RECOMMENDATIONS FOR THE CONTROL OF VANCOMYCIN-RESISTANT ENTEROCOCCUS (VRE) IN HEALTHCARE FACILITIES IN GEORGIA, WITH A FOCUS ON LONG-TERM CARE

Developed by:

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in conjunction with
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III. RATIONALE

In mid-1995, the Centers for Disease Control and Prevention (CDC) published the recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC) for preventing and controlling the spread of vancomycin resistance, with a special focus on Vancomycin resistant enterococcus (VRE) (1, and included as Appendix G). However, these recommendations primarily refer to VRE control in acute care hospital settings, with little mention of VRE control in long-term care facilities. By the fall of 1995, infection control practitioners and physicians working in long-term care were requesting state-based recommendations for preventing the spread of VRE in long-term care facilities in Georgia. In response to this need, the State Epidemiologist, Division of Public Health, Georgia Department of Human Resources (DPH-GADHR) convened a working group of representatives from public health, clinical and academic medicine, infection control, laboratory, regulatory affairs, and medical advocacy groups to address the need for specific recommendations for the control of VRE in long term care facilities. As a result of their collaboration and after perusal of similar recommendations from other states, this document was produced to address the issue of VRE in healthcare facilities in the state of Georgia, with a focus on long term care. The DPH-GADHR recommends that each healthcare facility, specifically long-term care facilities and other organizations providing ancillary care services (such as dialysis and home-health care agencies), review both the HICPAC recommendations (attached, Appendix G) and the recommendations presented herein to develop a comprehensive institution-specific strategic plan to detect, prevent and control infection and colonization with VRE in residents of long term care facilities.

IV. EPIDEMIOLOGY AND NATURAL HISTORY OF VRE

Enterococci are gram-positive bacteria that are morphologically similar to streptococci. They are part of the normal flora of the gastrointestinal tract and the female genital tract, and are an important cause of nosocomial infections in the hospital setting (2). These organisms have traditionally been resistant to a variety of antimicrobials, but, until recently, were consistently sensitive to vancomycin. Since 1989 vancomycin-resistant enterococci (VRE) have emerged as significant nosocomial pathogens in the United States. In 1993, 14% of nosocomial enterococci infections reported from intensive care units to the CDC's National Nosocomial Infections Surveillance System (NNISS) were vancomycin resistant (3). This emergence appears to be indirectly related to the use of broad spectrum antimicrobials, and more directly related to the use of vancomycin, particularly in the hospital setting (4-11).

People can be colonized or infected with VRE. People are considered colonized with VRE when the bacteria are present, but not causing disease. Colonization usually involves the gastrointestinal tract, but can also occur in the genitourinary tract or on the skin. Residents are considered infected with VRE when the bacteria cause clinically apparent disease (e.g., wound infection, bacteremia, urinary tract infection, or intra-abdominal infection).

The epidemiology of VRE is not fully understood; however, the following observations have been made (1):

1) Most clinical VRE isolates cause colonization, not infection.
2) VRE infections tend to occur in critically ill hospitalized patients with severe underlying diseases or immunosuppression.
3) People who develop VRE infections are often previously colonized (i.e., in the gastrointestinal tract) with these organisms (8, 12).
4) Prior use of vancomycin has repeatedly been reported as a risk factor for infection and colonization with VRE (6-11).
5) Most infections with VRE have been attributed to the indigenous flora of people involved (13). However, VRE and other enterococci can be transmitted directly by transient carriage on the hands of personnel or indirectly via contaminated equipment or environmental surfaces (5, 14, 15).
6) The *vanA* gene, which confers high-level resistance, is often plasmid-borne and has been transferred in vitro from enterococci to a variety of other gram-positive microorganisms (16-18).

VRE infections can be associated with serious life-threatening illnesses, particularly in residents with bacteremia and severe underlying diseases (19-21). However, wound infections may be relatively mild and may heal without specific therapy (22), and some authors have noted that VRE do not appear to be highly virulent (6). Despite variability in clinical presentation and outcome, VRE infections represent an important clinical and public health problem for the following

reasons. First, VRE are an important cause of nosocomial infections in the United States, indicating that efforts to prevent these infections are essential in clinical-care settings (1). Second, because resistance can be transferred between organisms in vitro, the emergence of vancomycin-resistance in clinical isolates of *Staphylococcus aureus* and *Staphylococcus epidermidis* is of serious concern (1). Several cases of patients with bacteremia caused by *S. epidermidis* resistant to vancomycin were recently reported, illustrating the clinical potential of transfer of vancomycin resistance to staphylococcal species (23-27). Furthermore, methicillin-resistant *S. aureus* (MRSA) infections are widespread in many hospitals in the United States, and vancomycin is the drug used to treat such infections. Third, cases of VRE infection involve complex issues of resident transfer and monitoring, particularly with regard to transfer between acute care and long-term care settings.

