

**GUIDELINES FOR PREVENTION AND CONTROL
OF
ANTIBIOTIC-RESISTANT ORGANISMS**

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December 2002

**Alabama Task Force
on
Antibiotic-resistant Organisms**

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PURPOSE

Widespread use of antimicrobials in both inpatient and outpatient settings has been associated with the emergence of antibiotic-resistant microorganisms. Bacterial strains that have been susceptible to all antimicrobial agents for decades have now developed resistance not only to those classic therapies, but to newer agents as well. Other organisms have developed resistance to new antimicrobials almost as soon as the drugs have been marketed, if not earlier. Organisms that are resistant to several different groups of antimicrobials have become more prevalent in recent years.

Antibiotic resistance has been a concern in the medical community since the 1950s, when an increase was documented in colonization and infection rates of penicillin-resistant *Staphylococcus aureus* in hospitalized patients. In March 1991, the Alabama Department of Public Health (ADPH) distributed a document, "Position Paper on the Control of Methicillin-resistant *Staphylococcus aureus* in Hospitals and Long-term Care Facilities", to the acute and long-term care facilities in Alabama. As there continues to be an evolution of knowledge concerning antibiotic resistance, this document has been written to update the 1991 document and to incorporate the present standards of care. As the need arises, it will be revised.

A rapid increase in the occurrence of vancomycin-resistant enterococci (VRE) reported in United States hospitals has generated concern comparable to that observed when the methicillin-resistant *Staphylococcus aureus* (MRSA) problem was first recognized. In addition, the first clinical strain of vancomycin-resistant staphylococcus aureus (VRSA) has recently been documented in the United States. In September, 1995, the Centers for Disease Control and Prevention (CDC) published the document "Recommendations for Preventing the Spread of Vancomycin Resistance, Recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC)". While this valuable CDC document addresses prevention and control issues in the acute care setting, it does not provide guidance for management of vancomycin resistance in other healthcare settings.

The purpose of this document is to update and expand the previous ADPH position paper on MRSA and to include infection control recommendations concerning VRE resistance in Alabama healthcare facilities/settings. Since today's trend is toward shorter hospital stays, more outpatient surgery, outpatient IV therapy, and a shift to home therapy, and because a colonization/infection may not be resolved when the patient is discharged or transferred, we have included recommendations for non-traditional healthcare settings in an effort to prevent and control antibiotic-resistant organism transmission.

Preventing and controlling the spread of all potential antibiotic-resistant bacteria in a variety of healthcare settings will require a coordinated, conscious effort from all individuals participating in the healthcare delivery system. Elements of this effort will require: (1) instituting a system for surveillance of clinical antimicrobial susceptibility summary reports by location and risk, (2) prudent use of antibiotics, (3) early detection and prompt reporting of MRSA, VRE, and other epidemiologically important antibiotic-resistant organisms by clinical microbiology laboratories, (4) immediate implementation of Standard Precautions and other appropriate infection control measures with specific emphasis on hand hygiene (to include monitoring of healthcare worker adherence) to prevent further spread, (5) implementing protocols for removal of invasive devices when they are no longer needed, (6) educating healthcare staff, as well as the general public, regarding the problems of antibiotic resistance, (7) meticulous communication between healthcare facilities/settings, and (8) incorporating the concept of infection control and prevention of transmission of infections into the healthcare facility's/setting's safety culture.

It is important to note that little prospective research has been done in nursing homes and other non-acute care settings which clearly delineates differences in treatment and control measures. The following recommendations are a group of **prudent practices** believed to be feasible and efficacious in minimizing the spread of antibiotic-resistant organisms in a variety of healthcare settings.

EMERGENCE OF RESISTANT ORGANISMS

Staphylococcus aureus

Staphylococcus aureus causes a variety of infections, from superficial skin infections to deep tissue infections or more life-threatening infections such as pneumonia, sepsis, and endocarditis. Treatment is with semi-synthetic penicillins and a wide range of antibiotic agents. Methicillin-resistant *Staphylococcus aureus* (MRSA) is a strain that is no longer sensitive to methicillin (oxacillin/nafcillin) due to alterations in penicillin-binding proteins located in bacterial cell walls. MRSA is **not** more virulent than methicillin-sensitive *S. aureus* (MSSA), but may be more difficult to treat due to limited antibiotic choices. The majority of MRSA isolates are also resistant to most other antibiotics, necessitating the use of the glycopeptide antibiotic, vancomycin.

Methicillin-resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* first emerged in England in 1960, soon after methicillin was introduced for the treatment of penicillin-resistant staphylococci. In the United States, MRSA was first reported at Boston City Hospital in 1968.

Colonization with MRSA may occur in the nares, axillae, chronic wounds or pressure ulcer surfaces, perineum, around gastrostomy and tracheostomy sites, and in the sputum or urine. One of the most common sites of colonization in both patients and employees is the nose (anterior nares). As with susceptible strains of *S. aureus*, personnel may become colonized with MRSA but rarely develop infections.

MRSA has become a prevalent nosocomial pathogen in the U.S. In hospitals, the most important reservoirs of MRSA are infected or colonized patients. Although hospital personnel can serve as reservoirs for MRSA and may harbor the organism for many months, they have been more commonly identified as a link for transmission between colonized or infected patients. The main mode of transmission is via hands (especially healthcare workers' hands) which may become contaminated by contact with a) colonized or infected patients, b) colonized or infected body sites of the personnel themselves, or c) devices, items, or environmental surfaces contaminated with body fluids containing MRSA.

Vancomycin-resistant *Staphylococcus aureus*

In June 2002, the first clinical isolate of *S. aureus* that is fully resistant to vancomycin (VRSA) was reported in the United States. The vancomycin-resistant genetic material from a co-infecting enterococci strain apparently had transferred to *Staphylococcus aureus* within the patient. The patient was successfully treated with trimethoprim sulfamethoxazole and the isolate was susceptible to several other drugs.

In the healthcare setting, the CDC recommends a patient with VRSA be placed in a private room and have dedicated patient care items. Health care workers providing care to such patients must follow Contact Precautions. (Appendix B, page 36)

Enterococcus

Enterococci are part of the normal flora found in the gastrointestinal and female genital tracts. Most enterococcal infections have been attributed to endogenous flora within the individual patient. However, patient-to-patient transmission can and does occur via direct contact, or indirectly via hands of personnel, contaminated equipment or environmental surfaces. In the past, all enterococci were sensitive to antibiotics such as ampicillin and vancomycin.

Vancomycin-resistant Enterococcus (VRE)

Vancomycin-resistant enterococci (VRE) are no more virulent than antimicrobial-sensitive enterococci but VRE poses distinct problems. These include the lack of available antibacterials and the possibility that vancomycin-resistant genes may be transferred to other gram-positive microorganisms.

COLONIZATION VS. INFECTION

Colonization is the presence, growth, and multiplication of the organism without observable clinical symptoms or immune reaction. Colonization does **not** require isolation, and antibiotic treatment is **not** necessary unless suspected or known to be epidemiologically linked to transmission.

- **MRSA** colonization may occur in the nares, axillae, chronic wounds or decubitus ulcer surface, perineum, around gastrostomy and tracheostomy sites, and 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 methicillin-susceptible *S. aureus*), they rarely develop infections.
- **Enterococci** are normal gastrointestinal tract and female genital tract flora. When exposed to antibiotics for any reason, the antibiotic-resistant bacteria may survive and multiply, resulting in an overgrowth of antibiotic-resistant bacteria in the bowel, referred to as colonization.

Infection refers to the invasion of bacteria into tissue with replication of the organism. Infection is characterized by isolation of the organism with accompanying clinical signs of illness. Certain populations such as the elderly or immunocompromised may exhibit minimal symptoms.

NOTE: Colonization and/or infection may be transferred to others if appropriate infection control measures are not taken. CDC's recommendations for preventing transmission of MRSA/VRE in hospitals consist of Standard/Universal Precautions, which should be used for all patient care. In addition, CDC recommends Contact Precautions when the facility deems the antibiotic-resistant microorganism to be of special clinical and epidemiologic significance.

DEFINITIONS

1. **Antimicrobial soap** - Soap containing an antiseptic agent.
2. **Antiseptic agents** - Antimicrobial substances that are applied to the skin to reduce the number of microbial flora. (Examples: alcohol, chlorhexidine, chlorine, iodine, triclosan, and quaternary ammonium compounds.)
3. **Antiseptic handrub** - Applying a waterless antiseptic agent to all surfaces of the hands to reduce the number of microorganisms present.
4. **Carrier** - An individual who is found to be persistently colonized with an organism without clinical manifestations of disease.
5. **Cohort** - Two or more patients/residents in a facility, colonized or infected with the same antibiotic-resistant organism, who are physically separated from other patients/residents and are cared for, as much as possible, by staff who do not provide care for other patients/residents.
6. **Colonized** - Any person who is found to be culture-positive for an organism but has no signs or symptoms of infection.
7. **Contact Precautions** - In addition to Standard Precautions/Universal (Appendix A, page 34), Contact Precautions or the equivalent are used for specified patients/residents known or suspected to be infected with antibiotic-resistant organisms or colonized with epidemiologically important antibiotic-resistant microorganisms. These organisms can be transmitted by direct contact with the patients/residents or by indirect contact with environmental surfaces or patient-care items in the patients'/residents' environment. (See Appendix B, page 36)
8. **Disinfection** - A process that kills or destroys nearly all microorganisms, with the exception of bacterial spores.
9. **Enterococcus** - A gram-positive cocci, which grows aerobically and anaerobically, and is a part of the endogenous flora. In the normal host, this organism has little pathogenic potential, however, in the elderly or immunocompromised patient, the organism becomes an opportunistic pathogen.
10. **Fomite** - An inanimate object that, when it is contaminated by pathogenic organisms such as MRSA or VRE, can transmit infection. Examples include stethoscopes, blood pressure cuffs, thermometers, bed linens, bed rails, and bedside tables.
11. **Handwashing** - Washing hands with plain (non-antimicrobial) soap and water or an antimicrobial soap and water when hands are visibly soiled with blood or other body fluids.. (See Appendix C, page 38)

12. **Immunocompromised** - Having the immune system impaired or weakened (as by drugs or illness).
13. **Infection** - The invasion and multiplication of an organism, such as MRSA or VRE, along with associated clinical signs and symptoms.
14. **Methicillin-resistant *Staphylococcus aureus* (MRSA)** - A strain of *Staphylococcus aureus* that is resistant to the antibiotics methicillin, (Staphcillin[®], Nafcillin (Nafcil[®]) Oxacillin (Prostaphalin[®]), Cephalosporins (Ancef[®], Rocephin[®], and Keflex[®]), quinolones (Levoquin[®]), and imipenem (Primaxin[®]). **Note: Use of trade names does not imply endorsement of use.**
15. **Mode of transmission** - The mechanism for transfer of an infectious agent from a reservoir to a susceptible host.
16. **Nosocomial** - An infection acquired in a hospital, nursing home, extended-care facility, or other healthcare facilities.
17. **Nosohusial** - A home care-acquired infection that occurs as a result of the home care provided.
18. **Reservoir** - A place in which an infectious agent can survive but may or may not multiply. Three common reservoirs are humans, animals, and environment/fomites.
19. **Standard/Universal Precautions** - Basic infection control precautions designed for the care of all patients/residents in healthcare facilities regardless of their diagnosis or presumed infection status. These precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection. (See Appendix A, page 34)
20. ***Staphylococcus aureus*** - A common species of gram-positive bacteria found on the skin and in the anterior nares of many people.
21. **Susceptible Host** - A person or animal lacking effective resistance to a particular pathogenic agent. Certain host characteristics may influence susceptibility to and severity of disease (e.g., age, sex, ethnicity, socioeconomic status disease history/underlying disease, heredity, medications, lifestyle).
22. **Transmission** - The passage of microorganisms from a colonized or infected person to a person previously free of these microorganisms.
23. **Vancomycin-resistant Enterococcus (VRE)** - Strains of enterococcus (*E. faecalis* and *E. faecium*) that are resistant to the antibiotic vancomycin and other antimicrobials.
24. **Vancomycin-resistant *Staphylococcus aureus* (VRSA)** - A strain of *Staphylococcus aureus* that is resistant to the antibiotic vancomycin.

