

North Carolina
Guidelines for Control of Antibiotic Resistant Organisms,
Specifically Methicillin-Resistant *Staphylococcus aureus* (MRSA)
and Vancomycin-Resistant Enterococci (VRE)

North Carolina Statewide Program for Infection Control and Epidemiology
North Carolina General Communicable Disease Control Section
Guideline Advisory Group

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by
Karen K. Hoffmann, R.N., M.S., C.I.C.
Irene Pipines Kittrell, R.N.

Advisory Group:

Paula Blankenship, R.N., C.I.C.
Kathy Butler, R.N., C.I.C.
Joyce Frederick, R.N.C., M.S.N., C.I.C.
Polly Godwin, R.N.
Donna Goering, M.T. (A.S.C.P.), M.S.P.H., C.I.C.
Wanda Lamm, R.N., B.S.N., C.I.C.
Linda Lemmons, R.N.
Susan Liles, R.N., C.I.C.
Jean-Marie Maillard, M.D., M.Sc.
Joyce Reddington, R.N.
William A. Rutala, Ph.D., M.P.H., C.I.C.
Stephen Streed, M.S., C.I.C.
Sharon Thompson, R.N., C.I.C.
David J. Weber, M.D., M.P.H.
Douglas Williams, M.T. (A.S.C.P.), C.I.C.

In collaboration with:

North Carolina Department of Environment, Health and Natural Resources
General Communicable Disease Control Section
J. Newton MacCormack, M.D., M.P.H., Chief

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CONTENTS

	<i>Page</i>
I. Introduction	1
II. Background	1
A. Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA)	1
B. Vancomycin-Resistant Enterococci (VRE)	1
III. Colonization vs. Infection	2
A. Colonization.....	2
1. MRSA	2
2. Enterococci	2
B. Infection.....	2
IV. Epidemiology	2
A. Methicillin-Resistant <i>Staphylococcus aureus</i>	2
1. Mode of Transmission	2
2. Reservoirs	2
3. Risk Factors.....	2
B. Vancomycin-Resistant Enterococci.....	3
1. Mode of Transmission	3
2. Reservoirs of VRE	3
3. Risk Factors	3
V. Control Measures.....	4
A. General Control Measures	4
1. Infection Control Plan.....	4
2. Handwashing	4
3. Communication	4
4. Standard Precautions.....	4
5. Decolonization Therapy	5
6. Education	5
7. Visitors	5
8. Surveillance	5
B. Institutionally Specific Control Measures	6
1. Acute Care Facilities	6
2. Long Term Care Facilities	6
3. Home Health Care/Hospice	9
4. Doctors' Offices/Outpatient Clinics.....	9
5. Schools for the Physically and Mentally Challenged	9
6. Rest Homes/Retirement Centers	9
7. Rehabilitation Hospitals	10
8. Psychiatric Hospitals	10
9. Patients Discharged to Their Homes	10
Centers for Disease Control and Prevention: HICPAC Guidelines	
Attachment A: Prudent Vancomycin Use.....	11
Attachment B: Standard Precautions	12
Attachment C: Prevention and Control of Nosocomial Transmission of VRE	14
Attachment D: Contact Precautions	16
References	18

**North Carolina Guidelines for Control of Antibiotic Resistant Organisms,
Specifically Methicillin-Resistant *Staphylococcus aureus* (MRSA)
and Vancomycin-Resistant Enterococci (VRE)**

I. INTRODUCTION

This policy outlines recommendations for control measures to prevent the spread of antibiotic-resistant organisms, specifically methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE), in healthcare settings including acute care hospitals, long term care (LTC) facilities, rehabilitation facilities, psychiatric facilities, hospice, home health care, and other settings in which people colonized or infected with resistant organisms may receive care. Although these guidelines do not encompass the whole body of knowledge on the subject, MRSA and VRE are currently the most important examples and represent the larger problem of resistant organisms which requires application of the basic principles of infection control.

II. BACKGROUND

A. Methicillin-Resistant *Staphylococcus aureus* - In the United States and North Carolina MRSA strains have been identified as a major source of nosocomial infections and outbreaks. For three decades MRSA has presented a challenge for infection control departments of university-affiliated and community teaching hospitals attempting to control and eradicate it. Long term care facilities, rehabilitation centers and small community hospitals are seeing increasing numbers of cases. These facilities experience continuous reintroduction of resistant organisms because of the recurrent admissions of patients to these settings. MRSA accounts for 12% of all nosocomial infections in the US; resistance to methicillin increased from 2.4% in 1975 to 29% in 1991.

Staphylococcus aureus is ubiquitous. It grows readily on human skin and mucous membranes. Methicillin-resistant *S. aureus* is a variant of *S. aureus* which is resistant to all beta-lactam antibiotics (including penicillins, cephalosporins and cephamicins). They may also be resistant to aminoglycosides, erythromycin, quinolones and others. By definition, MRSA must be resistant to one of the following semi-synthetic penicillins: methicillin, oxacillin, or nafcillin. MRSA is neither more infectious nor more virulent than susceptible *S. aureus*; it is just more difficult to treat. MRSA infections are most effectively treated with intravenous vancomycin.