Control of VRE involves the following: 1) careful adherence to appropriate infection control guidelines, Standard Precautions in particular (Appendix A); 2) clear communication of information between facilities and providers regarding VRE status of residents; 3) education of providers about the significance of VRE as a nosocomial pathogen; 4) development of policies regarding the prudent use of vancomycin; 5) appropriate and standardized laboratory techniques for isolation, identification and antibiotic susceptibility testing of enterococci; and 6) environmental cleaning with an appropriate disinfectant. All of these issues are addressed in the recommendations presented here. Additional factors that are important to recognize but that are not addressed here are public education on the importance of antimicrobial resistance and appropriate antibiotic use.

Data on the epidemiology of VRE and the effectiveness of control strategies are limited. Members of the DPH-GADHR Work Group also recognize that it is not possible to completely halt the spread of VRE within specific institutions or in the community at large (28- 29). As additional data become available or as these recommendations are implemented and assessed in various clinical-care settings, the recommendations may be changed or modified accordingly. At this time, the recommendations provided in this document apply to cases of *Enterococcus faecalis* and *Enterococcus faecium* with intermediate or high-level resistance to vancomycin, and not to other enterococci species. For questions regarding this document or questions specific to VRE, please contact the Georgia State Health Department, Notifiable Disease Unit, Epidemiology and Prevention Branch at (404) 657-2588.

Many of the recommendations presented in this document also apply to the control of MRSA, particularly those involving handwashing and barrier precautions (30, 31). However, control of VRE involves somewhat greater emphasis on environmental surfaces, since the organisms have been shown to persist on such surfaces for relatively long periods of time. Since vancomycin is the drug of choice to treat MRSA infections, control of the spread of MRSA is an essential element in controlling the emergence of VRE. Furthermore, limiting the spread of VRE may help to prevent widespread emergence of vancomycin-resistant *S. aureus* and/or *S. epidermidis*.

V. INFECTION CONTROL: NOSOCOMIAL INFECTION PREVENTION AND CONTROL MEASURES FOR VANCOMYCIN RESISTANT ENTEROCOCCI IN LONG-TERM CARE FACILITIES

A. Rationale

Few data exist specifically addressing the risk of VRE transmission in long-term care facilities (LTCFs). Available data suggest that while colonization with VRE is common in some LTCFs, serious infection is rare (32). Reasons for this may include less intense use of antibiotics and intravenous devices in LTCFs compared to acute care hospitals, where vancomycin overuse has played a primary role in the emergence of VRE. However, the risk of VRE transmission does exist in LTCFs due to other risk factors commonly found in residents of LTCFs. These include bowel and/or bladder incontinence and cognitive impairment, a high incidence of skin breakdown (for example, decubitus ulcers) and the use of urinary catheters **(REF)**.

While the committee recognizes that VRE transmission probably does occur in LTCFs, it also recognizes that full adherence to contact isolation precautions such as those recommended for acute-care facilities, are not practical for most LTCFs. The committee considered two critical points about LTCFs before arriving at this conclusion:

1. For every LTCF resident found to be colonized with VRE, there are likely many more colonized residents who go unrecognized because most LTCFs do not routinely look for VRE in all patients entering, or residing in their facility. For this reason, focusing control efforts only on residents who are known to be colonized with VRE, or denying admission to an individual based on current or past VRE colonization status, is unlikely to impact the spread of VRE.

2. Available information suggests that transmission of a variety of potentially pathogenic, antibiotic-resistant organisms other than VRE also occurs in LTCFs **(REF)**.

For these reasons we feel that the primary strategy employed by LTCFs to decrease transmission of potentially pathogenic organisms should be the universal application of good infection control practices (i.e., Standard Precautions [Appendix A]), with additional efforts to minimize the likelihood of a resident's exposure to feces.

Settings where this type of approach can be considered include LTCFs, rehabilitation hospitals, home health care settings, and some sub-acute wards in acute care facilities. Details of this approach are outlined below in Section V, Subsection B, under the heading of, "Recommended Practices for the Control of VRE in Long Term Care Facilities."
Some facilities may opt for a more aggressive approach in controlling the spread of VRE including adherence to contact isolation procedures outlined in the HICPAC guidelines (Appendix G). The Georgia State VRE task force feels that these more aggressive measures should be

instituted only when an adequate surveillance system to identify residents colonized with VRE, exists within the facility. This approach would be similar to strategies employed in acute care facilities and is outlined below in Section VIII, Subsection D, under the heading of , "Screening Procedures for Detecting VRE in Acute Care Hospitals Where VRE Have Not Previously Been Detected," and Section VIII, Subsection E, "Controlling Transmission of VRE in Acute Care Hospitals."

