

Guidelines for the Management of Patients with Vancomycin-Resistant Enterococci (VRE) Colonisation/Infection

Human
Services



Victoria



Guidelines for the Management of Patients with Vancomycin-Resistant Enterococci (VRE) Colonisation/Infection

**Prepared by the Standing Committee on Infection
Control (SCIC), Department of Human Services**

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These guidelines have been prepared following consultation with experts in the field of infection control and are based on information available at the time of preparation.

Practitioners should have regard to any information on these matters that may become available subsequent to the publication of these guidelines.

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Part 1 Introduction

In the absence of adequate infection control measures, the introduction of Vancomycin-Resistant Enterococci (VRE) strains into an Acute Care Facility can result in spread to other patients and sometimes cause infection. Evidence to date suggests there is much less chance for VRE strains to spread in Long-Term Care Facilities (LTCF) and to cause disease. This means that there should be less concern about the transfer of patients carrying VRE from Acute Care Facilities to LTCF for convalescence, rehabilitation or long-term care.

These guidelines outline measures to prevent the spread of Vancomycin-Resistant Enterococci (VRE) in acute care settings, rehabilitation facilities and in Long-Term Care Facilities (LTCF), including palliative care centres, nursing homes, hostels, psychiatric facilities, hospices, hospitals in the home, homes serviced by the Royal District Nursing Service (RDNS) and other settings in which people colonised or infected with VRE may receive care. Basic principles of infection control for patients in these settings are provided.

This document replaces previous guidelines relevant to VRE issued by the Standing Committee on Infection Control (SCIC):

- Management of Patients with Confirmed VRE Infection/Colonisation. August 1996.
- Supplemental Information on Terminal Disinfection. January 1997.
- Infection Control Guidelines for the Management of Patients with Methicillin-Resistant *Staphylococcus aureus* (MRSA) and *Vancomycin-Resistant Enterococci* (VRE) in Long-Term Care Facilities (LTCF). February 1998.

The antibiotics guidelines produced by the Victorian Drug Usage Advisory Committee (VDUAC) and the SCIC in May 1997 have been included as Part 4 of this document.

These guidelines are not intended to be prescriptive, but they offer a framework within which to apply clinical judgment and consider individual patient needs, including the dignity of the patient.

1.1 Background

Enterococci are bacteria normally found in the bowel and the female genito-urinary tract. They are of relatively low virulence but they may cause urinary tract infections and other infections after contamination of the peritoneal cavity by bowel contents.

When exposed to antibiotics, drug-resistant strains of these bacteria may survive and multiply, resulting in an overgrowth of drug-resistant enterococci in the bowel. VRE refers to the vancomycin-resistant enterococcal species, *Enterococcus faecium* and *Enterococcus faecalis*. VRE is neither more infectious nor more virulent than sensitive enterococci.

The first detection of a VRE infected patient in Australia occurred in Victoria in 1994.¹ In the late 1990s colonisation and infection of patients with VRE has spread as in the United States and Europe. Enterococci are known to contaminate hands, equipment² and the patient care environment.³ Recovery of enterococci from the hands of health care workers indicates hand contact may be an important means of transmission.⁴

The emergence of VRE poses several problems:

- The lack of available antimicrobials for treatment of VRE infections. VRE are resistant to multiple antibiotics (including vancomycin, aminoglycosides and usually ampicillin) that are normally used for the treatment of infections due to enterococci.
- The vancomycin-resistance gene present in VRE has the potential to be transmitted to other Gram positive organisms, such as *Staphylococcus aureus*. Strains of *Staphylococcus aureus* with partial resistance (intermediate sensitivity) to vancomycin have been described in Japan (1996), the USA (1997) and France (1997).

1.2 Colonisation and Infection

Colonisation is the presence, growth and multiplication of micro-organisms without observable clinical signs or symptoms of infection. For example, enterococci are not a cause of diarrhoea, so when they are isolated from a rectal swab or faecal specimen collected from a patient with diarrhoea, this isolation should be considered as colonisation and not infection.⁵

Infection refers to invasion of bacteria into tissues with replication of the organism. Infection is characterised by isolation of the organism accompanied by clinical signs of illness such as fever, inflammation (warmth, redness, swelling), pus formation and an elevated white blood cell count.