25. **Waterless antiseptic agent** - An antiseptic agent that does not require use of water. After applying such an agent, the individual rubs the hands together for at least 15 seconds or until the agent has dried.

MEASURES FOR CONTROLLING THE SPREAD OF ANTIBIOTIC RESISTANCE IN ALL HEALTHCARE FACILITIES

These measures are pertinent to **any** healthcare facility/setting. Additional facility-specific guidelines are also addressed in this document.

Infection Control Plan

It is recommended that every facility develop a comprehensive healthcare setting-specific strategic plan to detect, prevent, and control infection and colonization with antibiotic-resistant organisms. The plan should include controls to minimize prescribing of all unnecessary antibiotics, not just vancomycin. Methods to ensure the prudent use of vancomycin for appropriate indications should be in place and enforced.

Risk Assessment

Most acute care facilities (hospitals) with complex intensive care/critical care units are high risk and would benefit by developing a complete antibiotic-resistant organisms program. In non-hospital settings, a risk assessment should be done to determine the approach to be taken to develop an antibiotic-resistant organisms program. The risk assessment should be based on such factors as the patient population served, the inability to contain drainage or secretions, trends in the rate of transmission of target organisms, adherence or effectiveness of infection control measures, antimicrobial usage patterns, and available resources (e.g., monetary, laboratory, human).

Hand Hygiene

Healthcare workers should be required to perform hand hygiene for at least 15 seconds before and after any patient contact whether or not gloves are worn. Various hand hygiene products, including waterless alcohol-based antiseptic agents, non-antimicrobial soaps, and/or antimicrobial soaps 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 healthcare settings as well. **See Appendix C, (page 38) for more specific CDC hand hygiene recommendations.**

Communication

It is the responsibility of the facility transferring the patient to inform the receiving facility and the ambulance and/or personnel of the patient's colonization or infection history prior to treatment or transfer. A receiving facility which, within 48 hours of admission, finds that a patient admitted from another institution is infected or colonized with an antibiotic-resistant organism, should inform the transferring institution as soon as possible. Since special precautions are used for patients colonized/infected with antibiotic-resistant organisms, identifying such persons at the time of readmission to the facility can assist the admissions department and nursing personnel to promptly implement the necessary precautions. 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.

Standard/Universal Precautions

These precautions should be practiced for contact with every patient. (See Appendix A, page 34)

Environmental Cleaning

Routine disinfection and housekeeping protocols presently used in healthcare facilities need not be altered because of concerns about the potential for environmentally mediated transmission of antibiotic-resistant organisms. However, while hospital grade EPA-approved disinfectant-germicides are adequate, each must be used in the proper dilution and with the appropriate contact time. Strict adherence to label directions provided by the manufacturer is of utmost importance. Additionally, appropriate attention must be given to the thoroughness of daily cleaning of environmental surfaces during a patient's stay as well as the necessity of terminal cleaning upon discharge of the patient. In short, liberal amounts of dedicated cleaning efforts on the part of housekeeping staff, along with use of an Environmental Protection Agency- (EPA) approved hospital grade disinfectant-germicide product, should be adequate to minimize the impact of the environment on the transmission of antibiotic-resistant pathogens.

Education

- 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 basic infection control issues and the information presented in this guideline. Each facility should document such training.
- Patient Education - Education of patients/residents is essential to control the transmission of infections. It must emphasize that hands should be washed after contact with secretions or excretions and before touching other objects, for example, immediately after coughing. Patients should not share beverages or food. Patients on isolation, and their families, need additional education including the reason for isolation, control measures, and expected duration of isolation.

NOTE: Patients should be taught to remind their healthcare providers to always follow appropriate hand hygiene procedures.

- **Education Fact Sheets - See Appendix F, page 48 - MRSA Fact Sheets and/or Appendix G, page 57 - VRE Fact Sheets.**

Visitors

All 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, (see Appendix B, page 36) visitors should be instructed regarding control measures, with special emphasis on handwashing.

Surveillance

Culture and susceptibility data should be reviewed routinely to detect MRSA, VRE and other antibiotic-resistant organisms and a line listing of 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 the baseline or endemic rate of the facility. If continual cross-transmission occurs or an outbreak is recognized, additional surveillance techniques may be appropriate.

Nasal Culturing

- **Culturing of the nares of personnel is NOT recommended. During an epidemiologic investigation following an increase in patient/resident MRSA infections, culturing to detect colonization of other patients/residents or employees is discouraged. If a facility should decide to perform such cultures, it should only be done with expert guidance.**

General Considerations for Specimen Collection

It is essential that properly collected specimens be submitted to the laboratory in order to ensure valid results upon which the clinician can make critical decisions concerning patient care. Specimens should ideally be collected before antibiotic therapy is begun in order to ensure the viability of microbial pathogens. Routine follow-up cultures are expensive and are not advised.

Aseptic technique and standard/universal precautions should be observed during collection, storage, and transport of any specimen. If the patient is collecting the specimen, always provide clear directions and assistance as needed.

The accompanying requisition form should be complete with patient identifying information, exact source of the specimen, collection time and date, and the test(s) requested. The specimen container should also be labeled with patient identifying information, source of specimen and collection date and time. Specimens should always be transported to the laboratory without delay.

See Appendix H, page 63 for site-specific specimen collection information.

Outbreak Control

Recognition of an increase in the number of clinical cases of MRSA or VRE is important in the control of outbreaks and is dependent upon a good surveillance system. An outbreak is defined as an excess over the expected (usual) level of disease within a population or region (i.e., hospital, long-term care facility).

When an outbreak of MRSA or VRE infection occurs, an epidemiologic assessment should be initiated to identify risk factors for infection acquisition in the facility.

- All suspected outbreaks, whether they are nosocomial, community-acquired or from another facility, should be reported to the county or state health department.
- The Alabama Department of Public Health can provide guidance and possible laboratory support, if needed, to control an outbreak.
- Patients known to be colonized or infected should be identified as quickly as possible, appropriate barrier precautions should be instituted, and appropriate hand hygiene by medical personnel before and after all patient contacts should be strictly adhered to.
- All personnel should be re-instructed on appropriate precautions for patients infected with antibiotic-resistant microorganisms and should include the importance of appropriate hand hygiene and barrier precautions to prevent contact transmission.

GUIDELINES FOR HOSPITALS (ACUTE CARE FACILITIES)

The presence of antibiotic-resistant microorganisms is becoming an increasingly difficult problem in hospitals. As more resistant organisms emerge, therapeutic options available to the practitioner become more limited. In addition, as their prevalence increases, the control of transmission of these microbes becomes more of an infection control issue in the acute care setting.

Factors that have been documented to contribute to the development of, and infection with, antibiotic-resistant organisms in the acute care facility include:

- Inadequate compliance with handwashing and appropriate barrier precautions.
- Previous use of antibiotics, especially broad spectrum antibiotics.
- Use of invasive devices (e.g., urinary or intravascular catheters).
- Sub-optimal clinical laboratory recognition and reporting.
- Environmental contamination and survival of the organism(s) on inanimate surfaces.
- Intra-hospital and inter-hospital transfer of colonized or infected patients.
- Introduction of unrecognized carriers from other healthcare facilities or community settings.

To interrupt the transmission of antibiotic-resistant organisms in this setting, a multi-disciplinary approach is necessary. Hospitals should develop an Infection Control Plan that addresses prevention and control measures for this very complex problem. Specific CDC guidelines have been published for preventing and controlling nosocomial transmission of VRE. The following guidelines outline basic strategies to decrease the risk of colonization and transmission of antibiotic-resistant organisms, other than VRE, in the acute care setting.

Appendix D, page 43, outlines the specific CDC recommendations for control of VRE in acute care settings.

Room Assignment

- When possible, a private room, with private handwashing and toilet facilities, is preferred.
- When a private room is not available, cohorting may be used, by placing the patient with another patient who has the same organism(s).
- When a private room or cohorting patients is not possible, place the infected/colonized patient with another patient who does not have an underlying immunocompromising illness, open wounds, indwelling devices, or diarrhea, and ensure that the infected/colonized patient can cooperate in strategies to contain his/her secretions. Staff should be aware of patient placement and instructed to use good infection control practices.

Hand Hygiene

- Appropriate hand hygiene before and after patient contact and after removing gloves is the single most effective infection control measure to reduce the transmission of organisms.
- All staff who provide direct patient care to patients with antibiotic-resistant organisms should:
 - Use an antimicrobial soap and water when hands are visibly dirty or contaminated with blood/body fluids or an alcohol-based waterless antiseptic agent if hands are not visibly soiled .
 - Wash hands after glove removal.
 - Perform appropriate hand hygiene after every patient care contact.
 - Remove gloves between patients and perform appropriate hand hygiene.
- Patients should:
 - Wash hands after using toilet facilities.
 - Wash hands before leaving the room for common areas and/or interacting with other individuals.
 - Wash hands before eating.

If patients are unable to wash their hands, healthcare workers should assist them. **See Appendix C, page 38, for more specific CDC hand hygiene recommendations.**

Barrier Precautions

For specific isolation guidelines refer to the Centers for Disease Control and Prevention (CDC): *Guideline for Isolation Precautions in Hospitals*, HICPAC, 1996.

Basic Contact Precautions:

- Gloves should be worn when entering the patient room, assisting the patient, or when coming in contact with environmental surfaces.
- Gloves should be changed, if they become contaminated, between multiple procedures on the same patient.
- Gowns should be worn during direct patient care activities, then should be removed prior to leaving the patient's room.
- For additional Contact Precautions information, see Appendix B, page 36.

Equipment/Environment

- An EPA-registered disinfectant should be used on surfaces such as furniture, door handles, and floors in areas where patients are known to have antibiotic-resistant organisms.
- Dedicate reusable items (e.g., stethoscopes, sphygmomanometers, electronic thermometers, and bedside commodes) and properly decontaminate them.
- Maintain adequate and appropriate cleaning and disinfecting of rooms between patient admissions.
- Educate housekeeping staff on proper cleaning and disinfecting procedures, use of appropriate products, proper dilutions and contact times.
- Take only supplies/equipment which are to be used into the room. Shared equipment must be appropriately disinfected prior to use on another patient.

Linen and Laundry

Special handling (i.e., double bagging) of isolation linens is not necessary. (Appendix A, page 34, Standard Precautions)

Isolation Room Solid Waste

Special handling (i.e., double bagging) of isolation room solid waste is not necessary. Follow the institution's policy for waste management and disposal.

Food/Dishes

No special precautions need to be taken for handling food or soiled dishes. The combination of hot water and detergents used in institutional dishwashers is sufficient to decontaminate these items.

If dietary personnel serve/remove trays from patient's room, appropriate barrier techniques are to be used.

Transfer of Patients

It is the responsibility of the facility transferring the patient to notify the receiving facility and transport personnel of the patient's colonization/infection status prior to transfer. **Admission to licensed facilities should not be denied on the basis of colonization/infection with an antibiotic-resistant organism(s).**

Mechanism to Flag Patients Introduced or Reintroduced Into the Healthcare System

Utilize a computer or other system to provide access to antibiotic-resistant patient information at the time of admission and/or readmission. Always ensure patient confidentiality.

Visitors

- Visitors who are assisting with patient care or who have direct patient contact should perform hand hygiene prior to the contact and at the end of the visit. They must follow the same guidelines for barriers and hand hygiene as healthcare workers.
- Visitors who are not providing direct patient care should perform hand hygiene at the end of the visit. No special barriers are required.
- Basic educational materials should be provided to visitors explaining guidelines for care of patients with resistant organisms.

Education

Staff: Provide ongoing education for healthcare workers who give direct patient care.