B. Vancomycin-Resistant Enterococci - A rapid increase in the incidence of infection and colonization with vancomycin-resistant enterococci (VRE) has been reported from US hospitals from 1989 through 1993 (from 0.3% to 7.9%). The increase was due mainly to the 34-fold rise, from 0.4% to 13.6%, of VRE infections in intensive-care unit (ICU) patients, although a trend was also noted in non-ICU patients. The occurrence of VRE in National Nosocomial Infections Surveillance System (NNIS) hospitals was associated with larger hospital size (≥ 200 beds) and university affiliation. Other hospitals have also reported increases in endemic rates and clusters of VRE colonization and infection. This increase poses several problems, including the lack of available antimicrobials for therapy, since most VRE are also resistant to multiple other drugs (e.g., aminoglycosides and ampicillin) previously used for the treatment of infections due to these organisms. In addition, there is

the possibility that the vancomycin-resistant gene (VAN A gene) present in VRE may be transmitted to other gram positive organisms, such as *S. aureus*. Like MRSA, VRE is neither more infectious nor more virulent than susceptible enterococci, but it is a challenge because treatment options are limited to combinations of antimicrobials or experimental compounds with unproven efficacy.

III. COLONIZATION VS. INFECTION

- A. **Colonization** is the presence, growth, and multiplication of the organism without observable clinical symptoms or immune reaction.
1. **MRSA** - Colonization may occur in the nares, axillae, chronic wounds or decubitus ulcer surface, perineum, around gastrostomy and tracheostomy sites, in the sputum or urine. One of the most common sites of colonization in both patients and employees is the nose (anterior nares). While personnel may become colonized with MRSA (as they may with susceptible *S. aureus*), they rarely develop infections.
 2. **Enterococci** are normally found in the bowel and the female genital tract. When exposed to antibiotics for any reason, the drug-resistant bacteria may survive and multiply, resulting in an overgrowth of drug-resistant enterococci in the bowel, referred to as colonization.
- B. **Infection** refers to invasion of bacteria into tissue with replication of the organism. Infection is characterized by isolation of the organism accompanied by clinical signs of illness such as either fever, elevated white blood count, purulence (pus), pneumonia, inflammation (warmth, redness, swelling), etc.

IV. EPIDEMIOLOGY

A. Methicillin-Resistant *Staphylococcus aureus*

1. **Mode of Transmission** - MRSA is transmitted primarily by contact with a person who either has a purulent site of infection, a clinical infection of the respiratory tract or urinary tract, or is colonized with the organism. **Hands of personnel appear to be the most likely mode of transmission of MRSA from patient-to-patient.** Studies have demonstrated that MRSA can be present on the hands of personnel after performing such activities as wound debridement, dressing changes, tracheal suctioning, and catheter care.
2. **Reservoirs** - Colonized and infected patients are the major reservoir of MRSA. MRSA has been isolated from environmental surfaces including floors, sinks, and work areas, tourniquets used for blood drawing, and blood pressure cuffs. Although MRSA has been isolated from environmental surfaces (e.g., floors, medical equipment), these are not the most likely source of spread. However, environmental surfaces should be disinfected routinely to reduce the bacterial load.

3. **Risk Factors** - The factors that have been identified as increasing the risk that a patient will have a MRSA infection are:
 - a. Increased length of hospital stay
 - b. Multiple hospitalizations
 - c. Greater than 65 years old
 - d. Multiple invasive procedures
 - e. Wounds
 - f. Severe underlying disease
 - g. Administration of broad-spectrum antibiotics

Among hospitalized patients who acquire MRSA colonization, 30-60% eventually will develop a MRSA infection such as a wound infection, bacteremia, urinary tract infection, or pneumonia. However, unlike hospitalized patients, only 5-15% of residents in LTC facilities who acquire MRSA colonization subsequently will develop MRSA infections. Studies have indicated that roommate-to-roommate transmission of MRSA in LTC facilities appears to be uncommon.

B. Vancomycin-Resistant Enterococci

1. **Mode of Transmission** - Recent reports have demonstrated that enterococci, including VRE, can spread patient-to-patient by direct contact via transient carriage on the hands of personnel or indirectly on contaminated environmental surfaces and patient care equipment.
2. **Reservoirs of VRE** - Enterococci are part of the normal flora of the gastrointestinal tract and female genitourinary tracts. Most infections with these microorganisms have been attributed to the patient's endogenous flora. However, a recent study found VRE is capable of prolonged survival on hands, gloves, and environmental surfaces. *E. faecalis* was recovered from countertops for 5 days; the *E. faecium* persisted for 7 days. Thus environmental surfaces may serve as potential reservoirs for nosocomial transmission of VRE and need to be considered when formulating institutional infection control policies.
3. **Risk Factors** - The epidemiology of VRE has not been elucidated completely; however, certain patient populations have been found to be at increased risk for VRE infection or colonization. This includes patients who:
 - a. Are critically ill
 - b. Have severe underlying disease or immune suppression (such as ICU patients or patients in oncology or transplant wards)
 - c. Have had an intra-abdominal or cardio-thoracic surgical procedure
 - d. Have an indwelling urinary or central venous catheter
 - e. Have had a prolonged hospital stay
 - f. Have broad spectrum antimicrobial therapy
 - g. Have received administration of oral and, to a lesser extent intravenous (IV), vancomycin