Patients can be colonised or infected with VRE. In Victoria the majority of VRE isolates to date have been from colonised patients.

1.3 Epidemiology

Mode of transmission—The most likely modes of transmission from patient to patient are either by direct contact through transient carriage of VRE on the hands of personnel, or indirectly by contaminated environmental surfaces and patient care equipment.

Reservoirs of VRE—Enterococci are part of the normal flora of the gastro-intestinal tract and the female genito-urinary tract. Most infections with these micro-organisms are attributable to the patient's own flora. VRE are capable of prolonged survival on hands, gloves and environmental surfaces such as door handles, stethoscopes, over-bed tables and call bells.

Risk factors—Certain patients are at increased risk for VRE infection or colonisation, such as those who:

- Are critically ill, for example in intensive care units.
- Have immune-suppression, for example oncology or transplant patients.
- Have had an intra-abdominal or cardio-thoracic surgical procedure.
- Have a central venous catheter.
- Have a prolonged hospital stay.
- Have had broad spectrum antimicrobial therapy, and who have received administration of oral and, to a lesser extent, intravenous vancomycin.

There is no data available in Australia on the epidemiology of VRE in LTCF. However, overseas studies indicate that infections caused by VRE and transmission of VRE are uncommon in these settings.⁶⁻⁸

1.4 Standard Precautions and Additional Transmission-Based Precautions

Standard Precautions are work practices that provide a basic level of infection control for the care of all patients in health care facilities, regardless of their diagnosis or presumed infection status. They are designed to reduce the risk of transmission of micro-organisms from both recognised and unrecognised sources of infection in health care facilities. They include:

- Good hygiene practices, particularly washing hands before and after patient contact.
- The use of protective barriers, which may include gloves, gowns, plastic aprons, masks, eye shields or goggles.
- Appropriate handling and disposal of sharps and clinical waste (previously known as infectious waste).
- Aseptic techniques.

Standard Precautions are recommended for the care of **all patients**, regardless of their perceived infectious status, and for the handling of:

- Blood.
- All other body fluids, secretions and excretions (excluding sweat), regardless of whether they contain visible blood.
- Non-intact skin and mucous membranes.⁹

Additional Transmission-Based Precautions are designed for patients with documented or suspected infection with highly transmissible or epidemiologically important pathogens, for whom additional precautions beyond Standard Precautions are needed to interrupt transmission in hospitals.¹⁰ There are three types of Transmission-Based Precautions:

- Airborne
- Droplet
- Contact

In the context of VRE colonisation/infection the only additional Transmission-Based Precaution required is contact.

Contact Precautions are designed to reduce the risk of transmission by direct contact with the patient (hand- or skin-to-skin contact that occurs when performing patient care activities that require touching the patient's dry skin) or by indirect contact (touching) with environmental surfaces or patient care items in the patient's environment. Contact Precautions involve the routine use of gloves, gowns and plastic aprons, and the appropriate decontamination of patient care equipment to reduce the risk of transmission of micro-organisms.

Part 2 Guidelines for the *Management of Patients in Acute Health Care Facilities*

Principles of Management

- All facilities should develop plans for the management of VRE.
- Strict compliance with infection control measures by hospital personnel are required to limit nosocomial spread of VRE.¹¹
- Appropriate staff education on VRE and infection control is required.

Control Measures

2.1 Notification of Key Personnel

When the laboratory confirms the isolation of a VRE strain from a patient (infected or colonised), the relevant personnel should be notified immediately:

- Medical practitioner(s) responsible for the care of the patient.
- Infection Control personnel.
- Nurse in charge of the ward or unit.
- Other personnel as may be specified in the facility's VRE plan.

2.2 Confirmation of Diagnosis

The first culture of the VRE strain from each patient, plus any new clinical isolate, should be sent to the Microbiological Diagnostic Unit (MDU), Department of Microbiology & Immunology, University of Melbourne, for storage, surveillance and confirmatory testing if required. Follow up screening isolates or duplicated clinical isolates from the same patient do not need to be forwarded to MDU.