Patients: Develop or use educational tools that will be helpful for in-patient stay, as well as after discharge. Information should include the importance of:

- Using good handwashing techniques.
- Refraining from sharing personal use items with others.
- Maintaining a clean home environment and disinfecting common shared items with a household disinfectant.
- The need to use infection control procedures, the use of appropriate barriers, and the recommended duration of practices and barriers.

Education Fact Sheets: See Appendix F, page 48-56, for MRSA Fact Sheets and/or Appendix G, page 57-62, for VRE Fact Sheets.

GUIDELINES FOR LONG-TERM CARE AND REHABILITATION FACILITIES

The term long-term care facility refers to facilities that provide for the biopsychological needs of persons with sustained self-care deficits. In this document it will include nursing home and rehabilitation centers.

Long-term care facilities have experienced an increase in the numbers of encounters with antibiotic-resistant organisms among their residents; however, there are few published guidelines specific to this unique healthcare environment. Until such times as further studies or guidelines are made available, the following guidelines, which are modifications of the CDC's acute care guidelines or guidelines developed by other states or professional associations, are recommended. The chart in Appendix E, page 46, summarizes these guidelines.

Note: Rehabilitation facility patient populations are generally not as immunocompromised; thus the risk of colonization with antibiotic-resistant organisms progressing to infection may be 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, indwelling urinary catheter, etc.). More emphasis is placed on training and teaching self-care for specific procedures using "clean techniques". Therefore, proper hand hygiene and the use of barrier techniques should be included in patient and family education.

Origin of Antibiotic-resistant Organisms in Long -Term Care Facilities

Antibiotic-resistant pathogens in these facilities have three possible origins:

1. They may arrive with a colonized or infected patient;
2. Resistant pathogens may be selected for or, more rarely, may arise via mutation as a consequence of antibiotic use for a given patient or for the facility as a whole;
3. From the transfer of genetic material from one species or genus of bacteria to another within the facility.

Admissions

Admission to licensed facilities should not be denied on the basis of colonization/infection with antibiotic-resistant organisms.

Activities

Long-term care facilities are considered a resident's home in many situations. With this in mind, the following activity recommendations are made:

- Residents who have antibiotic-resistant organisms should be allowed to ambulate, socialize as usual, and participate in therapeutic and group activities as long as body substances are contained.

- In general, residents colonized or infected with these organisms may use common living areas, recreational areas, and dining facilities.
- Residents leaving their rooms for activities should have clean, dry dressings and wear clean clothes or a clean cover gown.
- Residents must wash their hands immediately before leaving their room. If necessary, hands must be washed for them.
- Special precautions and restriction of movement should be reserved for instances where residents may be shedding large numbers of organisms into the environment (e.g., large wounds not contained with dressings or tracheostomies with frequent coughing), and who also have been linked epidemiologically with other residents who acquired infections with similar microbes.

Precautions

The implementation of Contact Precautions, (Appendix B, page 36), in addition to Standard Precautions, (Appendix A, page 34), should be based upon the site and severity of infection. Other factors to consider include the resident's mental status and personal hygiene habits, the ability to contain wound drainage, and whether the resident who is colonized in the respiratory tract has a productive cough.

Standard Precautions are adequate for:

- The resident who is nasally or superficially colonized with MRSA (i.e., identified from sputum culture, but without purulence).
- The VRE resident who is colonized in the gastrointestinal tract and continent of stool and capable of maintaining hygienic practices (e.g., handwashing).

Contact Precautions are Indicated For:

- Residents who have indwelling urinary catheter-associated MRSA or VRE urinary tract infection or colonization.
- The resident who has wounds colonized or infected with MRSA or VRE.
- The resident who has a tracheostomy with a colonized or infected respiratory tract and who is unable to handle secretions on their own.
- All identified cases of MRSA or VRE when a cluster of nosocomial (institution acquired) infections are recognized.

Room Placement for Resident on Contact Precautions

- Ideally, the resident on Contact Precautions should be placed in a private room.
- When a private room is not available, the resident may be cohorted (i.e., placed in a room with a resident(s) who has the same microorganism, but no other infection or colonization with a different antibiotic-resistant organism).
- If a private room is unavailable and cohorting cannot be accomplished, the resident may be placed in a room with another resident. When making this decision, consider that the best roommate for a person with MRSA or VRE would be a resident who:
 - has intact skin (no open wounds)
 - has no invasive devices (e.g., nasogastric tubes, tracheostomy or tracheal tube, no venous or arterial access devices, urinary catheters, etc.)
 - is not significantly immunocompromised (e.g., neutropenic, on oral steroids, or on chemotherapy)
 - is not on antibiotic therapy.

Hand Hygiene

See Appendix C, page 38, for CDC Hand Hygiene Recommendations for Healthcare Workers.

Gloves

- In addition to wearing gloves as outlined under Standard/Universal Precautions, wear gloves (clean, single-use, non-sterile) when providing direct care or handling items potentially contaminated by the resident on Contact Precautions.
- During the course of providing resident care, change gloves when obviously contaminated.
- Remove gloves and cleanse hands immediately before leaving the resident's room. After glove removal and hand hygiene, in order to avoid transfer of microorganisms to other residents or their environments, ensure hands do not touch potentially contaminated environmental surfaces or items in the patient's room. Clean paper towels may be used to open doors when exiting.

Gowns or Aprons

In addition to wearing a gown as outlined under Standard/Universal Precautions, wear a clean, non-sterile gown:

- When providing direct care for the resident on Contact Precautions

- If you anticipate that clothing will have contact with the resident, environmental surfaces, or equipment items in the resident's room, or
- If the resident is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing.

Remove the gown/apron before leaving the resident's room. In order to avoid transfer of microorganisms to other residents or environments, ensure that clothing does not contact potentially contaminated environmental surfaces after gown/apron removal.

Masks

Should be worn as specified in Standard /UniversalPrecautions.

Equipment Used for Resident Care

- When possible, in order to avoid sharing between residents, dedicate the use of non-critical resident care equipment (equipment which comes in contact only with intact skin) to a single resident, or cohorted infected or colonized residents.
- Electronic thermometers used with the VRE residents should not be shared with other residents. Use a disposal thermometer or dedicate a thermometer for single resident use and disinfect it when the resident is removed from Contact Precautions.
- If use of common equipment or items is unavoidable, ensure they are properly cleaned and disinfected prior to using on another resident.

Linen and Laundry

Special handling (i.e., double bagging) of isolation linens is not necessary. (Appendix A, page 34)

Isolation Room Solid Waste

Special handling (i.e., double bagging) of isolation room solid waste is not necessary. Follow the institution's policy for waste management and disposal.

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.

If dietary personnel serve/remove trays from resident's room, appropriate barrier techniques are to be used to avoid potential contamination.

Routine and Terminal Cleaning

The room and bedside equipment of residents on Contact Precautions are to be cleaned daily using an EPA-approved disinfectant. Antibiotic-resistant organisms are as susceptible to disinfectants as the antibiotic-sensitive strains. Educate housekeeping staff on proper cleaning and disinfection procedures, use of appropriate products, proper dilutions, and contact times.

Surveillance

Routine surveillance for MRSA and VRE should be performed and should include:

1. Regular review (weekly, biweekly, or monthly, depending on the frequency of resistance within the facility) of available microbiological data obtained in association with patient care;
2. Maintenance of a line listing of antibiotic-resistant organisms identified;
3. Identification of individual facility threshold infection rates that would prompt additional actions;
4. Antibiotic utilizations in individual facility should be reviewed and rotation of antibiotics may need to be addressed if patterns of resistance are noted.

Education

See Appendix F, page 48-56, for MRSA Fact Sheets and Appendix G for VRE Fact Sheets, page 57-62.

GUIDELINES FOR HOME HEALTHCARE/HOSPICE

Recent trends in medical care have resulted in shorter patient stay in acute care facilities and an increase in the number of patients being cared for in their homes. Many home health and home hospice patients have been discharged from acute care facilities where historically there has been a significant increase in the incidence of antibiotic-resistant infections/colonizations. Because a colonization/infection may not be resolved when the patient is discharged to home, it is important that home health agencies and home hospices be made aware of and implement policies to prevent the transmission of antibiotic-resistant organisms in the home. The main focus of the following recommendations is reduction of risk of transmission to other clients, since healthcare workers visit numerous clients in their homes each day.

In addition to Standard /Universal Precautions (Appendix A, page 34), healthcare personnel providing care in the home should follow recommended practices for Contact Precautions (Appendix B, page 36). 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 worker.

Hand Hygiene

- See Appendix C, page 38, for detailed CDC Hand Hygiene Recommendations for Healthcare Workers.
- Care providers should keep their clinical bag stocked with appropriate hand hygiene agents and use them while in the client's home.
- Home care staff should use single use paper towels to avoid cross contamination from those used by the patient or other members of the household. Towels may be discarded in the patient's usual trash disposal system.
- Home health patients, their family members, and other household members should be instructed, and given written information, about the mechanisms by which antibiotic-resistant organisms are transmitted and the need for strict compliance with handwashing and other aseptic methods to prevent the spread of such organisms.

Barriers

- Gloves should be worn by home care staff when in direct contact with the patient. Family members and other care providers should be instructed on appropriate use of gloves in the home (e.g., direct patient care and handling of potentially infectious body fluids).
- Gowns/aprons should be worn if there is risk of soiling uniform/clothing with any body fluid.

- Family members and other care providers should be instructed to change and immediately wash clothing if it becomes soiled with any body fluid.

Environmental Cleaning

- All items must first be thoroughly cleaned with a detergent in order to remove all organic material prior to disinfecting.
- Commercial products that meet EPA standards for hospitals may be used on solid surfaces including floors, furniture, and equipment used by patients. Other suitable products include these household products: bleach (diluted between 1:10 and 1:100), hydrogen peroxide, phenols (e.g., Lysol[®], PineSol[®]), and isopropyl alcohol (70%).
Note: Use of trade names does not imply endorsement of use.
- Patient and family care providers should be taught the importance of prompt cleaning and disinfection of bathrooms and other environmental surfaces that may become contaminated with fecal material or other patient secretions/excretions.
- The sink and toilet that the infected/colonized patient uses should be disinfected daily.
- Home health care staff should wear gloves when cleaning the homes of patients colonized/infected with antibiotic-resistant organisms and in homes of patients with poor hygienic practices.

Patient Care Equipment

The home care provider should establish a safe working surface by placing a barrier (e.g., paper towels or newspapers) between environmental surfaces and the care provider's equipment to be used. In order to avoid contamination of supplies, the healthcare provider should take out of the clinical bag only the supplies to be used in patient care.

- As much as possible, provide each patient colonized/infected with antibiotic-resistant organisms with their own individual supplies to be left in the home/room including thermometer, stethoscope, and blood pressure cuff. (Electronic thermometers used for taking rectal temperatures have been implicated in VRE outbreaks and should **not** be used with patients with VRE colonization/infection.)
- Appropriate cleansing/disinfecting after patient contact should be done on any equipment to be used on other patients. Disinfect stethoscopes, thermometers, and glucometers with alcohol swabs before returning to clinical bag.

Linens

- Patient's linens soiled with body secretions or excretions should be washed separately.

- Patient's clothing not soiled with body secretions or excretions can be washed with other household linen.

Visitors

- Individuals having direct patient contact should be instructed to wash hands before and after providing any care and before leaving the home.

Specific Home Health/Hospice Setting Communication Recommendations

- Notification of patient's antibiotic-resistant status to the healthcare provider is just as important in this setting as it is in the acute or long-term care setting.
- When an antibiotic-resistant patient requires admission to an acute or long-term care facility, the infection control staff in the receiving facility must be notified of the patient's status prior to admission.
- Admission to licensed facilities should **not** be denied on the basis of colonization/infection with antibiotic-resistant organisms.

Education

See Appendix F, page 48-56, for general information Fact Sheets on MRSA and/or Appendix G, page 57-62, for Fact Sheets on VRE. These may be adapted to meet the home health/hospice needs.