V. CONTROL MEASURES

A. General Control Measures

1. **Infection Control Plan** - It is recommended that every facility develop a comprehensive, institution-specific, strategic plan to detect, prevent, and control infection and colonization with multiple-antibiotic-resistant organisms. The plan should include controls to minimize unnecessary antibiotic use in all patients and methods to insure the prudent use of vancomycin for strictly appropriate indications (see Attachment A).
2. **Handwashing** - Healthcare workers should be required to wash their hands for at least 10 seconds before leaving a patient room whether or not gloves were worn. The indications for handwashing are specified in the "APIC Guideline for Handwashing and Hand Antisepsis in Health Care Settings." Various antimicrobial handwashing products, including waterless alcohol-based antiseptic agents, have been strongly recommended by experts as a way to help prevent cross-transmission in acute care facilities. These products should be considered by other facilities as well. **It should be noted that bland soap has been shown to be relatively ineffective in removing VRE from the hands.**
3. **Communication**
 - a. It is the responsibility of the facility transferring the patient to inform a receiving facility and the ambulance squad of the patient's colonization or infection history and status prior to treatment or transfer.
 - b. A receiving facility that finds that a patient admitted from another institution is infected or colonized with a multiple-antibiotic-resistant organism within 48 hours of admission should inform the transferring institution.
 - c. It is important that healthcare workers who may have direct contact with patients on transmission-based precautions be made aware of appropriate control measures (e.g., protective garments/barriers) prior to room entry. Traditionally this has been accomplished by placing instructional cards on the patient's door and a label on the patient care record.
 - d. If special precautions are used for patients colonized/infected with multiple-antibiotic-resistant organisms, identifying such persons at the time of readmission to the facility can assist the admissions department and nursing personnel to implement special precautions promptly. This measure requires some indication in the patient's medical record and/or computer file, which is accessed at the time of admission. Use of a system that maintains patient confidentiality is essential.
4. **Standard Precautions** (Attachment B) should be practiced for contact with every patient. The term **Standard Precautions** is defined in "Guideline for Isolation Precautions in Hospitals," published in 1996, and is not the same as **Universal Precautions**.

5. **Decolonization Therapy** - Decolonization is the use of antibiotics to treat colonized patients for the purpose of reducing the magnitude of the reservoir.
 - a. **Patients**
 - (1) **MRSA** - Routine decolonization for MRSA is not recommended. The need for decolonization should be based on the patient's medical condition and expected outcome. Topical or systemic antibiotics, including trimethoprim-sulfamethoxazole, rifampin, ciprofloxacin, erythromycin, doxycycline, bacitracin and mupirocin have been used with variable results to eradicate colonization by MRSA. Vancomycin is not indicated for decolonization therapy, as it is ineffective for this purpose.
 - (2) **VRE** - There is no clinically proven decolonization regimen for VRE.
 - b. **Employees**
 - (1) **MRSA** - Healthcare personnel should be cultured only if epidemiologic data implicates them (e.g., by geographic location or patient care team) as a possible source of dissemination of MRSA. Identified infected personnel with hand or skin lesions should be treated. Decolonization should be considered for those employees with persistent MRSA nasal carriage (e.g., chronic sinusitis), especially if the healthcare worker had contact with patients who were subsequently found to be positive for the same strains. Intranasal mupirocin appears to be an effective agent for eradicating nasal carriage of MRSA; prolonged therapy should be discouraged.
 - (2) **VRE** - Carriers of enterococci have been rarely implicated in transmission of this organism. For facilities with continued VRE cross-transmission, see Attachment C.
6. **Education**
 - a. **Personnel** - Continuing education programs for healthcare workers who have direct patient contact or who are responsible for decision making regarding patient care should include a thorough review of the information presented in this guideline.
 - b. **Patient Education** - Patient education is essential to control the transmission of infections. Patients should be instructed to cover their mouths when coughing and practice good handwashing. They should not share drinks or food. Personal items such as games, books, or computers should be cleaned with an EPA-approved disinfectant before sharing with another patient. Patients on isolation and their families need additional education, including the reason for isolation, control measures, and expected duration of isolation.
7. **Visitors** - Visitors should be instructed that items are not to be shared between patients unless they can be appropriately cleaned. When visiting patients on Contact Precautions, visitors should be instructed regarding control measures, with special emphasis on handwashing.
8. **Surveillance** - Culture and susceptibility data should be reviewed routinely to detect MRSA and VRE, and a line listing of MRSA and VRE cases (infection or colonization) should be maintained. It should be noted whether cases are nosocomial, community-acquired, or transferred from another facility. This information may be used to establish

a baseline or endemic rate for the facility. If continual cross-transmission occurs or an outbreak is recognized, additional surveillance techniques may be appropriate. An outbreak is defined as an excess over the expected (usual) level of a disease within a geographic area (e.g., hospital). Guidance in outbreak situations may be obtained by calling the Statewide Program for Infection Control and Epidemiology (919-966-3242).

B. Institutionally Specific Control Measures - As stated in the Centers for Disease Control and Prevention (CDC) "Guideline for Isolation Precautions in Hospitals," no guidelines can address all the needs of the many kinds of facilities serving different patient populations.

1. **Acute Care Facilities** ideally should follow the CDC "Guideline for Isolation Precautions in Hospitals," making modifications according to what is possible, practical and prudent.

The recommendations are intended primarily for use in the care of patients in acute-care hospitals, although some of the recommendations may be applicable for some patients receiving care in subacute-care or extended-care facilities. (See Attachment D.)

For additional strategies regarding the control of VRE, consult the Hospital Infection Control Practices Advisory Committee (HICPAC) "Recommendations for Preventing the Spread of Vancomycin Resistance." (See Attachment C for the sections of the HICPAC recommendations describing screening, prevention and control measures).

The following recommendations for settings other than acute care are modifications to better meet the specific needs and circumstances of those facilities.

2. Long Term Care Facilities

- a. **Admission** - Admission to licensed facilities should not be denied on the basis of colonization or infection with multiple-antibiotic-resistant organisms.
- b. **Activities** - In general, residents colonized or infected with multiple-antibiotic-resistant organisms may use common living areas, recreational areas, and dining facilities. Patients leaving their rooms for activities should have clean, dry dressings and wear clean clothes or a clean cover gown. If necessary, their hands must be washed for them whenever they may be contaminated and before they leave their rooms for common areas. In addition to the above requirements, the VRE colonized or infected patient should be continent of stool.
- c. **Contact Precautions** - The implementation of Contact Precautions in addition to Standard Precautions should be based upon the site and severity of infection. Other factors to consider include the resident's mental status, reliability, personal hygiene, the ability to contain wound drainage, and whether the patient who is colonized in the respiratory tract has a cough.
 - (1) **Standard Precautions are adequate for**
 - (a) The patient who is nasally or superficially colonized (e.g., identified from sputum culture, but without purulence) with MRSA.

