in an open ward with suitable precautions against contact spread, but single room isolation may be preferred if available especially in critical areas (ICU, NICU, CCU) where the chances of transmitting organisms is higher.

- MDRO contact isolation card must be displayed outside the door or above the bed.

III. Protective Clothing

- Clean plastic or non-sterile latex gloves should be worn for direct contact with patient
- Hands should be washed and dried after the removal of gloves

- Gloves must be changed between patient care activities that may result in gross contamination example faeces, wound, exudates and etc.

IV. Gown and Apron

- Disposable plastic apron are preferred

- All persons including visitors must wear apron when in close contact with the patient

V. Face Mask Not required

VI. Patient Care Equipment

- Whenever possible equipment should stay in Isolation room e.g. Stethoscope, Glass thermometer, etc
- Use sphygmomanometer, BP Cuff that is designated for MDRO patients only
- If equipment has to be shared it must be disinfected thoroughly

VII. Linen

- All soiled /wet linen must be treated as infected
- Place into the red plastic bag and finally into the hamper bag

VIII. Staff

- The number of staff taking care of patient with MDRO should be kept at minimal to reduce the chances of cross transmission

IX. Transferring Patient

- Transfer of patient to wards/department must be kept at a minimal
- Concern staff must be notified prior to transfer
- All reusable items, e.g. ventilation tubing should be double bagged and sent to laundry/CSSD for appropriate processing.

X. Visitors

- Plastic apron should be worn only if involve in direct patient care (close contact)
- They should wash their hands after the visit

XI. Routine cleaning

- General purpose detergent and warm water should be used for routine cleaning
- There is no need for separate cleaning equipment for isolation room

XII. Terminal Cleaning

- All surfaces and non disposable should be washed with detergent and warm water
- Following cleaning, all surfaces should be dried.
- Rooms can be sued for the next patient when the surfaces are dry.

Infection Control Nurse will ensure that the above policy is in practice from admission of a known case or after the diagnosis of MDRO infection /colonization to discharge and will be documented in nursing notes regarding the practices.

4.2 Treatment

The Medical Microbiologist will provide advice on the antibiotic treatment of a MDRO infection.

4.3 Decolonisation

This may be attempted only for MRSA currently depending on the causative organism and source of infection. Advice should be sought from the Medical Microbiologist.

4.4 Routine Environmental Cleaning

During the care of a patient with MDRO, the clinical environment may become heavily contaminated. Therefore special attention should be paid to daily cleaning of the isolation environment and a full isolation clean following discharge with Sodium hypochlorite 1,000ppm.

4.5 Terminal Environmental Cleaning

Standard terminal cleaning procedure using a combined detergent and 1,000ppm available chlorine-releasing agent, paying special attention to dust collecting areas, horizontal surfaces and floors, and curtain laundering. Only visible splashes on walls need to be removed – full wall-washing is not necessary.

4.6 Surveillance

The Infection Control Team will monitor trends in relation to MDRO where these are associated with service areas under their remit. The Clinical Governance and Risk Committee will receive information on any specific concerns, escalated from the Infection Control forum relating to infection control issues. The concerns will be assessed and action taken to address the issue identified.

4.7 Antimicrobial Stewardship

The emergence and spread of MDRO is encouraged by the use of broad-spectrum antimicrobials. Units affected by MDRO should review their antibiotic policy in conjunction with Medical Microbiologist and in line with the Antibiotic Policy especially in relation to limitation of intravenous therapy and automatic stop dates for antimicrobial therapy. Antibiotics should be used appropriately as per NHS Forth Valley Antibiotic Policy based on the results of microbiological samples.

4.8 Transfer/Discharge of Patients

- Transfer of patients with MDRO to other wards should be minimized to reduce the risk of spread, **but** this should not compromise other aspect of patient's care. All transfer should be discussed with a member of the ICT prior to transfer;

- If a patient with MDRO is transferred to another health-care institution the receiving clinical and Infection Control staff must be informed. The ambulance service may require to be notified as well depending on the type and site of infection;

- In general, MDRO do not present a risk to healthy people in the community or patients in residential or nursing homes who do not have catheters, wounds or other lesions.

4.9 Discontinuation of Infection Control Precautions

Infection control precautions should be discontinued following discussion with the ICT.

Further Readings

The increasing prevalence of antibiotic resistant micro-organisms, especially those with multi drug resistance, is causing international concern and their control is vital.

Controlling multi-drug resistant organisms (**MDRO**) is important for the following reasons:

- MDROs are resistant to the most usual antimicrobial therapy;
- Increased patient morbidity and mortality;
- Add to the cost of patient treatment in terms of resources and length of stay;
- Have the potential to spread and act as reservoirs of resistant genes for the transmission to other organisms.