GUIDELINES FOR OTHER HEALTHCARE SETTINGS

The following guidelines are specific to various other healthcare settings. They are to be used in conjunction with the guidelines outlined in the “General Control Measures” Section of this document. See Appendix F, page 48-56, for general information Fact Sheets on MRSA and/or Appendix G, page 57-62, for VRE Fact Sheets. These may be adapted to meet the individual healthcare setting(s).

Doctor’s Offices/Outpatient Clinics

Standard /Universal Precautions (Appendix A, page 34) 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 an antibiotic-resistant organism, subsequent visits to the facility should be managed taking these recommended precautions. Any surfaces which may have had contact with the patient (e.g., blood pressure cuffs, examination table, stethoscopes) should be cleaned with an EPA-approved disinfectant prior to use for another patient.

Patients Discharged to Their Homes for Self-Care

Patients who are discharged to their homes for self-care, and are colonized or infected with antibiotic-resistant organisms should be informed of such by their healthcare provider. They usually require no special instructions/control measures beyond the importance of good handwashing and regular cleaning of contaminated home environmental surfaces. The patient and the family members should perform handwashing with a non-antimicrobial soap and water for a minimum of 15 seconds after direct contact with patient’s secretions/excretions or any items the patient has touched, before preparing food and eating, and after using the toilet. If patient is unable to provide self care, family members should be instructed on appropriate use of gloves in the home and on the need to change and immediately wash their clothing if it becomes soiled with body fluid.

For future encounters with health care, the patient or family member(s) should inform the healthcare providers of the patient’s prior colonization or infection with an antibiotic-resistant organism.

Psychiatric Hospitals

These patients may have no underlying medical conditions increasing their risk of infection. These facilities are unique in that the patients are encouraged to join 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 or VRE 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 they are infected with MRSA or VRE and the Guidelines for Long-Term Care and Rehabilitation Facilities may be adapted for use.

Schools for the Physically and Mentally Challenged

In addition to Standard/Universal Precautions (Appendix A, page 34) and Contact Precautions (Appendix B, page 36), the Long-Term Care and Rehabilitation Facilities recommendations (Appendix E, page 46) may be utilized on a case-by-case basis. The teachers/staff should be educated about transmission modes of antibiotic-resistant organisms and should be familiar with the recommended precautions.

Students identified with antibiotic-resistant organisms should be instructed regarding how to prevent contamination of school materials that are to be reused by others (e.g., wash hands prior to using materials and cover all coughs/sneezes). Shared items should be cleaned with an EPA-approved disinfectant prior to the use by another individual. When possible, these items should be assigned to the student for the duration of need, then appropriately cleaned and disinfected prior to use by another student.

Assisted Living Facilities/Rest Homes/Retirement Centers

Admission should **not** be denied on the basis of colonization with antibiotic-resistant organisms. These patients are usually ambulatory and not bed-bound. Since they usually require minimal assistance with activities of daily living and have few invasive devices (e.g., indwelling urinary catheters, IVs), additional precautions beyond Standard/Universal Precautions (Appendix A, page 34) are unnecessary unless a cluster of facility-acquired infections is recognized. Handwashing education (Appendix C, page 38) should be emphasized for both patients and employees.

Hemodialysis Units

Although the rate of MRSA carriage among hemodialysis patients is not known, studies indicate that a majority have been found to be carriers of *Staphylococcus aureus*. Nasal carriage with *S. aureus* may result in seeding the skin leading to device-insertion site infections and bloodstream infections. These patients can then serve as a source for transmission to other patients and/or their care providers.

While bloodstream infections are caused most frequently by *S. epidermidis* (or other coagulase negative staphylococcus), hemodialysis patients, because of their high rate of carriage of *S. aureus*, have a greater proportion of catheter-related bloodstream infections due to *S. aureus* than other patient populations. Subclavian hemodialysis catheters have been associated with a higher rate of blood stream infections than virtually all other subclavian catheters or alternative forms of vascular accesses used in hemodialysis including jugular accesses. Internal jugular catheters may, however, pose a greater risk of access site infection than a subclavian catheter due to their close proximity to oropharyngeal secretions.

Risk factors associated with VRE bloodstream infections include receipt of antimicrobials, gastrointestinal colonization with VRE, underlying disease severity, abdominal or cardiac procedures, use of indwelling catheters, and prolonged hospital stay.

MRSA and VRE, as part of the endogenous flora of hemodialysis patients or having been introduced on the contaminated hands of healthcare workers, may account for a large percentage of dialysis patient infections. In addition, environmental surfaces contaminated with VRE have a role in the transmission of disease. Contact transmission can be prevented by hand hygiene (i.e., handwashing or use of a waterless hand rub), glove use, and disinfection of environmental surfaces. Therefore, the following practices are recommended for the control of intravascular device-related infections:

- The use of sterile technique (mask for staff and patient and sterile gloves for staff and patient if participating in the dialysis process) should be considered to initiate and terminate hemodialysis treatments through an intravascular access.
- Apply povidone-iodine ointment to the catheter insertion site at each dressing change. Two percent chlorhexidine gluconate or 70% alcohol may be used in place of povidone-iodine.
- Clean injection ports with povidone-iodine or 70% alcohol before accessing the system.
- If occlusive transparent dressings are used instead of gauze and tape dressings, the product should allow the escape of moisture from beneath the dressing.

Recommended Infection Control Practices for Hemodialysis Units

Standard/Universal Precautions (Appendix A, page 34) are the system of infection control precautions recommended for the acute care setting. Standard/Universal Precautions are used on **all** patients and include use of gloves, gown, or mask whenever needed to prevent contact of the healthcare worker with blood, secretions, excretions, or contaminated items.

Note: Contact Precautions are not recommended in hemodialysis units for patients infected or colonized with pathogenic bacteria for several reasons. First, the routine use of infection control practices recommended for hemodialysis units, which are more stringent than the Standard/Universal Precautions routinely used in hospitals, should prevent transmission by the contact route. Second, although contact transmission of pathogenic bacteria is well-documented in hospitals, similar transmission has not been well-documented in hemodialysis centers. Third, contamination of the patient's skin, bedclothes, and environmental surfaces with pathogenic bacteria is likely to be more common in hospital settings (where patients spend 24 hours a day) than in outpatient hemodialysis centers (where patients spend approximately 10 hours a week).

In addition to Standard/Universal Precautions, more stringent precautions are recommended for hemodialysis units because of the increased potential for contamination with blood and pathogenic microorganisms. The following is a synopsis of these recommended precautions:

- Wear disposable gloves when caring for the patient or touching the patient's equipment at the dialysis station; remove gloves and wash hands between each patient

or station. (See Appendix C, page 38, for hand hygiene recommendations for healthcare workers.)

- Items taken into the dialysis station should either be disposed of, dedicated for use only on a single patient, or cleaned and disinfected before being taken to a common clean area or used on another patient.
- Nondisposable items that cannot be cleaned and disinfected (e.g., adhesive tape, cloth-covered blood pressure cuffs) should be dedicated for use only on a single patient.
- Unused medications (including multiple dose vials containing diluents) or supplies (e.g., syringes, alcohol swabs) taken to the patient's station should be used only for that patient and should not be returned to a common clean area or used on other patients.
- When multiple dose medication vials are used (including vials containing diluents), prepare individual patient doses in a clean (centralized) area away from dialysis stations and deliver separately to each patient. Do not carry multiple dose medication vials from station to station.
- Do not use common medication carts to deliver medications to patients. Do not carry medication vials, syringes, alcohol swabs, or supplies in pockets. If trays are used to deliver medications to individual patients, they must be cleaned between patients.
- Clean areas should be clearly designated for the preparation, handling, and storage of medications and unused supplies and equipment. Clean areas should be clearly separated from contaminated areas where used supplies and equipment are handled. Do not handle and store medications or clean supplies in the same or an adjacent area in which used equipment or blood samples are handled.
- Use external venous and arterial pressure transducer filters/protectors for each patient treatment to prevent blood contamination of the dialysis machines' pressure monitors. Change filters/protectors between each patient treatment, and do not reuse them. Internal transducer filters do not need to be changed routinely between patients.
- Clean and disinfect the dialysis station (e.g., chairs, beds, tables, machines) between patients.
 - Give special attention to cleaning control panels on the dialysis machines and other surfaces that are frequently touched and potentially contaminated with patients' blood.
 - Discard all fluid and clean and disinfect all surfaces and containers associated with the prime waste (including buckets attached to the machines).
 - For dialyzers and blood tubing that will be reprocessed, cap dialyzer ports and

clamp tubing. Place all used dialyzers and tubing in leakproof containers for transport from station to reprocessing or disposal area.

Ambulances, Care Vans

Standard/Universal Precautions (Appendix A, page 34) should be used for all transported patients/residents. In addition, Contact Precautions (Appendix B, page 36) should be used for all patients/residents known to be infected or colonized with antibiotic-resistant organisms. The following specific guidelines are recommended:

- **Guidance to the Discharging Facility**

When a person known to be infected or colonized with a antibiotic-resistant organism is being transported via a care van or ambulance, it is the responsibility of the discharging facility to inform the ambulance/van personnel of the patient's/resident's colonization/infection history. It is of utmost importance to explain the infection control measures needed to be taken in order to prevent the transmission of the antibiotic-resistant organism to healthcare workers or other patients/residents or person who will subsequently be using the care van, ambulance, or associated equipment. At a minimum, the following preparations should be communicated and implemented prior to transportation:

- Ensure the person being transported has on a clean gown or cloths and has washed his/her hands. Assist the patient if they are unable to adequately wash their own hands.
 - Personally assigned wheelchairs should be cleaned if grossly soiled, and the armrests and wheelchair handles should be cleaned and disinfected following use for patient transfer.
 - Persons colonized or infected with an antibiotic-resistant organism that may be transmitted through respiratory secretions (tracheostomy, pneumonia) should wear a mask or have the tracheostomy site covered while being transported, if possible.
 - The discharging facility should notify the transportation staff of the person's continence status (bowel and urine).
- **Guidance to Ambulance and Care Van Staff**

Ambulance and care van staff should implement the following precautions prior to, during, and after transporting persons infected or colonized with antibiotic-resistant organisms:

- Hand Hygiene
 - **See Appendix C, page 38, for CDC Hand Hygiene Recommendations for Healthcare Workers.**
- Gowns, Gloves, Masks
 - Gloves should be worn when having direct contact with infected/colonized persons.
 - Gloves should be worn to clean and disinfect the vehicle following a fecal or urine accident by a person known to be infected/colonized with a resistant organism.
 - When possible, water resistant gowns with sleeves should be worn by the person having direct contact with an infected/colonized person who is incontinent of stool or urine or whose wound exudate cannot be contained.
- Equipment
 - Any equipment shared between patients should be cleaned with soap and water and disinfected with an EPA-approved disinfectant prior to being used on another person.
- Disinfection/Environmental Cleaning
 - Use an EPA-approved disinfectant on solid surfaces, including floors and furniture, in areas used by patients with resistant organisms.
 - Wheelchairs and stretchers should be disinfected using an EPA-approved disinfectant between patient use. If visible soiling is evident they must be cleaned with soap and water prior to disinfection.
 - Items soiled with feces or urine should be cleaned with soap and water and disinfected with an EPA-approved disinfectant as soon as possible after the soiling occurs, and definitely before other individuals are transported in the same vehicle.
- Separate Conveyance

If feasible, do not transport persons infected/colonized with VRE at the same time as a person infected/colonized with MRSA. If this is the only option available, physically separate them as much as possible while in the same vehicle.

Schools and Daycare

There are no national guidelines for addressing the issue of antibiotic-resistant organisms in the school and daycare settings, however, transmission has been documented in a few situations. One such case reported MRSA being transmitted among high school wrestlers, with the probable cause being close contact and skin abrasions. In most cases, transmission requires direct contact with contaminated material, including the following:

- **MRSA:** Skin or respiratory secretions or material from an infected site.
- **VRE:** Stool, urine, or material from an infected site.