For a given population of patients in a given facility, the choice between instituting either of the above approaches should be made based on the risk of severe disease resulting from VRE, the likelihood that colonized patients would serve as source patients in the transmission of VRE, and the consequences of implementation of aggressive contact isolation precautions. It may be appropriate to employ both approaches within a single institution if the specific populations in which each approach is taken are easily recognized and geographically separated (i.e., a sub-acute ward within a LTCF). Finally, the committee recognizes that neither approach is supported by substantial scientific data and believes that further study of VRE in LTCFs is warranted.

B. Recommended Practices for the Control of VRE in Long Term Care Facilities

Long-term care facilities (LTCFs) present special problems with respect to infection control. Residents of LTCFs consider the facility to be a temporary or permanent home. The ability to socialize and participate in various group activities is an essential component of the care provided in these facilities. Aggressive implementation of contact isolation interferes with some very important functions of long-term care. Reassignment of rooms or roommates or restricting free movement within a facility (e.g., confinement within a patient's room as recommended in contact isolation) can be extremely disruptive. In addition, because cognitive impairment is common among LTCF residents, many residents are unable to comply with recommendations regarding room restrictions or personal hygiene practices.

1. Room/roommate selection: Facilities should apply the usual criteria for roommate selection to persons known to be colonized with VRE. In general, persons most likely to contaminate surfaces or their hands with fecal material should not be roomed with persons most likely to acquire infections following contact with fecal material (e.g., persons with long term indwelling intravenous catheters or foley catheters) (see specific recommendations in Appendix B).

2. General practices: The most important aspect of control of the spread of enteric organisms is adherence to standard precautions as described in detail in this document (Appendix A). Critical elements of standard precautions that are applicable to the control of VRE and other pathogenic organisms include the use of gloves by healthcare workers when contact, or the potential for contact with blood, body fluids, feces, non-intact skin, mucous membranes, or contaminated items is high; the use of gowns when contact or the potential for contact with blood, body fluids, or feces is high; and careful attention to handwashing. Recent studies have demonstrated that at least 10 seconds of handwashing with an appropriate antiseptic soap will help to eradicate most

potentially pathogenic organisms from the hands (33-34).

Staff should encourage handwashing among all residents and assist cognitively impaired residents with adherence to handwashing recommendations. The fingernails of cognitively impaired residents should be routinely inspected, cleaned and trimmed. A waterless alcohol based hand antiseptic agent may be used in the dining room or activity room or any other place where handwashing facilities are not readily available.

Handwashing by visitors is an important element of infection control. Educational materials that emphasize handwashing practices should be provided to resident's families upon admission (Appendix C). All visitors should be made aware of the need for handwashing prior to and following visits (e.g., by posting signs in common areas and patient rooms). Visitor compliance with handwashing recommendations should be encouraged by the staff through observation and verbal reminders.

Appropriate soap should be available at all handwashing stations. Optimal control of infection is achieved through routine use of a product that is able to kill enterococci and other enteric organisms but does not cause undue skin irritation (refer to product labels for information about activity against enterococci).

Because rectal thermometers have been associated with VRE transmission, the use of aural, oral or axillary thermometers is recommended in place of rectal thermometers.

3. Activities: Residents should be allowed to ambulate, interact with other residents socially, and participate in group activities if secretions and/or drainage can be reasonably contained. Open wounds should be covered with a clean barrier dressing before group activities. Residents should use diapers if fecal incontinence is anticipated.

4. Patient Transportation: Health care workers responsible for transporting residents should wear appropriate personal protective equipment if contact with blood or body fluids is anticipated. Soiled or wet dressings should be replaced prior to transport. Residents should wear a protective diaper if fecal incontinence is anticipated.

5. Practices related to patients with acute diarrhea: While infection/colonization with VRE is not a recognized cause of diarrhea, the potential for transmission of VRE and other enteric organisms may be increased during acute diarrheal disease. Patients with cognitive impairment or incontinence who develop diarrhea should be encouraged to stay in their room for the duration of the diarrheal illness.

6. Restriction of the use of vancomycin: As described in section VII and Appendix E, all health care facilities should have a policy to limit the use of vancomycin.

7. Surveillance: Members of the Georgia State task force agree that an active surveillance program for VRE, like those used in acute-care facilities, is not appropriate, feasible or cost-effective for most LTCFs. However, some LTCFs may find such a program appropriate for their facility. The decision of whether or not to institute an active surveillance program is left up to the individual facility. Specific aspects of this type of approach (i.e., use of contact isolation precautions to control VRE transmission) are described in detail in section VIII, Subsections D-F, "The Control of VRE in Acute/Subacute Care Facilities," and the attached CDC HICPAC guidelines (Appendix G).