2.3 Ward/Unit Management

As cases (infected or colonised) are identified, infection control personnel in conjunction with management need to review admission to the ward and the need to transfer patients to other wards and units, with the aim of preventing transmission of VRE.

2.4 Microbiological Surveillance

Rectal or faecal swabs (as appropriate for the patient) should be obtained for culture from room-mates of the VRE colonised/infected patient(s). Appropriate specimens for culture of VRE may be taken from other patients in the ward at the discretion of the Infection Control personnel. Contact Precautions should be maintained whilst awaiting microbiology results.

2.5 Management of Patients with VRE

2.5.1 Room Placement

Transmission risk is minimised when VRE infected or colonised patients are nursed in single rooms or cohorted in a room with other VRE patients. Substantial environmental contamination is known to occur from colonised patients with diarrhoea.¹²

Ideally, single rooms or cohort rooms should have en suite toilet and bathroom facilities for patients and a staff handwash basin located as close to the room exit as practicable.

2.5.2 Hand-washing

Health care workers are required to wash their hands before leaving the patient's room, whether or not gloves are worn. Hand-washing with aqueous chlorhexidine gluconate 4% is recommended. Ordinary soap is relatively ineffective in removing VRE from the hands.¹³ If clean hands are contaminated by touching environmental surfaces (for example door handles) when leaving the patient's room, hands should be washed again.

If a hand wash basin is not available in the room, an alcoholic chlorhexidine hand rub should be used after removal of gloves and prior to exiting the room. On exiting the room, hands should be washed immediately using an aqueous chlorhexidine gluconate 4% preparation.

2.5.3 Protective Apparel

2.5.3.1 Gloves

All staff entering the room anticipating patient or environmental contact should wear clean non-sterile gloves.

Gloves should be removed before exiting the patient's room.

2.5.3.2 Gowns/Plastic Aprons

A long sleeved gown should be worn (clean and non-sterile) if any physical contact with the patient or the patient's environment is anticipated. Gowns should be removed and discarded into linen bags (or waste bags if disposable) before exiting the patient's room.

2.5.3.3 Visitors

Visitors are not required to wear gowns and gloves unless they are involved in patient care. Nevertheless, they should be instructed always to wash their hands when leaving the room. Following visiting a patient with VRE, visitors should be advised not to meet with other "at risk" patients (see 1.3) during the same visit.

2.5.4 Non-critical Patient Care Equipment

Commonly used patient care equipment, such as stethoscope, sphygmomanometer and thermometer, should be dedicated for the sole use of the patient. This equipment should be left in the patient's room for the duration of the patient's stay and be decontaminated prior to use on any other patient.

Minimal stocks of non-critical items (such as dressing packs) should be stored in the room.

Used pans and urinal bottles should be sanitised in a pan flusher immediately.

Patients' charts and histories should be left outside patients' rooms.

2.5.5 Movement of Patients within the Hospital

2.5.5.1 Clinical Procedures

VRE status must not compromise patient management.

Guidelines should be in place for the movement of patients within the hospital. These should be directed at preventing environmental contamination and direct transfer of organisms from one patient to another. In addition to the protective apparel required for staff (see 2.5.3), any equipment, including trolleys or wheelchairs, in contact with patients with VRE should be cleaned and disinfected after use.

2.5.5.2 Patient Activity outside the Isolation Room

Patients should wash their hands thoroughly with aqueous chlorhexidine gluconate 4% or apply an alcoholic chlorhexidine preparation before leaving their rooms.

Patients may use corridors and balconies and may go outside hospital buildings, provided any lesions/wounds are contained within a dressing and the patient is faecally continent.

Gowns need not be worn by accompanying staff if direct contact is not anticipated.

2.6 Support Services

2.6.1 Linen

Special laundering of linen is not required. Laundry practice should conform with Australian Standards AS 4146—1994 Laundry Practice.¹⁴

Soiled linen, especially linen from patients who are faecally incontinent, is heavily contaminated with micro-organisms. The risk of organism transmission is considerably reduced if the linen is handled appropriately.