Subsequently, persons whose hands are contaminated with these organisms can transmit them to another person.

In most school and daycare settings, the children involved do not have any specific risk factors for acquiring infections with these bacteria or of having serious infections should transmission occur. Colonization would probably not persist for long periods of time in these populations. Colonization may be present without recognition, but does not appear to pose a serious threat. However, good hygienic practices are important at all times since antibiotic-resistant organisms are spread by unwashed hands and contaminated environmental surfaces and/or objects. The following preventive measures should be promoted to staff, parents, and children:

- Use good handwashing practices
- Do not use antibiotics for viral upper respiratory tract infections (colds)
- Use antibiotics only as prescribed
- Do not take someone else's medication
- Do not share your medication with others
- Do not take old or outdated medication

Schools and daycare staff should use caution in formulating daycare and school return policies requiring antibiotic use prior to return to the facility. The following are recommended guidelines:

- **Handwashing**
 - When washing hands use soap and water and scrub hands vigorously for 15 seconds. If hands are not visibly soiled, an alcohol-based waterless antiseptic agent may be used. **(See Appendix C, page 38, for more specific recommendations for hand hygiene for healthcare workers.)**
 - Instruct or assist children to wash their hands after using the restroom, before eating, after playing on the playground, after diapering, and before going home.

- Do not assume children know how to wash their hands properly. Supervision, especially in a daycare setting, is essential in forming good handwashing habits in children. They learn by example. Let them observe good handwashing technique from the adults who care for them.
- Do not use a single damp cloth to wash a group of children's hands.
- Do not use a standing basin of water to rinse hands.
- Staff should always wash their hands before eating, touching food, preparing bottles, giving medications, after handling pets, and before going home.
- Staff should always wash their hands after using the restroom, changing diapers, assisting children when toileting, and anytime hands are visibly soiled.
- Thoroughly rinse and dry hands. Do not use a common hand towel. Always use disposable towels in daycare or food preparation settings.
- Use paper towel to turn off faucet after washing hands.

- **Environmental Cleaning**

Use disposable cleaning cloths. If reusable cloths are used, they must be laundered on a regular basis adding chlorine bleach to the wash water. Avoid using sponges. Remember that germs thrive on moist surfaces.

- Staff should wear gloves when cleaning spills of blood, urine, feces, vomit, etc. A household disinfectant should be used.
 - Surfaces contaminated by a child's secretions and/or excretions should be cleaned and disinfected with a household disinfectant. Use chairs and other furniture that can be easily cleaned; avoid fabric furniture
 - Toys that are shared should be routinely cleaned.
- **Laundry**

Clothing, linens, and towels that are heavily soiled with body fluids should be washed separately using detergent and bleach. Articles that are not soiled with body fluids can be washed with other clothing.

- **Waste Management**

Place all disposable wastes such as dressings and bandages into plastic bags. Tie the bags securely and discard them with the regular trash.

- **Food Preparation/Eating**
 - Staff who prepare food must wash their hands thoroughly before touching the food or equipment.
 - Do not allow children to share dishes, glasses, or utensils or take bites of another child's food.
 - Make sure all children's hands are washed prior to eating.
- **Colonized/Infected Students**
 - Students **colonized** with antibiotic-resistant organisms should not be excluded from school or daycare.
 - Students **infected** due to an antibiotic-resistant organism should be under appropriate medical treatment.
 - In situations when infected students (or colonized students who are unable to control secretions) need to participate in school or daycare, the school should follow clinical guidelines for preventing transmission. These may include the use of designated environmental space, and/or exclusion from activities where direct contact may occur (e.g., wrestling).
- **Staff Education**

Educational material/in-services about the risks and transmission of antibiotic-resistant organisms should be available to staff of schools and daycare facilities. Information is available from the Alabama Department of Public Health.

Appendix A

STANDARD/UNIVERSAL PRECAUTIONS

Standard or Universal Precautions, as described in the “Guideline for Isolation Precautions in Hospitals” Centers for Disease Control and Prevention (CDC), Hospital Infection Control Practices Advisory Committee, *Infection Control and Hospital Epidemiology*, 1996; 17:53-80, should control the spread of MRSA in most instances.

Standard/Universal Precautions include:

- **Handwashing**

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. It may be necessary to wash hands between tasks and procedures on the same patient to prevent cross-contamination of different body sites. **(See Appendix C, page 38, for more specific hand hygiene recommendations.)**

- **Gloving**

Wear gloves (clean, non-sterile gloves are adequate) when touching blood, body fluids, secretions, excretions, and contaminated items. Put on clean gloves just before touching mucous membranes and non-intact 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 non-contaminated items and environmental surfaces, and before going to another patient, and wash hands immediately to avoid transfer of microorganisms to other patients or environments.

- **Masking**

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.

- **Gowning**

Wear a clean non-sterile gown to protect skin and prevent soiling of clothes during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions or cause soiling of clothing. Remove soiled gown or apron as promptly as possible and wash hands to avoid transfer of microorganisms to other patients or environments.

- **Appropriate Care of 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 and that single-use items are properly discarded.

- **Appropriate Handling of Laundry**

Handle, transport, and process linen 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.

- **Environmental Controls**

Ensure that adequate procedures are established and followed for the routine care, cleaning, and disinfection of environmental surfaces, beds, bed rails, bedside equipment, and other frequently touched surfaces.

- **Occupational Health and Bloodborne Pathogens**

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 use any other technique that involves directing the point toward any part of the body. Instead, use either a one-handed “scoop” technique or sharp safety devices 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, which are located as close as practical to the area in which the items were used. 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.

Appendix B

CONTACT PRECAUTIONS

(Source: Centers for Disease Control and Prevention (CDC), Hospital Infection Control Practices Advisory Committee (HICPAC), “Guideline for Isolation Precautions in Hospitals”, *Infection Control and Hospital Epidemiology*, 1996; 17:53-80.)

These 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.

In addition to Standard Precautions (Appendix A, page 34), use Contact Precautions, or the equivalent, for specified patients known or suspected to be infected or colonized with epidemiologically important antibiotic-resistant 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.

- **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.

- **Gloves and Handwashing**

In addition to wearing gloves as outlined under Standard Precautions, wear gloves (clean, non-sterile 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, in order to avoid possible transfer of microorganisms to other patients or environments, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient’s room. (See Appendix C, page 38, for more specific hand hygiene recommendations.)

- **Gown**

In addition to wearing a gown as outlined under Standard Precautions, wear a gown (a clean non-sterile 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, in order to avoid transfer of microorganisms to other patients or environments, ensure that clothing does not contact potentially contaminated environmental surfaces.

- **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.

- **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.

- **Additional Precautions for Preventing the Spread of Vancomycin Resistance**

See Appendix D, page 43, "Prevention and Control of Nosocomial Transmission of VRE in Hospitals".

RECOMMENDED HAND HYGIENE PRACTICES FOR HEALTHCARE WORKERS

These recommendations are designed to improve hand hygiene practices of healthcare workers and to reduce transmission of pathogenic microorganisms to patients and personnel in healthcare settings. They were adapted from the Centers for Disease Control and Prevention's 2002 Guideline for Hand Hygiene in Healthcare Settings. Refer to the Morbidity and Mortality Weekly Report, October 25, 2002/Vol. 51/No.RR-16 for the complete text.

Indications for Handwashing and Hand Antisepsis

- Wash hands with either a non-antimicrobial soap and water or an antimicrobial soap and water when hands are visibly soiled with blood or other body fluids.
- If hands are not visibly soiled, use an alcohol-based hand rub for routinely decontaminating hands in all other clinical situations described below. Alternatively, wash hands with an antimicrobial soap and water in all clinical situations described below:
 - Decontaminate hands before having direct contact with patients.
 - Decontaminate hands before donning sterile gloves when inserting a central intravascular catheter.
 - Decontaminate hands before inserting indwelling urinary catheters, peripheral vascular catheters, or other invasive devices that do not require a surgical procedure.
 - Decontaminate hands after contact with a patient's intact skin (e.g., when taking a pulse or blood pressure, or lifting a patient).
 - Decontaminate hands after contact with bloody fluids or excretions, mucous membranes, non-intact skin, and wound dressings, if hands are not visibly soiled.
 - Decontaminate hands if moving from a contaminated body site to a clean body site during patient care.
 - Decontaminate hands after contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient.
 - Decontaminate hands after removing gloves.
 - Before eating and after using a restroom, wash hands with a non-antimicrobial soap and water or with an antimicrobial soap and water.

- Antimicrobial-impregnated wipes (i.e., towelettes) may be considered as an alternative to washing hands with non-antimicrobial soap and water. Because they are not as effective as alcohol-based hand rubs or washing hands with an antimicrobial soap and water for reducing bacterial counts on the hands of healthcare workers, they are not a substitute for using an alcohol-based hand rub or antimicrobial soap.

Hand Hygiene Technique

- When decontaminating hands with an alcohol-based handrub, apply product to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry. Follow the manufacturer's recommendations regarding the volume of product to use.
- When washing hands with soap and water, wet hands first with water, apply amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet. Avoid using hot water, because repeated exposure to hot water may increase the risk of dermatitis.
- Liquid, bar, leaflet or powdered forms of plain soap are acceptable when washing hands with a non-antimicrobial soap and water. When bar soap is used, soap racks that facilitate drainage and small bars of soap should be used.
- Multiple-use cloth towels of the hanging or roll type are not recommended for use in healthcare settings.

Selection of Hand Hygiene Agents

- Provide personnel with efficacious hand hygiene products that have low irritancy potential, particularly when these products are used multiple times per shift.
- To maximize acceptance of hand hygiene products by healthcare workers, solicit input from these employees regarding the feel, fragrance, and skin tolerance of any products under consideration. The cost of hand hygiene products should not be the primary factor influencing product selection.
- When selecting non-antimicrobial soaps, antimicrobial soaps, or alcohol-based hand rubs, solicit information from manufacturers regarding any known interactions between products used to clean hands, skin care products, and the type of gloves used in the institution.
- Prior to making purchasing decisions, evaluate the dispenser systems of various product manufacturers or distributors to ensure that dispensers function adequately and deliver an appropriate volume of product.

- Do not add soap to a partially empty soap dispenser. This practice of “topping off” dispensers may lead to bacterial contamination of soap.

Skin Care

- Provide healthcare workers with hand lotions or creams to minimize the occurrence of irritant contact dermatitis associated with hand antisepsis or handwashing.
- Solicit information from manufacturers regarding any effects that hand lotions, creams, or alcohol-based hand antiseptics may have on the persistent effects of antimicrobial soaps being used in the institution.

Other Aspects of Hand Hygiene

- Do not wear artificial fingernails or extenders when having direct contact with patients at high risk (e.g., those in intensive care units or operating rooms).
- Keep natural nails less than 1/4 inch long.
- Wear gloves when contact with blood or other potentially infectious materials, mucous membranes, and non-intact skin could occur.
- Remove gloves after caring for a patient. Do not wear the same pair of gloves for the care of more than one patient, and do not wash gloves between uses with different patients.
- Change gloves during patient care if moving from a contaminated body site to a clean body site.

Healthcare Worker Educational and Motivational Programs

- As part of an overall program to improve hand hygiene practices of healthcare workers, educate personnel regarding the types of patient-care activities that can result in hand contamination and the advantages and disadvantages of various methods used to clean their hands.
- Monitor healthcare workers’ adherence with recommended hand hygiene practices and provide personnel with information regarding their performance.
- Encourage patients and their families to remind healthcare workers to decontaminate their hands.

Administrative Measures

- Make improved hand hygiene adherence an institutional priority and provide appropriate administrative support and financial resources.
- Implement a multidisciplinary program designed to improve adherence of health personnel to recommended hand hygiene practices.
- As part of a multidisciplinary program to improve hand hygiene adherence, provide healthcare workers with a readily accessible alcohol-based hand rub product.
- To improve hand hygiene adherence among personnel who work in areas in which high workloads and high intensity of patient care are anticipated, make an alcohol-based hand rub available at the entrance to the patient's room or at the bedside, in other convenient locations, and in individual pocket-sized containers to be carried by healthcare workers.
- Store supplies of alcohol-based hand rubs in cabinets or areas approved for flammable materials.