Since the introduction of antibiotics in the treatment of human infections and in food animals, there has been ample evidence to demonstrate that bacteria mutate and adapt to survive. Bacteria develop mechanisms to resist the action of antibiotics and in this way become resistant to their use in clinical practice.

Certain bacteria seem to develop resistance more readily than others. These bacteria can develop multi resistance to several antibiotics which may severely limit therapeutic choices.

The number of MDROs will increase if the selective pressure of antibiotic use continues and the resistant organism is able to spread from one person to another. Therefore the control of antibiotic resistance needs to focus on both:

- Rational antibiotic use to minimise selective pressure;
- The practice of effective infection control measures to prevent the spread of resistant organisms.

1. Definition of MDROs

Multi-drug resistant organisms can be defined in two ways; organisms that are resistant to:

- Several antimicrobial agents to which they would normally be susceptible;
- All but one or two antimicrobial classes, regardless of the mechanism of resistance (and often only susceptible to one or two commercially available antibiotics).

Such organisms include ESBL/AMPC-producing *enterobacteriaceae*,

vancomycin resistant *enterococcus* (VRE) and Meticillin-resistant *Staphylococcus aureus* (MRSA).

Organisms that are resistant to a first-line antibiotic are commonly also included in the definition of MDRO. These include organisms that are intrinsically resistant and readily acquire additional resistance mechanisms and become multi-drug resistant e.g. carbapenem-resistant *Acinetobacter*.

2. Types of MDROs

2.1 Gram Positive Bacteria

The most commonly known Gram positive MDRO bacteria are meticillin resistant *Staphylococcus aureus* (MRSA). There is a separate policy dedicated to the prevention, management and control of MRSA and the reader is directed to that policy. It is only mentioned here to give a holistic approach to MDROs.

2.2 Gram Negative Bacteria

Gram negative bacteria are commonly found in the gastro-intestinal tract, in water and in soil. In some hospitalised patients, colonisation of the gastro-intestinal tract and oropharynx is common. Gram negative bacteria can be part of the transient flora on the hands of healthcare workers. Some species of bacteria commonly found in the bowel e.g. *Escherichia coli* and *Klebsiella* can develop multi-resistance to antibiotics where they become collectively referred to as multi-drug resistant gram negative bacteria (**MDR-GNB).** They are seen most frequently in patients who have received broad spectrum antibiotics and where patients have diminished immunity. **MDR-GNB** may cause urinary tract infections, pneumonia and surgical site infections.

Resistance to glycopeptides such as Vancomycin i.e. vancomycin resistant enterococcus (**VRE**) has emerged, in particular in *Enterococcus faecalis* and *Enterococcus faecium*.

The emergence of **VRE** in Europe is thought to be linked to the use of the glycopeptide antibiotic avoparcin, used as a growth promoter in the livestock industry. Hence, animal strains of **VRE** may colonise the gut of healthy individuals via contaminated food. In the USA, where avoparcin has not been used, glycopeptide use is commonly linked with the use of Vancomycin itself in hospitals and especially in certain specialties, e.g. haematology, transplantation and renal medicine. This can also happen in the UK. Resistance to glycopeptides reduces the options for antibiotic treatment where clinical infection is evident.

Resistance in enterococci can transfer to other organisms. For example, the first detected clinical case of Vancomycin Resistant *Staphylococcus aureus*

(**VRSA**) occurred in the USA in 2002. This was caused by Vancomycin resistant genes transferring to Meticillin Resistant *Staphylococcus aureus* (MRSA). Since then further cases have been reported in the USA and elsewhere in the world. The risk of **VRSA** and potentially untreatable *Staphylococcus. aureus* infections is an important reason for controlling the spread of **VRE**.

Other **MDR-GNB** include: *Pseudomonas auruginosa* which is associated with infections related to invasive devices e.g. urinary catheter and *Acinetobacter.* Multi-drug resistant *Pseudomonas auruginosa* is resistant to at least two of the following: ceftazidime or piperacillin/tazobactam or gentamicin (or other aminoglycoside) or ciprofloxacin. Multi-drug resistant *Pseudomonas auruginosa* strains are occasionally resistant to carbapenem antibiotics.

Multi-drug resistant *Acinetobacter* are defined as isolates which are resistant to any aminoglycoside and to any third generation cephalosporin. Some multi-resistant *Acinetobacter* strains are also resistant to carbapenem antibiotics.

2.3. ESBLs

Some **MDR-GNB** produce an extended spectrum beta-lactamase which can destroy/inactivate even broad spectrum antibiotics including cephalosporins. These are referred to as extended spectrum beta lactamase bacteria or **ESBLs.**

ESBL-producing coliforms are resistant to intravenous cephalosporins and they are frequently resistant to many other antibiotics including ciprofloxacin and aminoglycosides. Recently Gram-negative *Enterobacteriaceae* with resistance to carbapenem conferred by metallo-beta-lactamase 1 (NDM-1) was reported in the UK, amongst some patients returning from India and Pakistan.