- Place all soiled linen directly in a linen bag. Avoid putting wet, soiled linen on patients' bedside tables, floors, chairs or on counter tops. Keep soiled linen away from clothing and clean linen.
- If the outer surface of a linen bag is contaminated, it should be placed in a second bag outside the room (double bagged) and thereafter be handled in the normal manner.

2.6.2 Catering

No special precautions are needed for eating utensils. The combination of hot water and detergents used in automatic dishwashers is sufficient to decontaminate these items. If this criterion cannot be met, disposable crockery and cutlery should be used.

2.6.3 Waste

General and clinical (infectious) waste should be handled in accordance with the facility's and Environment Protection Authority (EPA) guidelines. If the outer surface of a waste bag is contaminated, it should be placed in a second bag outside the room (double bagged) and thereafter be handled in the normal manner.

2.6.4 Cleaning

2.6.4.1 Daily Cleaning of Patient's Room

The room should be cleaned with warm water and detergent, paying particular attention to all horizontal surfaces, bed rails, door handles, hand basins and taps. In addition, if the patient is incontinent of faeces or has diarrhoea, wipe over all surfaces with a solution containing 500 ppm of sodium hypochlorite,¹⁵ leave for 10 minutes, rinse the surfaces with clean warm water and then leave to dry.

Cleaning cloths and mop heads used in these rooms should not be used elsewhere and after use be subjected to normal laundry procedure. Cleaning equipment such as the mop bucket, mop handle and bowls should be dedicated for cleaning the patient's room. After use, this equipment should be cleaned and decontaminated by thermal or chemical disinfection or cleaned with a solution containing 500 ppm sodium hypochlorite, left for 10 minutes, rinsed with clean warm water and then left to dry.

2.6.4.2 Terminal Disinfection/Cleaning Procedure

- Staff involved in cleaning the patient's room should wear a protective long sleeved gown and gloves.
- The room and patient care equipment should be cleaned with a solution containing 500 ppm of sodium hypochlorite. If any of these areas are visibly soiled they should be cleaned with detergent and warm water prior to the use of hypochlorite. Areas to be included are:
 - All horizontal surfaces or fittings
 - Walls that may have been contaminated
 - Doors
 - Door handles/knobs
 - Mattress, pillows, bedside lockers, over-bed table
 - Bed rails, IV pole
 - Bathroom, toilet, shower, hand basins
 - Call bell, blinds, telephone, remote control for television
 - Monitors, et cetera.
- Rinse with clean water.
- Carpeted rooms should be steam cleaned.
- Blinds should be cleaned and curtains and drapes should be changed.

All re-usable equipment (for example wash bowl, tooth mug, respiratory equipment) should be disinfected in a washer/sanitiser or sterilised prior to re-use for another patient. All single use equipment in the room should be discarded.

2.7 Discontinuation of Isolation

The optimal requirements for this are unknown and factors influencing the decision include the patient's clinical condition and setting. A facility may choose to discontinue isolation precautions once the patient is faecally continent, capable of self care with good hygiene and if any discharging lesions can be contained.

2.8 Transfer of VRE Patients to Other Health Care Facilities

Transfer to other health care facilities should not be denied on the basis of colonisation or infection alone.

Patient management should not be compromised and transfer may be necessary from acute care hospitals to other facilities for convalescence, rehabilitation or long-term care.

Available evidence suggests there would be little risk to patients in a rehabilitation centre, nursing home or geriatric unit from another patient colonised/infected with VRE. By contrast, the introduction of these organisms into certain specialist units in acute care facilities, for example transplant or oncology units, is most undesirable.

Before inter-hospital transfer, there must be full communication between the transferring and receiving medical and infection control staff. The medical/nursing documents accompanying the patient must clearly state details relating to the patient's VRE colonisation/infection history.

A receiving facility which finds, within 48 hours of admission, a patient admitted from another institution is infected with VRE should advise the transferring institution.

2.8.1 Screening before Transfer

Prior to transfer there is no role for routine bacteriological screening of patients in whom VRE has not been identified.

2.9 Transfer of Patients in Ambulances

When infected/colonised patients are to be transferred to another hospital/facility by ambulance, the ambulance service should be informed in advance. Refer to section 2.5.3 Protective Apparel.