- (b) The VRE patient who is colonized in the gastrointestinal tract and continent of stool and capable of maintaining hygienic practices (e.g., handwashing).
- (2) **Indications for Contact Precautions**
 - (a) Patients who should be placed on Contact Precautions include the following.
 - (i) Patients with foley catheter-associated MRSA or VRE urinary tract infection or colonization.
 - (ii) Patients with wounds heavily colonized or infected with MRSA or VRE.
 - (iii) Patients with a tracheostomy who have a colonized or infected respiratory tract and who are unable to handle secretions.
 - (b) When a cluster of nosocomial (institutionally acquired) infections is recognized, then Contact Precautions should be instituted for all identified cases.
- (3) **Room Placement for Patients on Contact Precautions**
 - (a) Ideally, the patient on Contact Precautions should be placed in a private room.
 - (b) When a private room is not available, the patient may be placed in a room with a patient(s) who has the same microorganism, but no other infection or colonization with a different multiple-antibiotic-resistant organism (cohorting).
 - (c) If a private room is unavailable and cohorting cannot be accomplished, then the patient may be placed in a room with another patient. The best roommate for a person with MRSA or VRE is a patient who:
 - (i) Has intact skin
 - (ii) Has no invasive devices (no nasogastric tubes, tracheostomy or tracheal tube, no IV lines, no foley catheters, etc.)
 - (iii) Is not significantly immunocompromised (e.g., neutropenic, on oral steroids, or on chemotherapy).
- (4) **Gloves**
 - (a) In addition to wearing gloves as outlined under Standard Precautions, wear gloves (clean, single-use, non-sterile gloves are adequate) when providing direct patient care or handling items potentially contaminated by the patient on Contact Precautions.
 - (b) During the course of providing care for a patient, change gloves after having contact with infected material that may contain high concentrations of microorganisms (e.g., fecal material and wound drainage).
 - (c) Remove gloves before leaving the patient's environment, and wash hands immediately. After glove removal and handwashing, ensure hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of microorganisms to other patients or environments.
- (5) **Gowns**
 - (a) In addition to wearing a gown as outlined under Standard Precautions, wear a gown (a clean, non-sterile gown is adequate) for the patient on Contact Precautions when doing direct patient care or if you anticipate that your clothing will have substantial contact with

- the patient, environmental surfaces, or items in the patient's room, or if the patient is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing.
- (b) Remove the gown before leaving the patient's environment. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces in order to avoid transfer of microorganisms to other patients or environments.
- (6) **Masks** - Masks should be worn as specified in Standard Precautions.
 - (7) **Patient-Care Equipment**
 - (a) When possible, dedicate the use of non-critical patient care equipment (equipment which comes into contact only with intact skin) to a single patient (or cohort of patients infected or colonized with the pathogen requiring precautions) to avoid sharing between patients.
 - (b) Electronic thermometers used with the VRE patient should not be shared with other patients. Dedicate a thermometer for single patient use and disinfect when the patient is removed from Contact Precautions.
 - (c) If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use for another patient.
 - (8) **Linen and Laundry** - Special handling (i.e., double bagging) of isolation linens is not recommended. (See Attachment B for further information).
 - (9) **Isolation Room Solid Waste** - Special handling (i.e., double bagging) of isolation room solid waste is not recommended. Follow your institutional policy for waste management.
 - (10) **Dishes, Glasses, Cups, and Eating Utensils** - No special precautions are needed for dishes, glasses, cups, or eating utensils. The combination of hot water and detergents used in institutional dishwashers is sufficient to decontaminate these items.
 - (11) **Routine and Terminal Cleaning** - The room and bedside equipment of patients on Contact Precautions are cleaned using the same procedures used for all patients in accordance with Standard Precautions. Multiple-antibiotic-resistant organisms are as susceptible to disinfectants as antibiotic-sensitive strains.
 - (12) **Termination of Precautions**
 - (a) **MRSA** - A patient with MRSA may be taken off Contact Precautions after two cultures taken 24 hours apart are found to be negative for MRSA. These cultures should be taken from each previously infected or colonized site and from the anterior nares. These cultures should be taken at least 48-72 hours after antibiotics used for treatment have been discontinued.
 - (b) **VRE** - For the VRE patient, Contact Precautions may be discontinued when three successive negative cultures (stool cultures and initial site of infection/colonization) obtained at least one week apart are reported. These cultures should be taken at least 48-72 hours after antibiotics used for treatment have been discontinued.