APPENDIX C (TABLE)

Anti-microbial spectrum and characteristics of hand hygiene antiseptic agents*

GROUP	Gram-positive bacteria	Gram-negative bacteria	Mycobacteria	Fungi	Viruses	Speed of action	Comments
Alcohols	3+	3+	3+	3+	3+	fast	optimum concentration 60-90%; no persistent activity
Chlorhexidine (2% and 4% aqueous)	3+	3+	1+	1+	3+	inter-mediate	persistent activity; rare allergic reactions
Iodine compounds	3+	3+	3+	2+	3+	inter-mediate	causes skin burns; usually too irritating for hand hygiene
Iodophors	3+	3+	1+	2+	2+	inter-mediate	less irritating than iodine; acceptance varies
Phenol derivatives	3+	1+	1+	1+	1+	inter-mediate	activity neutralized by non-iron surfactants
Triclosan	3+	2+	1+	-	3+	inter-mediate	acceptability on hands varies
Quaternary ammonium compounds	1+	2+	-	-	1+	slow	used only in combination with alcohols; ecologic concerns

Activity:

3+ (excellent)

2+ (good, but does not include the entire bacterial spectrum)

1+ (fair)

- (no activity or not sufficient)

Note: Hexachlorophene is not included because it is no longer an accepted ingredient of hand disinfection.

*Adapted from: CDC, (HICPAC) Draft Guidelines for Hand Hygiene in Health Care Settings, 2002.

Appendix D

PREVENTION AND CONTROL OF NOSOCOMIAL TRANSMISSION OF VANCOMYCIN-RESISTANT ENTEROCOCCUS IN HOSPITALS

(Source: Centers for Disease Control and Prevention (CDC), Recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC), “Recommendations for Preventing the Spread of Vancomycin Resistance”, *MMWR*, Vol. 44, No. RR-12, September 22, 1995)

Eradication of vancomycin-resistant enterococcus (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 multi-disciplinary effort. Therefore, the hospital’s quality assurance/improvement department would be involved at the outset in order to identify specific problems in hospital operations and patient-care system and to design, implement, and evaluate appropriate changes in these systems.

- **For all hospitals, including those where VRE have been isolated infrequently or not at all:**
 - Notify appropriate hospital staff promptly when VRE is detected.
 - 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.
 - Establish system(s) for monitoring appropriate process and outcome measures, such as cumulative 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 clinical, administrative, laboratory and support staff as reinforcement to ongoing education and control efforts.
 - Isolation precautions to prevent patient-to-patient transmission of VRE:
 1. Place VRE-infected or colonized patients in private rooms or in the same room as other patients with VRE.

- Wear gloves (clean non-sterile 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).
- Wear a gown (a clean non-sterile gown is adequate) when entering the room of a VRE-infected or colonized patient if 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.
- 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.
 - 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.

(See Appendix C, page 38, for more specific updated CDC Hand Hygiene Recommendations)

- Dedicate the use of non-critical 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.
- 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.
- Adopt a policy for deciding when patients infected or colonized with VRE can be removed from isolation precautions. The optimal requirements remain unknown; however, because VRE colonization can persist indefinitely, stringent criteria might be appropriate, such as VRE-negative results on at least three consecutive occasions (greater than or equal to 1 week apart) for 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). (A total of 3 cultures.)
- Establish a system for highlighting the records of infected or colonized patients so they can be promptly identified and placed on isolation precautions upon readmission to the hospital since patients with VRE can remain colonized for long periods after 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 non-availability of the patients' medical records.

- **In Hospitals With Endemic VRE or Continued VRE Transmission:**

- 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 which VRE spreads to other wards when patients are well enough to be transferred.
- In order to minimize the movement/contact of healthcare providers between VRE, positive and VRE-negative patients, cohort, when feasible, staff who provide regular ongoing care to VRE culture-positive patients.
- Carriers of *Enterococci* within the hospital staff have not 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 consider performing 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.
- 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., bed rails, charts, carts, door-knobs, 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.
- 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.

**Residents of Long-Term Care and Rehabilitation Facilities:
Recommended Practices for Antibiotic-Resistant Organisms
(If safe, appropriate care cannot be achieved using this guide, contact Infection Control)***

Patient Transmission Risk	Room Placement	Care of Patient in Patient Room	Care of Patient in Common Area	Rehab Activity (RT, OT, PT)
<ul style="list-style-type: none"> ● Incontinent of stool or urine ● Diarrhea ● Uncontained body fluids or drainage ● Cognitively impaired 	<ul style="list-style-type: none"> ● Private room always ideal with handwashing and toilet facilities OR ● Cohort with a patient with the same resistant organism. OR ● Share room with patient who does not have venous, arterial access device¹, a foley catheter, trach, or open wounds, or is on antibiotics, or is immunocompromised.² AND ● Both patients are able to cooperate in care plan to contain their body secretions. ● Patient items can be washed/dried in machines provided in the facility using regular detergent. 	<ul style="list-style-type: none"> ● Wear gloves to enter room and for direct patient care and contact with frequently touched surfaces in patient room. ● Change gloves after contact with material that could contain high concentrations of antibiotic-resistant organisms, e.g., stool, body fluids ● Hand hygiene as recommended by CDC (Appendix C) ● Wear gown if substantial contact is anticipated with patient or with environmental surfaces in the patient's room. ● Limit and/or dedicate supplies to patient room. ● Clean all equipment with disinfectant before removing from room.³ 	<p>(This includes dining room, hallway, activity room, etc.)</p> <ul style="list-style-type: none"> ● Case-by-case assessment when patient's body fluids, stool cannot be contained. (Contact Infection Control.) ● Instruct or assist patient to wash hands consistently and properly after using the toilet and before leaving room for common areas. ● Prohibit group handling of items, e.g., cards, puzzle pieces, TV remote. ● Gloves are not required for casual contact with patients outside of their rooms. ● Staff wear gowns and gloves when cleaning spills. If patient needs to use bathroom, take back to own room, instruct or assist patient to wash hands before returning to activity room. <p style="text-align: center;">(continued)</p>	<ul style="list-style-type: none"> ● Case-by-case assessment of patient leaving room when body fluids, stool cannot be contained. (Contact Infection Control). Consider doing rehab activities and other services in patient room. Minimize sending patient to other sites. ● Instruct or assist patient to wash hands on arrival to the rehab department and before leaving. ● Gloves are not required for casual contact with patients outside of their rooms. Staff wear gowns and gloves when cleaning spills. ● Wipe equipment with disinfectant after patient contact and before next patient use.³ ● Surfaces contaminated by patient secretions and/or excretions should be clean and disinfected.⁴

Patient Transmission Risk	Room Placement	Care of Patient in Patient Room	Care of Patient in Common Area	Rehab Activity (RT, OT, PT)
			<ul style="list-style-type: none"> Surfaces contaminated by patient secretions and/or excretions should be cleaned and disinfected.³ Have patients use chairs, etc., that can be easily cleaned; avoid fabric furniture.⁴ 	
<ul style="list-style-type: none"> Continent of stool or urine No diarrhea Wound drainage or body fluids is/are contained. Is able to cooperate in strategies to contain their body secretions. 	<ul style="list-style-type: none"> Private room is always ideal with handwashing and toilet facilities. OR Can share room.² 	<ul style="list-style-type: none"> Gloves are not required for casual contact. Gloves are worn for direct patient care and contact with frequently touched surfaces in patient's room. Hand hygiene as recommended by CDC (Appendix C). Gowns are not required unless soiling with fecal material or infectious drainage is anticipated. 	<ul style="list-style-type: none"> Instruct patients to wash hands after using toilet and before leaving their rooms for common areas. Instruct patients to use their own bathroom for toilet use. Reinforce handwashing. Gloves are not required for casual contact with patients outside of their own rooms. Staff wear gowns and gloves when cleaning spills. 	<ul style="list-style-type: none"> Instruct patient to wash hands on arrival to rehab department or before leaving room. Gloves are not required for casual contact with patients outside of their rooms. Staff wear gowns and gloves when cleaning spills. Wipe equipment with disinfectant after patient contact and before next patient use.³

¹Exception: A patient with an implanted port **not** being used can share a room with a patient who has drug-resistant organisms.

²The health status of drug-resistant organism patients and uninfected roommates should be periodically reassessed to determine whether continued room sharing is appropriate.

³The disinfectant must be in contact with the item to be cleaned for at least 10 minutes.

⁴Daily environmental cleaning is recommended for surfaces commonly touched by patients known to be positive for drug-resistant organisms.

*Adapted from: Report of the Iowa Antibiotic Resistance Task Force: A Public Health Guide. 1999. Iowa Antibiotic Resistance Task Force.

MRSA - Methicillin Resistant *Staphylococcus aureus*

FACT SHEET #1*

Information for Healthcare Personnel

Methicillin-resistant *Staphylococcus aureus* (MRSA) has become a prevalent nosocomial pathogen in the United States. In hospitals, the most important reservoirs of MRSA are infected or colonized patients. Although hospital personnel can serve as reservoirs for MRSA and may harbor the organism for many months, they have been more commonly identified as a link for transmission between colonized or infected patients. The main mode of transmission of MRSA is via hands (especially health care workers' hands) which may become contaminated by contact with a) colonized or infected patients, b) colonized or infected body sites of the personnel themselves, or c) devices, items, or environmental surfaces contaminated with body fluids containing MRSA. **Standard Precautions should control the spread of MRSA in most instances.**

Standard Precautions include:

1) Handwashing and Hand Asepsis

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. It may be necessary to wash hands between tasks and procedures on the same patient to prevent cross-contamination of different body sites. Wash hands with a non-antimicrobial soap and water or an antimicrobial soap and water when hands are visibly dirty or contaminated with blood/body fluids. If hands are not visibly soiled, use an alcohol-based waterless antiseptic agent for routinely decontaminating hands.

2) Gloving

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.

3) Masking

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.

4) Gowning

Wear a gown (a clean nonsterile gown is adequate) to protect skin and prevent soiling of clothes during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions or cause soiling of clothing.

5) Appropriate device handling

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 and that single-use items are properly discarded.

6) Appropriate handling of laundry

Handle, transport, and process used linen 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.

If MRSA is judged by the hospital's infection control program to be of special clinical or epidemiologic significance, then Contact Precautions should be considered.

Contact Precautions consist of:

1. Placing a patient with MRSA in a private room. When a private room is not available, the patient may be placed in a room with a patient(s) who has active infection with MRSA, but with no other infection (cohorting).
1. Wearing 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 (e.g., fecal material and wound drainage). Remove gloves before leaving the patient's room and wash hands immediately with an antimicrobial 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 and environments.
2. Wearing a gown 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 room. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients and environments.

1. Limiting 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.
2. Ensuring that patient-care items, bedside equipment, and frequently touched surfaces receive daily cleaning.
3. When possible, dedicating the use of noncritical patient-care equipment and items such as stethoscope, sphygmomanometer, bedside commode, or electronic rectal thermometer to a single patient (or cohort of patients infected or colonized with MRSA) to avoid sharing between patients. If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use on another patient.

Control of MRSA Outbreaks

When an outbreak of MRSA infection occurs, an epidemiologic assessment should be initiated to identify risk factors for MRSA acquisition in the institution; clinical isolates of MRSA should be saved and submitted for strain typing. Colonized or infected patients should be identified as quickly as possible, appropriate barrier precautions should be instituted, and handwashing by medical personnel before and after all patient contacts should be strictly adhered to.

Personnel should be reinstructed on appropriate precautions for patients colonized or infected with multi-resistant microorganisms and on the importance of handwashing and barrier precautions in preventing contact transmission.

If additional help is needed by the hospital, a consultation with the local or state health department may be necessary.