2.10 The Outpatient Setting

Standard Precautions apply to all patients. Use protective apparel for incontinent patients and for those with uncontained discharging lesions. Refer to sections 2.5.2 for hand-washing and 2.6.4 for cleaning procedures.

2.11 Re-admission

Since VRE carriage can persist for long periods, when re-admission to an acute care facility is required there must be a specific mechanism to alert the hospital staff that the patient may still be VRE colonised. On re-admission the VRE status of the patient should be re-assessed. Meanwhile, consideration as to whether the patient should be isolated should be determined on factors such as whether they are faecally continent and capable of self care with good hygiene, the presence of discharging lesions and the type of unit to which they are being admitted.

2.12 RDNS, Hospitals in the Home

Home health care workers should focus on preventing transmission of organisms via the clinical bag, clothing, equipment and documentation that may be carried to and from the home by the health care professional. Alternatively, the clinical bag may be left in the vehicle and only the disposable items used for the patient are carried into the home. Re-usable equipment may be cleaned in the patient's home or bagged prior to returning it to a suitable facility for disinfection. Hands should be washed before leaving the home.

Any waste generated in the care of the patient (excluding sharps) may be discarded in the household waste.

Part 3 Guidelines for the *Management of Patients in Long-Term Care Facilities (LTCF) and Rehabilitation Units*

The guidelines for the management of VRE patients in Long-Term Care Facilities (LTCF) and Rehabilitation Units are basically the same, except in the areas specified below. Sometimes in Rehabilitation Units there may be patients at particular risk of VRE colonisation/infection due to their medical condition (for examples see section 1.3).

3.1 Admission of VRE Patients

Admission to LTCF and Rehabilitation Units should not be denied on the basis of VRE status alone. Available evidence suggests that there is little risk to patients in a nursing home, hostel, special accommodation facility, rehabilitation unit or geriatric unit from other patients colonised/infected with VRE.

Before transfer to LTCF there must be full communication between the transferring and receiving personnel. The medical/nursing documents accompanying the patient should clearly state details relating to the patient's VRE colonisation/infection history.

If a VRE isolate from a patient indicates an infection, for example from a urine specimen, within 48 hours of admission, the LTCF should advise the transferring facility.

Staff should be educated about infection control and VRE.

3.1.1 Screening

There is no role for routine VRE screening of patients prior to admission.

3.1.2 Surveillance

Surveillance cultures of rectal swabs and wounds for VRE may be appropriate if an outbreak of infection is suspected. Otherwise, surveillance cultures are unlikely to be cost effective and are not recommended.

3.2 Management of Patients with VRE

3.2.1 Room Placement

Standard Precautions with hand-washing should be applied for all residents of the facility, but neither a private room nor cohorting is indicated for a VRE colonised patient who is faecally continent. Such patients should not be restricted from participation in social or therapeutic group activities within the facility.

A single room and an ensuite bathroom is appropriate for a colonised patient with diarrhoea or faecal incontinence.

3.2.2 Hand-washing

Health care workers are required to wash their hands before leaving the patient's room, whether or not gloves are worn. Hand-washing with aqueous chlorhexidine gluconate 4% is recommended. Ordinary soap is relatively ineffective in removing VRE from the hands.¹³ If clean hands are contaminated by touching environmental surfaces (for example door handles) when leaving the patient's room, hands should be washed again.

If a hand wash basin is not available in the room, an alcoholic chlorhexidine hand rub should be used after removal of gloves and prior to exiting the room. On exiting the room, hands should be washed immediately using a 4% chlorhexidine preparation.

3.2.3 Protective Apparel for Staff

Standard Precautions are to be practised for all patients.

Gloves and gowns should be worn for direct care when contact with soiling is likely, such as when a patient has diarrhoea, faecal incontinence or a discharging lesion.

3.2.4 Non-critical Medical Equipment

Used pans and urinal bottles should be sanitized in a pan flusher immediately. Wheelchairs and commodes should be dedicated for the patient's use. If equipment is to be used for other patients, it should be adequately cleaned and disinfected before use (see 3.3.4.2).