C. Housekeeping

1. Environmental Cleaning: Rooms of residents should be cleaned at least daily. Personnel should pay particular attention to bed rails, bedside commodes, faucet handles, doorknobs, hand rails in the bathroom, soap dispensers, and bed stands (i.e., any surface likely to be touched by the resident). Any hospital grade disinfectant can be used. Thorough terminal cleaning emphasizing the above areas should be conducted following resident transfer. The methods (including products) of cleaning should be determined by facility policy. Phenolics, quaternary ammonium compounds, and alcohol are effective at eliminating VRE and other potentially pathogenic organisms from inanimate surfaces given prolonged contact time.

Articles used for resident care that cannot be dedicated and must be shared with other residents should either be thoroughly cleaned and disinfected with a hospital grade germicide between resident use or an appropriate, replaceable barrier should be used. Some common examples include (not an exhaustive list):

a. Hoyer lift: an individual sling should be supplied or an impervious barrier (e.g. rubber sheet or Chux) should be placed between the resident and the surface of the lift.
b. Shower seat: Should be cleaned and disinfected after use by a resident.
c. Commode: When they are deemed necessary, bedside commodes should be dedicated to an individual resident and left in that resident's room. Commodes may be disinfected per hospital policy and used for the general resident population when no longer needed by an individual resident.
d. Slideboard -- use a barrier or clean and disinfect after use.

2. Housekeeping - Laundry: Laundry must be handled in accordance with standard precautions for infectious materials. The Occupational Safety and Health Administration regulations for contaminated laundry are listed below. As a minimum, workers handling laundry should wear gloves and aprons. The hottest available temperature should be used to wash bed linen. The recommended temperatures, between 140° Fahrenheit (60° C) and 160° Fahrenheit (71° C), are sufficient to kill VRE as well as other pathogenic organisms. Note that in facilities where these higher temperatures may not be reached in existing laundry equipment, particular attention must be paid to the correct use of germicidal soaps and bleaches.

1. Contaminated laundry should be handled as little as possible by HCWs and laundry personnel. Contaminated laundry should be bagged or containerized, but not sorted or rinsed, at the location where it was used (i.e., the resident's room).

2. Standard Precautions dictates that contaminated laundry be placed and transported in bags or containers labeled or color-coded as potential bio-hazards. The choice of labeling or color-coding of laundry bags is the individual facilities so long as it permits all employees to recognize containers that require compliance with Standard Precautions.

3. Whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through or leakage from the bag or container, the laundry shall be placed and transported in bags or containers which prevent soak-through and/or leakage of fluids to the exterior.

4. The employer shall ensure that employees who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.

5. When a facility ships contaminated laundry off-site to a second facility which does not utilize Standard Precautions in the handling of all laundry, the shipping facility must place laundry in containers which are labeled or color-coded so that the receiving facility is informed to use Standard Precautions. However, if all laundry generated by a facility is considered contagious and handled in accordance with Standard Precautions, color coded bags, or similar measures, are not necessary.

VI. TRANSFER ISSUES OF VRE COLONIZED/INFECTED PATIENTS TO AND FROM LONG-TERM CARE FACILITIES

A. Transfer of Residents Between Long-Term Care Facilities and Acute Care Facilities

It is the belief of the VRE working group that transfer of residents to and from acute and long term care facilities (LTCFs) should be allowed to occur freely regardless of their VRE status. In general however, medically unstable patients with VRE infections should not be transferred to long-term care facilities. Such decisions should be made by infection control and medical staff at individual LTCFs and acute care facilities.

Known or suspected colonization with VRE should not affect acceptance of persons for admission to long-term care facilities. Long-term hospitalization in acute care facilities solely because of VRE colonization is unnecessary, wasteful and potentially dangerous to the patient. Facilities should apply their usual criteria for acceptance to persons colonized with VRE. Stool cultures and/or rectal swabs that are negative for VRE are not necessary before patient transfer to a LTCF.

B. Records of colonization status

Because colonization status serves as the basis for isolation practices in some *acute-care settings*, information about known past or present colonization with VRE should be maintained in each resident's chart (35). This information should be available to care providers and shared with receiving institutions should transfer from a LTCF occur. Transfer documents should be adapted to allow consistent documentation of known colonization with VRE (and other antibiotic resistant organisms). If appropriate, facilities may incorporate a VRE (or resistant organism) check-box onto their interfacility transfer form.

VII. PROVIDER EDUCATION AND VANCOMYCIN USE ISSUES

A. Health care worker and patient/family education

Educational programs on the epidemiology of VRE and its control, (such as knowledge of Standard Precautions [Appendix A]) as well as prudent vancomycin use (Appendix E), should be provided for all staff of long-term care facilities. Programs should primarily target attending and consulting physicians, pharmacy, nursing, laboratory personnel and other direct resident-care providers. Administrators within long-term care facilities need to assure that educational programs are available to new staff, and that continuing education opportunities exist. Educational information should also be provided to residents with VRE (when appropriate) and to their family members and care givers (i.e., for the home-care setting) (Appendices C and D).