*Adapted from: www.cdc.gov/ncidod/hip/aresist/mrsahcw.htm

MRSA - Methicillin Resistant *Staphylococcus aureus*

FACT SHEET #2*

Information for Patients

What is MRSA?

Staphylococcus aureus, often referred to simply as "staph," is a bacteria commonly found on the skin of healthy people. Occasionally, staph can get into the body and cause an infection. This infection can be minor (such as pimples, boils, and other skin conditions) or serious (such as blood infections or pneumonia). Methicillin is an antibiotic commonly previously used to treat staph infections. Although methicillin is very effective in treating most staph infections, some staph bacteria have developed resistance to methicillin and can no longer be killed by this antibiotic. These resistant bacteria are called methicillin-resistant *Staphylococcus aureus*, or MRSA.

What is the difference between colonization and infection?

Colonization means that MRSA is present on or in the body without causing illness. Infection means that MRSA is making the person sick.

Who gets MRSA?

MRSA infection usually develops in hospital patients who are elderly or very sick, or who have an open wound (such as a bedsore) or a tube (such as a urinary catheter) going into their body. Healthy people rarely get MRSA infection.

Where is MRSA found?

MRSA can be found on the skin, in the nose, and in blood and urine.

How common is MRSA?

A precise number is not known, but according to some estimates as many as 80,000 patients a year get an MRSA infection after they enter the hospital. The number who become colonized is not known.

Is MRSA treatable?

Yes. Although MRSA is resistant to many antibiotics and often difficult to treat, a few antibiotics can still successfully cure MRSA infections. Patients who are only colonized with MRSA usually do not need treatment.

Can MRSA spread?

Yes. MRSA can spread among other patients, who are often very sick with weak immune systems that may not be able to fight off infections. MRSA is almost always spread by physical contact, and not through the air. Hospitals usually take special steps to prevent the spread of MRSA from patient to patient. One of these steps may be to separate, or isolate, a patient with

MRSA from other patients.

What happens when a patient with MRSA is isolated?

Procedures may vary from one hospital to another, but the following often occurs:

- The patient is placed in a private room, or in a room with one or more patients who also have MRSA.
- The patient's movement from the room is limited to essential purposes only, such as for medical procedures or emergencies.
- Healthcare workers usually put on gloves (and sometimes hospital gowns) before entering the patient's room, remove their gloves (and gowns) before leaving the room, and then immediately wash their hands.
- Visitors also may be asked to put on gloves (and sometimes gowns), especially if they are helping to take care of the patient and likely to come in contact with the patient's skin, blood, urine, wound, or other body substances. Visitors should always wash their hands before leaving the patient's room to make sure they don't take MRSA out of the room with them.

How long does a patient with MRSA have to be isolated?

The hospital staff will determine when it is safe for a person with MRSA to come out of isolation. Because MRSA is difficult to treat, this may be a few days to a few weeks or longer.

When a person with MRSA is being cared for at home, should the same precautions be followed?

Before the patient leaves the hospital, be sure to ask the nurse or doctor about what precautions should be taken at home.

In general, the following precautions are recommended for the care of a person with MRSA at home:

- Wash your hands after caring for the person with MRSA.
- Periodically clean the person's room and personal items with a commercial disinfectant or a fresh solution of one part bleach and 100 parts water (for example, one tablespoon of bleach in one quart of water).
- Wear gloves if you handle body substances (blood, urine, wound drainage) and wash your hands after removing the gloves.

Is it safe to be in the same room as a person with MRSA?

Again, healthy people are at very little risk of getting infected with MRSA. So as long as family members or other visitors are healthy, it's okay for them to be in the same room with a person with MRSA. Casual contact, such as touching or hugging, is also okay. However, be sure to wash your hands before you leave the hospital room (or the patient's home).

Persons who are very ill or who have weak immune systems should avoid handling the body substances of a person with MRSA and should limit their physical contact to no more than casual touching. They should also wash their hands after physical contact with a person with MRSA.

Can my children get MRSA by being around a person with MRSA?

Healthy people, including children, are at very little risk of becoming infected with MRSA.

I have MRSA and I'll be going home soon. What should I do to prevent my family from getting MRSA?

If you are infected or colonized with MRSA, you should take the following precautions to prevent spreading MRSA to your family and others:

- Follow good hygiene practices, as described above.
- Tell any nurses or doctors who treat you that you have MRSA.

*Adapted from: www.cdc.gov/ncidod/hip/aresist/mrsahcw.htm

MRSA - Methicillin Resistant *Staphylococcus aureus*

FACT SHEET #3*

Laboratory Detection of Oxacillin/Methicillin-resistant *Staphylococcus aureus* (MRSA)

What are the susceptibility patterns of clinical *S. aureus* isolates?

Approximately 5% of *S. aureus* isolates still are susceptible to penicillin. In the United States, most *S. aureus* strains are resistant to penicillin but susceptible to penicillinase-stable penicillins, such as oxacillin and methicillin. Strains that are oxacillin and methicillin resistant, historically termed methicillin-resistant *S. aureus* (MRSA), are resistant to all beta-lactam agents, including cephalosporins and carbapenems. MRSA isolates often are multiply resistant to commonly used antimicrobial agents, including erythromycin, clindamycin, and tetracycline. Since 1996, reports of MRSA strains with decreased susceptibility to vancomycin (minimum inhibitory concentration [MIC], ≥ 8 microgram/ml.) have been published.

Why is MRSA important?

- Pathogenicity. MRSA is pathogenic and is a common cause of hospital-acquired infections.
- Limited treatment options. Vancomycin often is the only drug of choice for treatment of severe MRSA infections, although some strains remain susceptible to fluoroquinolones, trimethoprim/sulfamethoxazole, gentamicin, or rifampin. Because of the rapid emergence of rifampin resistance, this drug should never be used as a single agent to treat MRSA infections.
- MRSA is transmissible. A MRSA outbreak can occur when one strain is transmitted to other patients. Often this occurs when a patient or healthcare worker is colonized with a MRSA strain (i.e., carries the organism but shows no clinical signs or symptoms of infection) and, through contact with others, spreads the strain. Handwashing and screening patients for MRSA should be performed to decrease transmission and reduce the number of patients infected with MRSA.

How should clinical laboratories screen for MRSA?

The National Committee for Clinical Laboratory Standards (NCCLS)-recommended "Screening Test for Oxacillin-resistant *S. aureus*" uses an agar plate containing 6 $\mu\text{g/ml}$ of oxacillin and Mueller-Hinton agar supplemented with NaCl (4% w/v; 0.68 mol/L). For methods of inoculation, see NCCLS Approved Standard M100-S9 (1)

Is it difficult to detect oxacillin/methicillin resistance?

Accurate detection of oxacillin/methicillin resistance can be difficult due to the presence of two subpopulations (one susceptible and the other resistant) that may coexist within a culture (2). All cells in a culture may carry the genetic information for resistance but only a small number can express the resistance in vitro. This phenomenon is termed heteroresistance and occurs in staphylococci resistant to penicillinase-stable penicillins, such as oxacillin. Heteroresistance is a problem for clinical laboratory personnel because cells expressing resistance may grow more slowly than the susceptible population. This is why NCCLS recommends incubating isolates being tested against oxacillin, methicillin, or nafcillin at 35° C for a full 24 hours before reading (1).

Can all susceptibility tests detect MRSA?

When used correctly, broth-based and agar-based tests usually can detect MRSA. Oxacillin screen plates can be used in addition to routine susceptibility test methods or as a back-up method.

Are there additional tests to detect oxacillin/methicillin resistance?

Amplification tests like those based on the polymerase chain reaction (PCR) detect the *mecA* gene. These tests confirm oxacillin/methicillin resistance caused by *mecA* in *Staphylococcus* species.

How is the *mecA* gene involved in the mechanism of resistance?

Staphylococcal resistance to oxacillin/methicillin occurs when an isolate carries an altered penicillin-binding protein, PBP2a, which is encoded by the *mecA* gene. The alteration of the penicillin-binding protein does not allow the drug to bind well to the bacterial cell, causing resistance to β -lactam antimicrobial agents.

What are the breakpoints for testing the susceptibility of staphylococci to oxacillin?

The 1999 NCCLS breakpoints for *S. aureus* are different than those for coagulase-negative staphylococci (CoNS) (1).

MICs	Oxacillin Susceptible	Oxacillin Intermediate	Oxacillin Resistant
<i>S. aureus</i>	$\leq 2 \mu\text{g/ml}$	no intermediate MIC	$>4 \mu\text{g/ml}$
CoNS	$\leq 0.25 \mu\text{g/ml}$	no intermediate MIC	$>0.5 \mu\text{g/ml}$

Zone sizes	Oxacillin Susceptible	Oxacillin Intermediate	Oxacillin Resistant
<i>S. aureus</i>	$\geq 13 \text{ mm}$	11-12 mm	$\leq 10 \text{ mm}$
CoNS	$\geq 18 \text{ mm}$	no intermediate zone	$\leq 17 \text{ mm}$

Why is oxacillin tested instead of methicillin?

Oxacillin is more resistant to degradation in storage and is more likely to detect most heteroresistant strains. In addition, methicillin is no longer commercially available in the United States. Antimicrobials like oxacillin and nafcillin now are used for treatment of *S. aureus* infections.

If oxacillin is tested, why are the isolates called "MRSA" instead of "ORSA"?

When resistance was first described in 1968, methicillin was used to test and treat infections caused by *S. aureus*. Now, methicillin is no longer the agent of choice for testing or treatment of susceptible staphylococcal infections. However, the acronym MRSA is still used by many to describe these isolates because of its historic role.

- National Committee for Clinical Laboratory Standards. 1999. Performance standards for antimicrobial susceptibility testing. NCCLS approved standard M100-S9. National Committee for Clinical Laboratory Standards, Wayne, PA.
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*Adapted from: www.cdc.gov/ncidod/hip/aresist/mrsahcw.htm

VRE - Vancomycin-Resistant Enterococcus

FACT SHEET #1*

Information for Healthcare Personnel

VRE is one of the most commonly encountered antibiotic-resistant organisms in patients residing in hospitals and non-hospital healthcare facilities.

What is the difference between colonization and infection?

COLONIZATION means that the organism is present in or on the body but is not causing illness.

INFECTION means that the organism is present and is causing illness.

What conditions increase the risk of acquiring these organisms?

There are several risk factors for both colonization and infection:

- severity of illness
- previous exposure to antimicrobial agents
- underlying diseases or conditions, particularly:
 - chronic renal disease
 - insulin-dependent diabetes mellitus
 - peripheral vascular disease
 - dermatitis or skin lesions
- invasive procedures, such as:
 - dialysis
 - presence of invasive devices
 - urinary catheterization
- repeated contact with the healthcare system
- previous colonization by an antibiotic-resistant organism
- advanced age

Can patients colonized or infected with these organisms be admitted to non-hospital healthcare facilities?

Non-hospital healthcare facilities can safely care for and manage these patients by following appropriate infection control practices. In addition, non-hospital healthcare facilities should be aware that persons with VRE, and other infections may be protected by the Americans with Disabilities Act or other applicable state or local laws or regulations.

What precautions should family caregivers take for infected persons in their homes?

Outside of healthcare settings, there is little risk of transmitting organisms to persons at risk of disease from VRE, therefore, healthy people are at low risk of getting infected. In the home, the following precautions should be followed:

- Caregivers should wash their hands with soap and water after physical contact with the infected or colonized person and before leaving the home.
- Towels used for drying hands after contact should be used only once.
- Disposable gloves should be worn if contact with body fluids is expected and hands should be washed after removing the gloves.
- Linens and cloths should be changed and washed if they are soiled and on a routine basis.
- The patient's environment should be cleaned routinely and when soiled with body fluids.
- Notify doctors and other healthcare personnel who provide care for the patient that the patient is colonized/infected with a antibiotic-resistant organism.

What can be done to prevent or control transmission of these pathogens in my facility?