3.2.5 Movement of Patients within Facility

Prior to leaving their room patients should wash their hands with aqueous chlorhexidine gluconate 4%, have wounds covered and contain incontinence with incontinence aids before joining others for meals, recreation and therapy sessions. The importance of hand-washing, especially after using the toilet, should be explained and, if necessary, be supervised. Any faecal spills should be cleaned up immediately (see 3.3.4).

3.2.6 Rehabilitation Facilities: Precautions in Therapy Areas

- Standard Precautions apply for all patients. Patients who require Contact Precautions should attend therapy separately.
- Patients with diarrhoea or wounds should not use the hydrotherapy pool.

All surfaces and equipment used by the patient requiring Contact Precautions should be cleaned with soap and warm water and disinfected with 500 ppm hypochlorite solution, then rinsed and dried before being used by other patients.

3.2.7 Visitors

Visitors are not required to wear gowns or gloves but should be instructed to wash their hands when leaving the patient's room.

3.3 Support Services

3.3.1 Linen

Special laundering of linen is not required. Laundry practice should conform with Australian Standard AS 4146—1994 Laundry Practice.¹⁴

Soiled linen from patients who are faecally incontinent is heavily contaminated with micro-organisms. The risk of organism transmission may be considerably reduced when linen is handled appropriately.

- Place all soiled linen directly into a linen bag. Avoid putting wet, soiled linen on patients' bedside tables, floors, chairs or on counter tops. Keep soiled linen away from clothing and clean linen.

3.3.2 Catering

No special precautions are needed for eating utensils. The combination of hot water and detergents used in automatic dishwashers is sufficient to decontaminate these items. If this criterion cannot be met, disposable crockery and cutlery should be used.

3.3.3 Waste

General and clinical (infectious) waste should be handled in accordance with the facility's and Environment Protection Authority (EPA) guidelines. If the outer surface of a waste bag is contaminated, it should be placed in a second bag outside the room (double bagged) and thereafter handled in the normal manner.

3.3.4 Cleaning

3.3.4.1 Cleaning of Patient's Room or Ward

The room should be cleaned with hot water and detergent, paying particular attention to all horizontal surfaces, bed rails, door handles, hand basins and taps. In addition, if the patient is incontinent of faeces or has diarrhoea, wipe over all surfaces with a solution of 500 ppm of sodium hypochlorite,¹⁵ leave for 10 minutes, then rinse the surfaces with warm water and leave to dry.

Cleaning cloths and mop heads used in these rooms should not be used elsewhere and after use should be subjected to the normal laundry procedure. Cleaning equipment, such as the mop bucket, mop handle and bowls should be dedicated for cleaning the patient's room. After use, this equipment should be cleaned and decontaminated by thermal or chemical disinfection or cleaned with a solution of 500 ppm sodium hypochlorite, left for 10 minutes, rinsed with warm water and then left to dry.

3.3.4.2 Terminal Disinfection/Cleaning Procedure

- Staff involved in cleaning the patient's room should wear a protective long sleeved gown and gloves.
- The room and patient care equipment should be cleaned with a solution of 500 ppm of sodium hypochlorite. If any of these areas are visibly soiled they should be cleaned with detergent and warm water prior to the use of hypochlorite. Areas to be included are:
 - All horizontal surfaces of fittings
 - Walls that may have been visibly soiled
 - Doors
 - Door handles/knobs
 - Mattress, pillows, bedside lockers, over-bed table
 - Bed rails, intravenous pole
 - Bathroom, toilet, shower, hand basins
 - Call bell, blinds, telephone, remote control for television
 - Monitors, et cetera.
- Rinse with clean water.
- Carpeted rooms should be steam cleaned.
- Blinds should be cleaned and curtains and drapes should be changed.

All re-useable equipment (for example wash bowl, tooth mug, respiratory equipment) should be disinfected in a washer/sanitiser or sterilised prior to re-use for another patient. All single use equipment in the room should be discarded.

Part 4 Guidelines for *Preventing Emergence of Vancomycin-Resistant Enterococci*

These guidelines were developed in May 1997 by the Victorian Drug Usage Advisory Committee and the Standing Committee on Infection Control, in collaboration with the Writing Group for Therapeutic Guidelines: Antibiotic, to amplify the recommendations for vancomycin use in the Antibiotic Guidelines 10th edition.