B. Continuing Medical Education Programs

Continuing education programs for hospital staff should include information concerning the epidemiology of VRE and the potential impact of this pathogen on the cost and outcome of patient care. All health care facilities and organizations should design educational programs to increase knowledge about VRE, to promote strict adherence to Standard Precautions and environmental cleaning protocols, to promote judicious antibiotic use, to provide acceptable laboratory testing, and to appropriately manage identified cases.

The use of Standard Precautions should be stressed in the care of all patients (Appendix A). All health care workers participating in the continuum of patient care should be educated in Standard Precautions. Educational programs should be updated periodically and used to educate all new staff as well as to remind existing staff of these issues (Appendix D).

C. Education on Appropriate Antibiotic Usage

A key element in the CDC/HICPAC recommendations is promoting the prudent use of vancomycin. Hospitals and other institutions, working with pharmacy and infection control personnel, should periodically evaluate the appropriateness of vancomycin use in their facilities. When vancomycin use is inappropriate, educational interventions are indicated with subsequent re-evaluation of usage patterns. A fact sheet outlining the prudent and inappropriate use of Vancomycin is attached (Appendix E).

Individual long term care facilities may opt for a more aggressive approach in educating physicians that care for or refer patients to their facility. Attached is a sample letter that may be used or modified to address this issue with physicians (Appendix F).

VIII. THE CONTROL OF VRE IN ACUTE/SUBACUTE CARE FACILITIES

A. Rationale

The emergence of vancomycin-resistance in enterococci in this country began among severely ill, hospitalized patients. The increasing incidence of gram-positive pathogens causing nosocomial infections combined with a high prevalence of methicillin resistance has contributed to an increase in vancomycin use, which, in turn, has resulted in the current epidemic of VRE. Although VRE have now appeared in many clinical environments, acute care facilities continue to provide conditions in which the highest rates of VRE transmission are likely to occur. Programs designed to prevent the spread of VRE should therefore focus aggressive control measures on the acute care setting. Since the control of VRE in long-term care facilities is connected to the control of VRE from transferring facilities (often acute care facilities), the Georgia VRE task force finds it prudent to include recommendations for the control of VRE in acute/subacute care facilities. The core components of a VRE control program in acute care facilities are: 1) control of antibiotic use, 2) surveillance, and 3) infection control procedures designed to prevent cross transmission among patients. The Centers for Disease Control and Prevention published complete guidelines for the control of VRE in Acute care facilities in 1994 (Appendix G).

B. Prudent Vancomycin Use in Acute Care Hospitals

Vancomycin use is a well established risk factor for infection and colonization with VRE as well as for the emergence of vancomycin-resistant *Staphylococcus aureus* (23-27). It is the belief of the VRE working group that all acute care hospitals and health care delivery services, even those where VRE have never been detected, should a) develop a comprehensive, antimicrobial utilization plan for their medical staff (including medical and nursing students who rotate through clinical areas of the healthcare facility), b) oversee surgical prophylaxis, and c) develop guidelines for the proper use of vancomycin (as applicable to the institution). Guideline development should be part of the hospital's quality improvement program and should involve participation from the hospital's pharmacy and therapeutics committee, hospital epidemiologist, the infection control practitioner, and infectious disease, medical, and surgical staff. Such guidelines should address appropriate and inappropriate uses of vancomycin as outlined in Appendix E of this document.

C. Role of the Microbiology Laboratory in the Detection, Reporting, and Control of VRE in Acute Care Hospitals

The microbiology laboratory's ability to promptly and accurately identify VRE is essential to avoid complex containment efforts that may be required when recognition of VRE is delayed. Cooperation and communication between the laboratory and the infection control program will facilitate control efforts. See Subsection H, "Laboratory Identification and Recommendations for Culturing and Screening," pages 17-19 for a complete description of culturing techniques and

indications, laboratory identification of VRE, and susceptibility testing for vancomycin.

D. Screening Procedures for Detecting VRE in Hospitals Where VRE Have Not Previously Been Detected

In some hospital laboratories, antimicrobial susceptibility testing of enterococcal isolates from non-sterile body sites (e.g., wounds) is not routinely performed, thus delaying identification of VRE colonization/infection in hospitalized patients. In hospitals where VRE have not yet been detected, implementing special measures like those below, can promote earlier detection of VRE:

1. Antimicrobial susceptibility survey: Periodic susceptibility testing of randomly selected enterococcal isolates recovered from all types of clinical specimens, especially those from high-risk patients (e.g., those in ICUs, oncology, or transplant wards) can be implemented. The frequency of testing and the number of isolates tested will vary among hospitals, depending on the patient population and number of cultures performed at the hospital. Hospitals that process large numbers of culture specimens might only need to test a fraction (e.g., 10%) of enterococcal isolates every 1–2 months, whereas hospitals processing fewer specimens might decide to test all enterococcal isolates during the survey period. The hospital epidemiologist can help design a suitable sampling strategy.