CDC's recommendations for preventing transmission of MRSA / VRE in hospitals consist of **Standard Precautions**, which **should be used for all patient care**. In addition, CDC recommends **Contact Precautions** when the facility (based on national or local regulations) deems the antibiotic-resistant microorganism to be of special clinical and epidemiologic significance.

The components of Contact Precautions may be adapted for use in non-hospital healthcare facilities, especially if the patient has draining wounds or difficulty controlling body fluids.

In addition to Standard and Contact Precautions, the following procedures also may be considered for non-hospital healthcare facilities:

- **Patient placement** - Place the patient in a private room, if possible. When a private room is not available, place the patient in a room with a patient who is colonized or infected with the same organism, but does not have any other infection (cohorting). Another option is to place an infected patient with a patient who does not have risk factors for infection.
- **Patient placement in dialysis facilities** - Dialyze the patient at a station with as few adjacent stations as possible (e.g., at the end or corner of the unit).
- **Group activities** - It is extremely important to maintain the patients' ability to socialize and have access to rehabilitation opportunities. Infected or colonized patients should be permitted to participate in group meals and activities if draining wounds are covered, bodily fluids are contained, and the patients observe good hygienic practices.

The following are recommended for prevention of VRE in hospitals and may be adapted for use in non-hospital healthcare facilities:

- Obtain stool cultures or rectal swab cultures of roommates of patients newly found to be infected or colonized with VRE.
- Adopt a policy for deciding when patients can be removed from isolation, e.g., VRE-negative results on at least three consecutive occasions, one or more weeks apart.

If a patient in a facility is colonized or infected with VRE, what do their visitors/family members need to know?

In general, healthy people are at low risk of getting infected with MRSA or VRE. Therefore, casual contact - such as kissing, hugging, and touching - is acceptable. Visitors should wash their hands before leaving an infected person's room. Also, disposable gloves should be worn if contact with body fluids is expected. (If excessive contact with body fluids is expected, gowns should also be worn.)

*Adapted from: www.cdc.gov/ncidod/hip/aresist/mrsahcw.htm

FACT SHEET #2*

Vancomycin-resistant Enterococci (VRE) and the Clinical Laboratory

What are the types of vancomycin resistance in enterococci?

There are the two types of vancomycin resistance in enterococci. The first type is intrinsic resistance. Isolates of *Enterococcus gallinarum* and *E. casseliflavus*/*E. flavescens* demonstrate an inherent, low-level resistance to vancomycin.

The second type of vancomycin resistance in enterococci is acquired resistance. Enterococci can become resistant to vancomycin by acquisition of genetic information from another organism. Most commonly, this resistance is seen in *E. faecium* and *E. faecalis*, but also has been recognized in *E. raffinosus*, *E. avium*, *E. durans*, and several other enterococcal species.

Several genes, including *vanA*, *vanB*, *vanC*, *vanD*, and *vanE*, contribute to resistance to vancomycin in enterococci.

What are typical vancomycin MICs (phenotypes) for various species of VRE?

E. faecium is the most frequently isolated species of VRE in hospitals and typically produces high vancomycin (>128 µg/ml) and teicoplanin (≥16 µg/ml) minimum inhibitory concentrations (MICs). These isolates typically contain *vanA* genes. A *vanB*-containing isolate typically produces lower level resistance to vancomycin (MICs 16 to 64 µg/ml) and is susceptible to teicoplanin (MICs ≤1 µg/ml). Recently, a few *vanD*-containing isolates of *E. faecium* with a moderate level of resistance to vancomycin (MICs 64 to 128 µg/ml) and teicoplanin (MICs 4-8 µg/ml) have been reported, as has a novel *vanE*-containing *E. faecalis*.

E. gallinarum and *E. casseliflavus*/*E. flavescens* isolates are intrinsically resistant to vancomycin. These isolates contain *vanC* genes that typically produce vancomycin MICs of 2 to 16 µg/ml.

Is identification of VRE to species level important?

Yes. Identification of VRE to species level aids in confirming whether an isolate has intrinsic (*vanC*) or acquired resistance (*vanA* or *vanB*). Knowledge of the type of resistance is critical for infection control purposes. *vanA* and *vanB* genes are transferable and can spread from organism to organism. In contrast, *vanC* genes are not transferable, have been associated less commonly with serious infections, and have not been associated with outbreaks.

For species differentiation, motility and pigment tests are easily performed and are important tests to distinguish among species phenotypically. *E. faecium* and *E. faecalis* are non-motile, whereas *E. gallinarum* and *E. casseliflavus*/*E. flavescens* generally are motile. Most isolates of *E. casseliflavus*/*E. flavescens* have a distinct yellow pigment, which can be observed by collecting growth from an agar plate on a swab. In addition to motility and pigment tests, an organism's susceptibility profile also helps differentiate *vanA* and *vanB* isolates from *vanC* isolates.

When should clinical laboratory personnel screen for VRE?

The decision about who and when to screen for VRE is a facility-specific decision. CDC recommendations can assist in the determination of a screening strategy appropriate for health care facilities (Recommendations for Preventing the Spread of Vancomycin Resistance Recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC) MMWR 1995; 44(RR12):1-13). Infection control personnel at some healthcare facilities selectively screen newly admitted or high-risk patients (e.g., intensive care, oncology, and surgery patients) determined to be at greater risk for VRE colonization.

Why is the difference between colonization and infection important for VRE screening?

Infected patients carry VRE and show clinical signs or symptoms of disease. Colonized patients carry VRE but do not have clinical signs or symptoms of infection. This distinction is important in VRE screening. Patients are usually colonized in the gastrointestinal tract and occasionally in the urinary tract. VRE colony counts are similar in the stool of colonized or infected patients. If a hospital VRE rate is based solely on VRE isolated from clinical cultures (infected patients), the facility may be adequately reporting its infection rate, but may be underestimating the true burden (and therefore potential transmissibility) of VRE in the facility. Screening for patients colonized by VRE provides information about potential sources of illness. The goal of screening is to identify as many colonized patients as possible so that infection control measures can be implemented to decrease transmission and reduce the number of patients infected with VRE.

How should clinical laboratory personnel screen for VRE?

Screening for VRE can be accomplished in a number of ways. For inoculating peri-rectal/anal swabs or stool specimens directly, one method uses bile esculin azide agar plates containing 6 µg/ml of vancomycin. Black colonies should be identified as an enterococcus to species level and further confirmed as vancomycin resistant by an MIC method before reporting as VRE.

Vancomycin resistance can be determined for enterococcal colonies available in pure culture by inoculating a suspension of the organism onto a commercially available brain heart infusion agar (BHIA) plate containing 6 µg/ml vancomycin. The National Committee for Clinical Laboratory Standards (NCCLS) recommends performing a vancomycin MIC test and also motility and pigment production tests to distinguish species with acquired resistance (*vanA* and *vanB*) from those with *vanC* intrinsic resistance (1).

Are all VRE of the same species in a hospital clonally related?

Not necessarily. Many molecular sub-types of VRE have been documented, primarily by pulsed-field gel electrophoresis (PFGE). Some hospitals have a large number of VRE that fall into only a few distinct sub-types; one factor causing this could be clonal spread. Other hospitals have isolates

of VRE in many sub-types. Many sub-types within a hospital could be caused by different factors, e.g., the hospital may have admitted patients carrying varying molecular sub-types of VRE.

What methods exist to type VRE to determine clonal spread in a hospital?

Molecular typing of enterococci in outbreak situations is commonly performed by PFGE. Banding patterns produced by each organism are matched, and this information is combined with epidemiologic data to determine relatedness between strains. Other molecular typing systems include PCR-based typing methods, multilocus enzyme electrophoresis, and ribotyping.

(1) National Committee for Clinical Laboratory Standards. 1999. Performance standards for antimicrobial susceptibility testing. NCCLS approved standard M100-S9. National Committee for Clinical Laboratory Standards, Wayne, PA.

*Adapted from: www.cdc.gov/ncidod/hip/aresist/mrsahcw.htm

Guidelines for Specimen Collection*

Blood Cultures

A total of three (3) blood cultures during a 24 hour period is usually sufficient to identify most cases of blood stream infection. The recommended interval between blood draws is 15-30 minutes. For conditions causing intermittent bacteremia (non-intravascular infections) the greatest yield occurs if the blood cultures are drawn during a temperature spike. The sample volume must be adequate for the particular blood culture system used, to maximize recovery of the microorganism.

Sputum

All organisms obtained from sputum cultures may not be representative of lower respiratory tract infection. Laboratories use a Gram stain of the sputum to screen for inadequate specimens. Microscopic exam showing more than 25 epithelial cells per low power field suggest oral contamination and the culture will not be done. Many WBC should be seen in a properly collected specimen if lower respiratory tract infection is present.

Obtain lower respiratory tract secretions, **not saliva**, either by deep cough, expectoration or suctioning. If sputum is obtained by suctioning and only a small amount of sample is obtained, rinse the suction catheter with sterile water or saline into the sputum trap.

- Collect first morning specimen, when possible
- Remove dentures when indicated
- Rinse mouth with water
- Inhale deeply prior to deep cough
- Collect >1 milliter into sterile container
- Transport immediately or refrigerate at 2.8 C° and transport to laboratory within 24 hours

A sputum culture request generally does not include a TB (Tuberculosis) culture unless specifically requested as TB culture and smear or AFB (Acid Fast Bacillus) culture and smear. Refer to facility's TB Exposure Control Plan for detailed procedure.

Wounds

- Open abscess, ulcer

Cleanse the superficial adjacent area of the wound with soap and water, 70° alcohol, or povidone iodine before collecting specimen. Aspirate if possible, or pass swab deep into lesion and firmly sample lesion's advancing edge using a swab transport system, e.g., culturette. Sampling surface area can introduce colonizing bacteria not involved in infectious process. Therefore sampling dry wounds, including ischemic limbs and pressure ulcers is generally of little value.

- Closed

Aspirate material with a syringe. Aseptically transfer **all** material into an anaerobic transport system.

Urine

- Specimen

Label all urine samples accurately: Clean catch, catheterized urine, suprapubic aspirate, etc. The microbiology department must know the source of urine specimen in order to make decisions in specimen processing, interpreting colony counts, and testing of isolates for identification and antimicrobial susceptibility.

- Clean Catch Midstream Specimen

Carefully instruct or assist patient in collecting a clean catch midstream specimen into the sterile urine container. Cool specimen on ice and/or refrigerate if no transport tube is available and there is a delay in transport to the laboratory. This specimen may also be used for urinalysis.

Urinary-Catheters

- Indwelling catheter (Foley) tip. Do **not** culture, since growth represents distal urethral flora.
- Indwelling catheter (Foley) specimen: Take only fresh urine from aspiration port after disinfecting with 70% alcohol. Use sterile needle and syringe to aseptically collect urine. Transfer sample to sterile tube or container.
- Straight Catheter specimen: Aseptically insert catheter into bladder after carefully cleaning urethral area with soap and water. Allow the urine to pass; then collect urine in sterile container.

Stool - Culture

- Routine Culture - Pass stool specimen directly into clean container. Transport to microbiology within one hour or transfer specimen to enteric transport system. Most laboratories screen stool cultures for *Campylobacter*, *Salmonella*, *Shigella*, *Vibrio*. Collaborate with microbiology laboratory on special requests to examine the specimen for *Yersinia* and other organisms, e.g., VRE, MRSA, or *E. coli* 0157:H7.

Rectal Swab

- Carefully insert swab one inch beyond anal sphincter. Gently rotate swab to sample anal crypt; feces should be evident on the swab. Send to lab by way of swab transport system. Swabs may be stored at room temperature up to 24 hours. Swabs are examined routinely for enteric pathogens similar to stool cultures, and for other organisms as described above, by special request.

NOTE: This procedure should not be performed on patients with severe neutropenia.

*Adapted from: Guidelines for Prevention and Control of Antibiotic Resistant Organisms: Focus on Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Vancomycin-Resistant Enterococcus (VRE). 1997. Michigan Society for Infection Control

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