Over the past decade and a half, increasing prevalence of infection with methicillin-resistant *Staphylococcus aureus* (MRSA) has thrust the glycopeptide antibiotics, vancomycin and, more recently, teicoplanin, into prominence as the only reliable treatment. This resource is now threatened by the occurrence of enterococci with a high level of glycopeptide resistance conferred by transferable genetic material. These organisms themselves can cause serious infections. Even more ominously, their glycopeptide resistance can be transferred *in vitro* to *Staphylococcus aureus*, and it must be assumed that this process will sooner or later occur on a wide scale *in vivo*. This will result in a common pathogen causing serious infections untreatable by currently available antimicrobial agents.

The emergence of Vancomycin-Resistant Enterococci (VRE) is exacerbated by inappropriate use of vancomycin and teicoplanin. Therefore, to delay this process it is important to limit exposure of the microflora to these antibiotics by using them only in those situations where they are indispensable. These may be stated in general to be:

- Treatment of serious infections proven or presumed on compelling grounds to be due to MRSA or methicillin-resistant *Staphylococcus epidermidis* (MRSE).
- Treatment of patients with severe hypersensitivity to β -lactam antibiotics, suffering from serious infection due to Gram positive organisms.
- Prophylaxis for enterococcal endocarditis in patients with severe hypersensitivity to β -lactam antibiotics, when indicated by the nature of the underlying cardiac disease and by the procedure being performed.
- Prophylaxis for surgical procedures where infection with MRSA or MRSE is common or its consequences are severe. Vancomycin and teicoplanin should be used in such situations only in patients with severe hypersensitivity to β -lactam antimicrobials or in facilities or specific hospital areas where the prevalence of MRSA and the corresponding risk of infection with it is high. Exposure should be limited to one or two doses.

A more questionable indication for vancomycin is treatment of antibiotic-associated colitis due to toxigenic *Clostridium difficile*. Oral vancomycin should be used only in patients unresponsive to or relapsing after treatment with metronidazole and/or bacitracin, or in patients with severe *Clostridium difficile* infection.

Severe hypersensitivity to β -lactam antibiotics is indicated by a history of a reaction occurring within 72 hours of exposure, manifested by anaphylaxis, angioedema, bronchospasm or urticaria, or by severe delayed reactions such as fever or serum sickness. History of a rash is less predictive of risk from re-exposure. In doubtful situations, concern for the patient's welfare should outweigh ecological considerations.

The initial empirical use of vancomycin or teicoplanin in the febrile neutropenic patient should be discouraged unless there is a pre-existing infection with MRSA or MRSE, or the prevalence of those organisms in the facility is high, or there is clinical evidence of infection with MRSA or MRSE, such as an infected long-term intravenous access device.

Similarly, despite its advantageous spectrum and pharmacokinetics in renal failure, vancomycin should not be the routine initial management of peritonitis associated with continuous ambulatory peritoneal dialysis or of methicillin-susceptible *Staphylococcus aureus* or other Gram-positive coccal infections in patients on renal dialysis.

In patients with nosocomial infections, failure to respond promptly to other antibiotics may justify the empirical administration of vancomycin, if no other reason accounts for failure to respond and while culture results are pending.

The use of vancomycin and teicoplanin in domiciliary treatment is convenient due to their long half-life, but this alone does not justify their use in this setting. In fact, vancomycin use should be strongly discouraged for patients with infections caused by organisms susceptible to other antibiotic agents.

When vancomycin is used empirically, it should be discontinued after 48 hours if all cultures are negative for MRSA, unless there are compelling clinical reasons to do otherwise.

Routine use of vancomycin or teicoplanin for other purposes is both expensive and dangerous in that it will hasten the loss of the benefits of these essential antimicrobial agents.

The emerging problems with VRE are a stark reminder of the vulnerability of our present success in treating infections. As enterococci are resistant to cephalosporins, the unnecessary use of this class of drugs will exert selective pressure in the bacterial population, favouring enterococci including VRE. Therefore, restraint in overall use of antibiotics is necessary.

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