3. **Home Health Care/Hospice** - In addition to Standard Precautions (Attachment B), healthcare personnel providing care in the home should follow the recommended practices for Contact Precautions as described by the CDC for acute care facilities. (See Attachment D, paragraphs B, C, and E.) Specifically, home healthcare workers should focus on preventing cross-transmission via the clinical bag, clothing, and equipment which is carried to and from the home by the healthcare professional. Alternatively, the clinical bag may be left in the vehicle and only the disposable items used for the patient be carried into the home. Reusable equipment must be cleaned either in the patient's home or bagged prior to returning to the clinician's vehicle or facility for disinfection. Hands should be washed before leaving the home.
4. **Doctors' Offices/Outpatient Clinics** - Standard Precautions should be used for all patients. Waiting areas should be screened for patients with productive coughs, draining wounds or other signs and symptoms of infection. Patients exhibiting such symptoms should be removed from the waiting area to an exam room as soon as possible. Once a patient has been identified with a multiple-antibiotic-resistant organism, subsequent visits to the office/clinic should be managed carefully. Any surfaces which may have had contact with the patient (e.g., blood pressure cuffs, examination table, stethoscopes) should be cleaned with an EPA-registered disinfectant prior to use for another patient. (See Attachment D, Paragraphs B and C for information about the proper use of gloves and gowns.) For guidelines on handling linen and laundry and isolation room solid waste, see Attachment B, Section G - Linen.
5. **Schools for the Physically and Mentally Challenged** - In addition to Standard Precautions, follow the Long Term Care recommendations in this guideline. Students identified with multiple-antibiotic-resistant organisms should be instructed regarding how to prevent contamination of school materials that are to be reused by others (e.g., cover cough, wash hands prior to using school materials). Shared items such as books and computer keyboards must be cleaned with an EPA-registered disinfectant prior to use by another individual. When possible, these items should be assigned to the student who is on Contact Precautions as long as the person requires the items, and then cleaned and disinfected prior to reuse by another student.
6. **Rest Homes/Retirement Centers** - Admission should not be denied on the basis of colonization with multiple-antibiotic-resistant organisms. These patients are usually ambulatory and not bed-bound. Since these patients require minimal assistance with activities of daily living and have few invasive devices (e.g., foley catheters), additional precautions beyond Standard Precautions are unnecessary unless a cluster of facility-acquired infections is recognized. Handwashing education should be emphasized in employee and staff education. Consult the Statewide Program for Infection Control and Epidemiology (919-966-3242) if a cluster is recognized.

7. **Rehabilitation Hospitals** - This patient population is generally not immunocompromised; thus, the risk of colonization with multiple-antibiotic-resistant organisms progressing to infection is less than for patients in acute care facilities. These patients are unique in that they are learning to manage their own care (e.g., wound, foley). Handwashing and the use of barrier techniques should be included in patient education. In addition to Standard Precautions, the Long Term Care recommendations in this guideline should be followed. Consult the Statewide Program for Infection Control and Epidemiology (919-966-3242) if a cluster is recognized.
8. **Psychiatric Hospitals** - These patients typically have no underlying medical conditions increasing their risk of infection. These facilities are unique in that the patients are encouraged to join in group activities, and they may eat in a common dining room. All these activities are important for their treatment regimen. To isolate or cohort ambulatory patients with MRSA would be contrary to the philosophy and policy of most of these facilities. However, patients with underlying medical conditions should be evaluated on a case by case basis for the risk of contaminating their environment if infected with MRSA or VRE. Those patients who cannot comply may need to be transferred. Consult the Statewide Program for Infection Control and Epidemiology (919-966-3242) if a cluster is recognized.
9. **Patients Discharged to Their Homes** - The patients colonized or infected with multiple-antibiotic-resistant organisms require no special control measures beyond regularly cleaning all surfaces contaminated by secretions or touched by hands . Family members should inform healthcare facilities or providers of the patients' prior colonization or infection with multiple-antibiotic-resistant organisms. Family members should perform handwashing with an antibacterial soap for a minimum of 10 seconds after direct contact with the patient or any items the patient has touched, before preparing food and before eating. The patient and caregiver should wash hands after using the toilet.

ATTACHMENT A

Excerpt from: Recommendations for Preventing the Spread of Vancomycin Resistance: Recommendations of the Hospital Infection Control Practices Advisory Committee. MMWR 1995;44(RR-12):1-13; also in AM J INFECT CONTROL 1995;23:87-94.

- A. Situations in which the use of vancomycin is appropriate or acceptable:
1. For treatment of serious infections due to beta-lactam resistant gram-positive microorganisms. Clinicians should be aware that vancomycin may be less rapidly bactericidal than beta-lactam agents for beta-lactam susceptible staphylococci.
 2. For treatment of infections due to gram-positive microorganisms in patients with serious allergy to beta-lactam antimicrobials.
 3. When antibiotic-associated colitis (AAC) fails to respond to metronidazole therapy or if AAC is severe and potentially life-threatening.
 4. Prophylaxis, as recommended by the American Heart Association, for endocarditis following certain procedures in patients at high risk for endocarditis.
 5. Prophylaxis for major surgical procedures involving implantation of prosthetic materials or devices, e.g., cardiac and vascular procedures and total hip replacement, at institutions with a high rate of infections due to MRSA or methicillin-resistant *S. epidermidis*. A single dose administered immediately before surgery is sufficient unless the procedure lasts more than 6 hours, in which case the dose should be repeated. Prophylaxis should be discontinued after a maximum of two doses.
- B. Situations in which the use of vancomycin should be discouraged:
1. Routine surgical prophylaxis other than in a patient with life-threatening allergy to beta-lactam antibiotics.
 2. Empiric antimicrobial therapy for a febrile neutropenic patient, unless there is strong evidence at the outset that the patient has an infection due to gram-positive microorganisms (e.g., inflamed exit site of Hickman catheter), and the prevalence of infections due to MRSA in the hospital is substantial.
 3. Treatment in response to a single blood culture positive for coagulase-negative staphylococcus, if other blood cultures drawn in the same time frame are negative, i.e., if contamination of the blood culture is likely. Because contamination of blood cultures with skin flora, e.g., *S. epidermidis*, may cause vancomycin to be inappropriately administered to patients, phlebotomists and other personnel who obtain blood cultures should be trained properly to minimize microbial contamination of specimens.
 4. Continued empiric use for presumed infections in patients whose cultures are negative for beta-lactam-resistant gram-positive microorganisms.
 5. Systemic or local (e.g., antibiotic lock) prophylaxis for infection or colonization of indwelling central or peripheral intravascular catheters.
 6. Selective decontamination of the digestive tract.
 7. Eradication of MRSA colonization.
 8. Primary treatment of AAC.
 9. Routine prophylaxis for very low-birth-weight infants.
 10. Routine prophylaxis for patients on continuous ambulatory peritoneal dialysis or hemodialysis.
 11. Treatment (chosen for dosing convenience) of infections due to beta-lactam-sensitive gram-positive microorganisms in patients with renal failure.
 12. Use of vancomycin solution for topical application or irrigation.