2. Culture survey of stools or rectal swabs In tertiary medical centers and hospitals with large numbers of critically ill patients (e.g., ICU, oncology, and transplant patients) at high risk for VRE colonization/infection, periodic culture surveys of stools or rectal swabs may be indicated. Because most patients with VRE have intestinal colonization, screening of susceptible patient's stool or rectal swab is recommended even if VRE infections have not previously been identified in the facility. The surveillance frequency should be based on the population at risk and the specific hospital unit(s) involved.

Stool or rectal swab culture surveys are useful if VRE have been detected in other healthcare facilities in a hospital's geographic area or if a hospital with no recognized clinical cases decides to survey for VRE. Screening costs can be reduced by inoculating specimens directly onto selective media containing vancomycin, restricting screening to those patients who have been in the hospital long enough to have a substantial risk for colonization (e.g., 5–7 days), or in those who have been admitted from a facility (e.g., a tertiary care hospital or long-term care facility) where VRE have been identified. If colonization with VRE is detected, all enterococcal isolates (including those from urine and wounds) from patients in the hospital should be screened routinely for vancomycin resistance, and efforts to contain the spread of VRE should be intensified (e.g., enforcing adherence to handwashing and compliance with isolation precautions). Intensified fecal screening for VRE might facilitate earlier identification of colonized patients, leading to more efficient containment of the microorganism.

E. Controlling Transmission of VRE in Acute Care Facilities

Eradicating VRE from hospitals is most likely to succeed when VRE infection or colonization is confined to a few patients on a single ward. After VRE have become endemic in the hospital or community, eradication becomes more difficult and costly. Since the control of VRE requires a collaborative, institution-wide effort, the hospital's quality-assurance/improvement department should be involved from the beginning to identify, evaluate and address specific problems in hospital operations and patient-care systems. Recommendations for isolation procedures, the use of barrier precautions by hospital staff, environmental cleaning procedures, and handling of laundry in acute care hospitals are essentially the same as those for long-term care facilities (see Section V: Infection Control Measures for Vancomycin Resistant Enterococci in Long-term Care Facilities, pages 6-10). A copy of Standard Precautions and a checklist for room placement of patients with potentially pathogenic organisms, are attached (Appendices A and B).

1. Recommendations for Culturing Patients of Acute Care Facilities: When a VRE-positive patient is identified, decisions about culturing roommates and other patients should be made on a case-by-case basis, considering the potential for transmission and the risk of transmission to the surrounding patient population. It is not currently clear whether stool cultures or rectal or perianal swab cultures are more sensitive for identifying VRE-colonized patients. Institutions should choose the most feasible method and follow appropriate laboratory procedures for collection and transport of specimens. Facilities experiencing VRE outbreaks or continued transmission despite appropriate infection control measures and tertiary care medical centers that care for many critically-ill patients at high risk for VRE may choose to conduct periodic culture surveys of stool or rectal swabs of high-risk patients.

2. Criteria for Discontinuing Isolation Precautions in Patients of Acute Care Facilities: Each acute care institution should adopt criteria for determining when a patient may be released from isolation precautions. Because VRE colonization can persist indefinitely, relatively stringent criteria should be used. *The following examples are based upon current expert opinion and limited available scientific data.*

> Three negative stool (or rectal or perianal) cultures obtained on three separate days and one negative culture from each previously positive site or source (e.g., wound or urine) taken when the patient is off antimicrobials.
>
> ***- or -***
>
> VRE-negative results on at least three consecutive occasions ($\geq$ 1 week apart) for all cultures from multiple body sites (including stool or rectal swab, perineal area, axilla or umbilicus, wound, Foley catheter, and/or colostomy sites if present) (11).

VRE-colonized patients who become culture negative may harbor a small number of VRE below the detectable limits of most culture techniques. These patients are unlikely to transmit VRE to others and do not require special precautions. However, recrudescence of VRE colonization/ infection is possible if the patient is treated with antibiotics in the future. These patients should be considered high-risk, and appropriate cultures might be prudent during future hospitalizations.

3. Visitors to Patients in Acute Care Facilities: Visitors should follow the same guidelines for the use of barrier precautions and handwashing procedures as healthcare workers. No additional precautions or restrictions are required for pregnant visitors or healthcare workers.

F. Outbreak Control Measures in Acute Care Facilities

Efforts should be made to raise staff awareness of VRE-related issues during an outbreak. If VRE is endemic or transmission is ongoing, control efforts should be focused initially on high-risk areas (i.e., ICUs, transplant units). Such sites can serve as reservoirs for VRE, allowing spread to other wards when patients are well enough to be transferred.

Verify that infection control policies (i.e., handwashing, use of barrier precautions) are being followed. Other measures that may be appropriate include patient surveillance cultures, cohorting of VRE positive patients, appropriate barrier protections, and increasing the thoroughness and frequency of environmental cleaning.