All these multi-resistant gram-negative organisms are detected by isolation from clinical specimens where they may occur as colonizers or cause true infection. **MDR-GNB** have been implicated in outbreaks of infection in the intensive care units, neonatal, haematology/oncology units. The genes that confer antibiotic resistance can spread to other bacteria. Multi-resistance in these organisms limits the therapeutic options available.

3. Risk Factors for Acquiring MDRO

The patient risk factors associated with colonisation and infection are often the same for MRSA, VRE, MDR-GNB, *C. difficile* and *Candida* spp. The following risk factors have been identified:

3.1 Gram Positive Bacteria

- Previous carriage or infection with MDRO;
  Elderly;
- Hospital stay within the last year;
- Antibiotic exposure within the last year e.g. fluoroquinolones, 2nd and 3rd generation cephalosporin;
- Transfer from another institution;
- Stay in a department with a high MDRO rate;
- Open cutaneous wounds;
- Chronic disease;
- Invasive devices;
- High risk surgery;
- Immunosuppressed;
- Haemodialysis.

3.2 Gram Negative Bacteria

- Previous carriage or infection with MDRO;
- Elderly;
- Antibiotic exposure within the last year
- Hospital stay within the last year e.g. fluoroquinolones, 2nd and 3rd generation cephalosporin;
- Chronic disease;
- Length of hospital stay in hospital;
- Length of stay in intensive care;
- Use of central venous or arterial catheter;
- Use of urinary catheter;
- Ventilatory assistance;
- Haemodialysis;
- Emergency abdominal surgery;
- Use of gastrostomy or jejunostomy tube;
- Immunosuppressed.

4. Sources/Reservoirs of MDROs

Infected or colonised patients are the major reservoir of MDRO. The gastrointestinal tract is the major reservoir for VRE, and multi-drug resistant gram negative bacilli (MDR-GNB), including ESBL-producing bacteria.

While human sources are usually responsible for transmission of micro-organisms during health care, inanimate environmental sources may also be involved. Colonisation can be prolonged and is not always recognised.

Environmental contamination can lead to transmission especially when patients have diarrhoea or faecal incontinence and the reservoir of the MDRO is the gastrointestinal tract.

The inanimate environment and equipment may serve as a secondary source for MRSA and VRE but are generally less likely to do so for gram-negative bacteria. MRSA or VRE can survive for weeks to several months on various surfaces and may remain viable for prolonged periods.

A common environmental source of ESBLs has only occasionally been discovered (e.g. contaminated ultrasound gel, a bronchoscope and thermometers). Unlike other gram-negative bacteria, *Acinetobacter* can survive for many days on both moist and dry surfaces (bed linen, curtains, floor, etc), therefore environmental contamination can be difficult to control which may lead to full ward closures for deep cleaning.

Consistently following the recommended procedures for cleaning and disinfecting the environment should be adequate to keep rooms of MDRO patients clean.

5. Identification of a Patient with MDRO Infection

Patients with MDRO infection are identified from a clinical specimen sent to the Microbiology laboratory. It is most often found in blood, wound swabs or urine and sputum samples.

Routine screening for these bacteria is not necessary, and there are currently no guidelines for decolonisation. Where screening is indicated, samples should be tested to identify carriage. A newly diagnosed patient should be "flagged" on the E-ward system and case notes by the ward staff. It is the responsibility of admitting staff to ensure that the clinical alerts are checked. If the patient has previously been positive for MDRO then the ICT must be informed at the earliest opportunity.

Blood stream infections will be reported to the ward/clinical team by Medical Microbiologist or the Infection Control Team.

VRE infections will be reported to the ward/clinical team by Medical Microbiologist or the Infection Control Team.

The Infection Control Team will conduct a risk assessment in collaboration with the clinical team and provide advice on the infection prevention and control measures required.

5.1 Identification of Infection or Colonisation

As colonisation is more common than infection, careful consideration is required when interpreting positive microbiology results. When MDRO is isolated from a clinical specimen the following screening of the patient is advised prior to commencing antibiotic therapy.

Table 1

Organism	Sites for Sampling
MRSA	Throat, Nose, Axilla, Groin and as appropriate – urine, wound and invasive device site
VRE	Stool sample or if unavailable, rectal/peri-rectal swab, nose, throat, groin, axilla and as appropriate wound and urine samples

When patients are screened the microbiology request form should include C&S (to exclude VRSA) and site of original infection / colonisation documented in relevant clinical details.