Further study is required to determine the most effective methods for influencing the prescribing practices of physicians, although a variety of techniques may be useful. In addition, key parameters of vancomycin use can be monitored through the hospital's quality assurance/improvement process or as part of the drug-utilization review of the pharmacy and therapeutics committee and the medical staff.

ATTACHMENT B

Excerpt from: Garner JS, Hospital Infection Control Practices Advisory Committee. Guideline for Isolation Precautions in Hospitals. *INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY* 1996;17:53-80.

"The recommendations are intended primarily for use in the care of patients in acute-care hospitals, although some of the recommendations may be applicable for some patients receiving care in subacute-care or extended-care facilities."

Categorization of HICPAC Recommendations

Category IA. Strongly recommended for all hospitals and strongly supported by well-designed experimental or epidemiologic studies.

Category IB. Strongly recommended for all hospitals and reviewed as effective by experts in the field and a consensus of HICPAC based on strong rationale and suggestive evidence, even though definitive scientific studies have not been done.

Category II. Suggested for implementation in many hospitals. Recommendations may be supported by suggestive clinical or epidemiologic studies, a strong theoretical rationale, or definitive studies applicable to some, but not all, hospitals.

No recommendation; unresolved issue. Practices for which insufficient evidence or consensus regarding efficacy exists.

II. Standard Precautions

Use Standard Precautions, or the equivalent, for the care of all patients.

Category IB

A. Handwashing

1. Wash hands after touching blood, body fluids, secretions, excretions, and contaminated items, whether or not gloves are worn. Wash hands immediately after gloves are removed, between patient contacts, and when otherwise indicated to avoid transfer of microorganisms to other patients or environments. *Category IB*
2. Use a plain (nonantimicrobial) soap for routine handwashing. *Category IB*
3. Use an antimicrobial agent or a waterless antiseptic agent for specific circumstances (e.g., control of outbreaks or hyperendemic infections), as defined by the infection control program. *Category IB* (See Contact precautions for additional recommendations on using antimicrobial and antiseptic agents.)

B. Gloves

Wear gloves (clean, nonsterile gloves are adequate) when touching blood, body fluids, secretions, excretions, and contaminated items. Put on clean gloves just before touching mucous membranes and nonintact skin. Change gloves between tasks and procedures on the same patient after contact with material that may contain a high concentration of microorganisms. Remove gloves promptly after use, before touching noncontaminated items and environmental surfaces, and before going to another patient, and wash hands immediately to avoid transfer of microorganisms to other patients or environments. *Category IB*

C. Mask, Eye Protection, Face Shield

Wear a mask and eye protection or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions. *Category IB*

D. Gown

Wear a gown (a clean nonsterile gown is adequate) to protect skin and to prevent soiling of clothing during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions. Select a gown that is appropriate for the activity and amount of fluid likely to be encountered. Remove a soiled gown as promptly as possible, and wash hands to avoid transfer of microorganisms to other patients or environments. *Category IB*

E. Patient-Care Equipment

Handle used patient-care equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of microorganisms to other patients and environments. Ensure that reusable equipment is not used for the care of another patient until it has been appropriately cleaned and reprocessed appropriately. Ensure that single use items are discarded properly. *Category IB*

F. Environmental Control

Ensure that the hospital has adequate procedures for the routine care, cleaning, and disinfection of environmental surfaces, beds, bedrails, bedside equipment, and other frequently touched surfaces, and ensure that these procedures are being followed. *Category IB*

G. Linen

Handle, transport, and process used linen soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures and contamination of clothing, and that avoids transfer of microorganisms to other patients and environments. *Category IB*

H. Occupational Health and Bloodborne Pathogens

1. Take care to prevent injuries when using needles, scalpels, and other sharp instruments or devices; when handling sharp instruments after procedures; when cleaning used instruments; and when disposing of used needles. Never recap used needles or otherwise manipulate them using both hands, or any other technique that involves directing the point of a needle toward any part of the body; rather, use either a one-handed "scoop" technique or a mechanical device designed for holding the needle sheath. Do not remove used needles from disposable syringes by hand, and do not bend, break, or otherwise manipulate used needles by hand. Place used disposable syringes and needles, scalpel blades, and other sharp items in appropriate puncture-resistant containers located as close as practical to the area in which the items were used, and place reusable syringes and needles in a puncture-resistant container for transport to the reprocessing area. *Category IB*
2. Use mouthpieces, resuscitation bags, or other ventilation devices as an alternative to mouth-to-mouth resuscitation methods in areas where the need for resuscitation is predictable. *Category IB*

I. Patient Placement

Place a patient who contaminates the environment or who does not (or cannot be expected to) assist in maintaining appropriate hygiene or environmental control in a private room. If a private room is not available, consult with infection control professionals regarding patient placement or other alternatives. *Category IB*

ATTACHMENT C

Excerpt from: Recommendations for Preventing the Spread of Vancomycin Resistance: Recommendations of the Hospital Infection Control Practices Advisory Committee. MMWR 1995;44(RR-12):1-13; also in AM J INFECT CONTROL 1995;23:87-94.

IV. Prevention and Control of Nosocomial Transmission of VRE

Eradication of VRE from the hospital is most likely to succeed when VRE infection or colonization is confined to a few patients on a single ward. Once VRE have become endemic on a ward or have spread to multiple wards or to the community, eradication becomes extremely difficult and costly. Aggressive infection control measures and strict compliance by hospital personnel are required to limit nosocomial spread of VRE.