When feasible, cohort staff who provide regular ongoing care to VRE-positive patients to minimize the contact of healthcare providers between VRE-positive and VRE-negative patients.

Culturing of staff is generally not recommended since hospital personnel who are carriers of enterococci have rarely been implicated in the transmission of this organism. Culturing of personnel should only be done in conjunction with careful epidemiologic studies under the direction of infection control staff. In addition, culturing of staff should only be performed when a clear plan has been established for dealing with those personnel who are determined to be VRE carriers. Personnel should be examined for chronic skin and nail problems, and hand and stool or rectal swab cultures should be obtained, if indicated.

Mechanisms to monitor readmission of known VRE-positive patients to the acute care facility should be established and implemented.

G. Communication/discharge/readmission Issues

When a patient is found to be VRE-positive, appropriate healthcare providers should be notified promptly. Because patients with VRE can remain colonized indefinitely, highlighting or flagging the medical record of VRE-positive patients should be considered. It may be appropriate to keep logs of VRE-positive patients, particularly for those facilities without computerized registration.

A method of communicating the patient's VRE status to physicians' offices and other ambulatory-care settings (i.e., hemodialysis units) should be provided. For example, when follow-up appointments are made, e.g., post-hospitalization or from long-term care facilities, the physician's office should be informed of a patient's VRE status. In addition, VRE-positive patients and their families should be educated about the need to inform their healthcare providers of their VRE

status. Similarly, when a patient is enrolled in home health care, home health care staff should be notified of the patient's VRE-positive status.

H. Laboratory Identification and Recommendations for Culturing and Screening in Acute or Sub-acute Care Settings

1. Specimen Source: It is not clear whether stool cultures or rectal/perianal swab cultures have a greater sensitivity for identifying VRE-colonized residents. Institutions should choose the most feasible specimen source. Institutions should follow appropriate instructions from the laboratory providing the microbiology services about procedures for collection and transport of specimens.

2. Laboratory Identification: It is essential that laboratories throughout Georgia be able to promptly and accurately identify enterococci and determine the presence of vancomycin resistance. The laboratory should provide written procedures for specimen collection, transport, and reporting of results.

a. Identification of Enterococci

Presumptively identify colonies on primary isolation plates as enterococci by using colonial morphology, a Gram stain and a pyrrolidonyl arylamidase (PYR) test (preferred method) or bile esculin hydrolysis and 6.5% NaCl.

b. Speciation

Identifying enterococci to species level may be useful in predicting certain resistance patterns (e.g., *Enterococcus faecium* is more resistant to ampicillin than is *Enterococcus faecalis*). Such identification is not routinely necessary if antimicrobial susceptibility testing is performed. Speciation also can assist in determining the epidemiologic relatedness of enterococcal isolates.

c. Biochemical Tests

Under special circumstances, or as laboratory resources permit, biochemical tests can be used to differentiate between species. Most commercially available identification systems adequately differentiate *Enterococcus faecalis* from other species of enterococci. Additional tests for motility and pigment production are required to distinguish *Enterococcus gallinarum* (motile, nonpigmented), *Enterococcus casseliflavus* (motile, pigmented), and *Enterococcus faecium* (nonmotile, nonpigmented).

I. Susceptibility Testing for Vancomycin:

1. Specimens To Test: Susceptibility testing for vancomycin should be performed on all clinically relevant isolates, including those from blood, other sterile body fluids, and urine. Which antimicrobial agents are tested depends on the site of infection, the significance of the isolate, and

resources available for testing. Refer to standards of the National Committee for Clinical Laboratory Standards (NCCLS) standards for appropriate antimicrobial choices (36-37).

2. Susceptibility Testing Methods: Different test methods can be used for detecting vancomycin resistance in enterococci.

a. Automated instruments (Vitek, MicroScan) - Newly developed software for the Vitek system, in association with susceptibility test cards introduced in November 1996, now permit reliable identification of vancomycin resistance. Vitek instruments without this software and/or using older test cards, require testing of susceptible isolates by an alternate method to detect vancomycin resistance. MicroScan Rapid panel tests still require testing by an alternate method to confirm susceptible vancomycin test results. Agar screening plates or determination of minimum inhibitory concentration (MIC) may be used as the alternate method; however, the agar screening plate does not distinguish between intermediate and resistant strains. The MicroScan Standard overnight panel is an acceptable way of detecting VRE when incubated for 24 hours.

b. Disk diffusion - Accurate detection of VRE by the disk diffusion test requires that plates be incubated for a full 24 hours (rather than the 16-18 hours used for many other organisms) and that the vancomycin zone of apparent inhibition be examined carefully with transmitted light for evidence of small colonies or a light film growing within the zone. This method is unreliable for detecting resistance in strains with intermediate or low-level resistance to vancomycin. An intermediate category result by the disk diffusion test should be verified by determining the MIC. The 1997 breakpoints for determining vancomycin resistance by disk diffusion are: susceptible (17 mm), intermediate (15-16 mm), and resistant (14 mm). For dilution testing, the 1997 breakpoints are: susceptible (4 µg/ml), intermediate (8-16 µg/ml), and resistant (32 µg/ml).