Control of VRE requires a collaborative institution-wide multidisciplinary effort. Therefore, the hospital's quality assurance/improvement department should be involved at the outset in order to identify specific problems in hospital operations and patient-care systems and to design, implement, and evaluate appropriate changes in these systems.

A. For all hospitals, including those where VRE have been isolated infrequently or not at all:

1. Notify appropriate hospital staff promptly when VRE is detected. (See Section III-C-2 above).
2. Make clinical staff aware of the hospital's policies regarding VRE-infected or colonized patients. Implement the required procedures as soon as VRE are detected because the slightest delay can lead to further spread of VRE and complicate control efforts. Clinical staff play a pivotal role in limiting the spread of VRE in patient-care areas. Accordingly, continuing education regarding the appropriate response to the detection of VRE is critical (See Section II above).
3. Establish system(s) for monitoring appropriate process and outcome measures, such as cumulative incidence or incidence density of VRE colonization, rate of compliance with VRE isolation precautions and handwashing, interval between VRE identification in the laboratory and implementation of isolation precautions on the wards, and the percentage of previously colonized patients admitted to the ward who are promptly recognized and placed on isolation precautions. Relay these data to the clinical, administrative, laboratory, and support staff as reinforcement to ongoing education and control efforts.
4. Isolation precautions to prevent patient-to-patient transmission of VRE:
 - a. Place VRE-infected or colonized patients in single rooms or in the same room as other patients with VRE.
 - b. Wear gloves (clean nonsterile gloves are adequate) when entering the room of a VRE-infected or colonized patient; extensive environmental contamination with VRE has been noted in some studies. During the course of caring for a patient, a change of gloves may be necessary after contact with material that may contain high concentrations of VRE (e.g., stool).
 - c. Wear a gown (a clean nonsterile gown is adequate) when entering the room of a VRE-infected or colonized patient if substantial contact with the patient or environmental surfaces in the patient's room is anticipated, or if the patient is incontinent, or has diarrhea, an ileostomy, a colostomy, or a wound drainage not contained by a dressing.
 - d.
 - i. Remove gloves and gown before leaving the patient's room, and wash hands immediately with an antiseptic soap. Hands can be contaminated via glove leaks or during glove removal and bland soap has been shown to be relatively ineffective in removing VRE from the hands.
 - ii. Ensure that after glove and gown removal and handwashing, clothing and hands do not contact environmental surfaces potentially contaminated with VRE (e.g., door knob or curtain) in the patient's room.
5. Dedicate the use of noncritical items, such as stethoscope, sphygmomanometer, or rectal thermometer, to a single patient or cohort of patients infected or colonized with VRE. If such devices are to be used on other patients, adequately clean and disinfect them first.
6. Obtain culture of stools or rectal swabs of roommates of patients newly found to be infected or colonized with VRE to determine their colonization status, and apply isolation precautions as necessary. Perform additional screening of patients on the ward at the discretion of the infection control staff.

7. Adopt a policy for deciding when patients infected and/or colonized with VRE can be removed from isolation precautions. The optimal requirements remain unknown; however, since VRE colonization may persist indefinitely, stringent criteria may be appropriate, e.g., VRE-negative results on at least three consecutive occasions, one or more weeks apart, for all cultures from multiple body sites (including stool or rectal swab, perineal area, axilla or umbilicus, and wound, Foley catheter, and/or colostomy sites if present).
8. Establish a system of highlighting the records of infected or colonized patients so that they can be recognized and promptly placed on isolation precautions upon readmission to the hospital because patients with VRE may remain colonized for long periods following discharge from the hospital. Ideally, this information should be computerized so that placement of colonized patients on isolation precautions will not be delayed due to unavailability of the patients' medical records.
9. Discharging VRE-infected or colonized patients:

Consult local and state health departments [**in North Carolina, the State Health Department has designated the Statewide Program for Infection Control and Epidemiology* as the agency to consult**] in developing a plan regarding the discharge of VRE-infected or colonized patients to nursing homes, other hospitals or home health-care, as part of a larger strategy for handling patients with resolving infections and patients colonized with antimicrobial-resistant microorganisms.

- B. In hospitals with endemic VRE or continued VRE transmission despite implementation of measures described in IV-A-1 through IV-A- 9:
1. Focus control efforts initially on ICUs and other areas where VRE transmission rate is highest. Such units may serve as a reservoir of VRE, from where VRE spreads to other wards when patients are well enough to be transferred.
 2. When feasible cohort staff who provide regular ongoing care to patients to minimize the movement/contact of healthcare givers between VRE-positive and VRE-negative patients.
 3. Carriers of enterococci on the hospital staff have been implicated in the transmission of this organism. Nonetheless, in conjunction with careful epidemiological studies and upon the direction of the infection control staff, examine personnel for chronic skin and nail problems and perform hand and rectal-swab cultures on them. Remove VRE-positive personnel epidemiologically linked to VRE transmission from the care of VRE-negative patients until such time as their carrier state has been eradicated.
 4. The results of several enterococcal outbreak investigations suggest a potential role for the environment in the transmission of enterococci. In institutions experiencing ongoing VRE transmission, verify that the hospital has adequate procedures for the routine care, cleaning, and disinfection of environmental surfaces (e.g., bedrails, charts, carts, doorknobs, faucet handles, bedside commodes) and that these procedures are being followed by housekeeping personnel. Some hospitals may elect to perform focused environmental cultures before and after cleaning of rooms housing patients with VRE to verify the efficacy of hospital policies and procedures. All environmental culturing should be approved and supervised by the infection control program in collaboration with the clinical laboratory.
 5. Consider sending representative VRE isolates to reference laboratories for strain typing by pulsed field gel electrophoresis or other suitable techniques to aid in defining reservoirs and patterns of transmission.

* North Carolina Statewide Program for Infection Control and Epidemiology, Chapel Hill, NC (919) 966-3242

ATTACHMENT D

Excerpt from: Garner JS, Hospital Infection Control Practices Advisory Committee. Guideline for Isolation Precautions in Hospitals. *INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY* 1996;17:53-80.

"The recommendations are intended primarily for use in the care of patients in acute-care hospitals, although some of the recommendations may be applicable for some patients receiving care in subacute-care or extended-care facilities."

V. Contact Precautions

In addition to Standard Precautions, use Contact Precautions, or the equivalent, for specified patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted 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 indirect contact (touching) with environmental surfaces or patient-care items in the patient's environment. *Category IB*

A. Patient Placement

Place the patient in a private room. When a private room is not available, place the patient in a room with a patient(s) who has active infection with the same microorganism but with no other infection (cohorting). When a private room is not available and cohorting is not achievable, consider the epidemiology of the microorganism and the patient population when determining patient placement. Consultation with infection control professionals is advised before patient placement. *Category IB*

B. Gloves and Handwashing

In addition to wearing gloves as outlined under Standard Precautions, wear gloves (clean, nonsterile gloves are adequate) when entering the room. During the course of providing care for a patient, change gloves after having contact with infective material that may contain high concentrations of microorganisms (fecal material and wound drainage). Remove gloves before leaving the patient's environment and wash hands immediately with an antimicrobial agent or a waterless antiseptic agent. After glove removal and handwashing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of microorganisms to other patients or environments. *Category IB*

C. Gown

In addition to wearing a gown as outlined under Standard Precautions, wear a gown (a clean nonsterile gown is adequate) when entering the room if you anticipate that your clothing will have substantial contact with the patient, environmental surfaces, or items in the patient's room, or if the patient is incontinent, or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing. Remove the gown before leaving the patient's environment. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients or environments. *Category IB*

D. Patient Transport

Limit the movement and transport of the patient from the room to essential purposes only. If the patient is transported out of the room, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or equipment. *Category IB*

E. Patient-Care Equipment

When possible, dedicate the use of noncritical patient-care equipment to a single patient (or cohort of patients infected or colonized with the pathogen requiring precautions) to avoid sharing between patients. If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use for another patient. *Category IB*

F. Additional Precautions for Preventing the Spread of Vancomycin Resistance

Consult the HICPAC report on preventing the spread of vancomycin resistance for additional prevention strategies. (See Attachment C.)

References

1. Boyce JM, Jackson MM, Pugliese G, et al. Methicillin-resistant *Staphylococcus aureus* (MRSA): A briefing for acute care hospitals and nursing facilities. *Infect Control Hosp Epidemiol* 1994;15:105-115.
2. Centers for Disease Control and Prevention. Nosocomial enterococci resistant to vancomycin - United States, 1989-1993. *MMWR* 1993;42:597-9.
3. Department of Health, State of Rhode Island and Providence Plantations. Guidelines for control of vancomycin resistant enterococci in nursing homes and extended care facilities. Department of Health, State of Rhode Island and Providence Plantations. April 1996.
4. Emory TG, Gaynes RP. An Overview of nosocomial infections, including the role of the microbiology laboratory. *Clin Microbial Rev* 1993;6:428-42.
5. Garner JS, Hospital Infection Control Practices Advisory Committee. Guideline for isolation precautions in hospitals. *Infect Control Hosp Epidemiol* 1996;17:53-80.
6. Hospital Infection Control Practices Advisory Committee. Recommendations for preventing the spread of vancomycin resistance: Recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC). *Am J Infect Control* 1995;23:87-94. (also in: *MMWR* 1995;44(RR-12):1-13.)
7. Larson, EL. APIC guideline for handwashing and hand antisepsis in health care settings. *Am J Infect Control* 1995;23:251-69.
8. Maryland Department of Health and Mental Hygiene. Guidelines for methicillin-resistant *Staphylococcus aureus* (MRSA) for long term care facilities. Maryland Department of Health and Mental Hygiene. September 1989.
9. MRSA Interagency Advisory Committee. Guidelines for management of patients with methicillin-resistant *Staphylococcus aureus* in acute care hospitals and long term care facilities. Connecticut Department of Public Health and Addiction Services. July 1993.
10. Mulligan ME, Murray-Leisure KA, Ribner BS. Methicillin-resistant *Staphylococcus aureus*: A consensus review of the microbiology, pathogenesis, and epidemiology with implications for prevention and management. *Am J Med* 1993;94:313-328.
11. New York Department of Health. Supplemental Infection Control Guidelines. Colonized or infected with vancomycin-resistant enterococci (VRE) in hospitals; long term care and home health care. Albany, New York. September 1995.
12. Noskin GA, Stosor V, Cooper I, Peterson LR. Recovery of vancomycin-resistant enterococci on fingertips and environmental surfaces. *Infect Control Hosp Epidemiol* 1995;16:577-581.
13. Rosenberg J. Methicillin-resistant *Staphylococcus aureus* (MRSA) in the community: who's watching? *Lancet* 1995;346(8968):132-3.
14. Rutala WA and the APIC Guideline Committee. APIC guideline for selection and use of disinfectants. *Am J Infect Control* 1996;24:313-342.
15. Visiting Nurses Association. Protocol for the management of home care patients with vancomycin resistant enterococcus. *Homecare Education Management* 1997;2:17-32.
16. VRE Task Force, Washington State. Vancomycin resistant enterococci: Information and Recommendations. VRE Task Force, Washington State. February 1999.