c. Agar Screening Plates - These are an acceptable method of determining vancomycin susceptibility in the absence of a reliable MIC method. Isolates such as *Enterococcus gallinarum* which have intermediate levels of resistance to vancomycin, will grow on screening plates in which 6 µg/ml of vancomycin has been incorporated. Biochemical identification of isolates that grow on screening plates may be useful, as clinical impact of such organisms is not clear. Identification of these strains may be accomplished by determination of motility and pigment production, as described above.

d. Other methods - E-test, Pasco and other susceptibility test methods have been found acceptable for this purpose, as long as quality control strains recommended by the manufacturers are employed to validate the method.

J. When VRE Are Isolated From a Clinical Specimen:

1. Confirm: Vancomycin resistance should be confirmed by repeating antimicrobial susceptibility testing using any of the recommended methods above, particularly if VRE isolates are unusual in the hospital. Alternatively, the laboratory can streak 1 µL of standard inoculum (0.5 McFarland) from an isolated colony of enterococci onto brain heart infusion agar containing 6 g/ml of vancomycin, incubate the inoculated plate for 24 hours at 35 C (95 F), and consider any growth indicative of vancomycin resistance (1).

2. Notify: Immediately, while performing confirmatory susceptibility tests, notify the patient's primary caregiver, patient-care personnel, and infection-control personnel regarding the presumptive identification of VRE so that appropriate isolation precautions can be initiated promptly. Follow this preliminary report with the (final) result of the confirmatory test. Additionally, highlight the report regarding the isolate to alert staff that isolation precautions are indicated.

3. Interpret: To interpret VRE positive clinical isolates, it is critical that all laboratories use the same interpretive standards for determining vancomycin resistance. These vary for the different test methods - for example broth dilution methods, disk diffusion have different criteria for calling organisms susceptible, intermediate, and resistant. These standards are periodically changed by the NCCLS, and should be reviewed by the laboratory at least every year.

IX. Home Care Infection Control Guidelines for the Care of Patients Colonized with VRE

Admission and transfer of patients with VRE to or from the home is not a concern, other than to alert the receiving facility or agency. In addition, there is no need to disrupt housing arrangements because a household member has VRE. The same principles of infection control deemed appropriate in long term care facilities (i.e., adherence to Standard Precautions with an emphasis on personal hygiene), apply to the care of an individual in the home environment.

Efforts to control VRE transmission in the home should focus on preventing cross-contamination via the nursing bag, clothing and equipment which are carried to and from the home by the health care professional. Hands should be washed upon entering, and before leaving the home.

Other persons in the home should be educated about VRE and instructed to clean and disinfect toilet facilities used by the patients and contain dressings and other disposable materials that may be contaminated for proper disposal. Ordinary household detergents may be used per their instructions. No special precautions for linen, dishes or personal clothing are indicated. If persons in the home provide direct care, they too should be guided on the importance of hand washing, glove use, and other barriers as reasonable and appropriate to the situation.

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Appendix A: STANDARD PRECAUTIONS FOR INFECTION CONTROL

Standard Precautions are used when contacting blood, body fluids, secretions and excretions, except sweat (regardless of whether or not they contain visible blood), non-intact skin, and mucous membranes. Standard Precautions apply to all residents in health care settings, regardless of their diagnosis or presumed infection status. Standard Precautions are designed to reduce the risk of transmission of microorganisms from both known and unknown infection sources.

- ✔ Handwashing is crucial. Wash hands for 10 seconds or more:
  - ☞ After touching blood, body fluids, feces, or contaminated items (regardless of whether or not gloves are worn),
  - ☞ Immediately after gloves or gowns are removed,
  - ☞ As necessary, between tasks and procedures on the same resident to prevent cross-contamination of different body sites, and
  - ☞ Between all resident contacts.

- ✔ Wear clean gloves when touching blood, body fluids, feces. non-intact skin, mucus membranes, or contaminated items. Change gloves between tasks and procedures on the same resident following contact with potentially infectious material. Remove gloves promptly after use, and before touching non-contaminated items, environmental surfaces, self, or other residents.

- ✔ Wear masks, eye protection, or face shields when providing care that is likely to generate splashes of blood, body fluids, or feces.

- ✔ Wear gowns (clean, impermeable and non-sterile) when providing care that is likely to generate splashes or sprays of blood, body fluids, or feces. Remove gowns promptly after use.

- ✔ Use care in handling resident-care equipment or soiled linen in order to prevent skin and mucus membrane exposure, contamination of clothing, and transfer of microorganisms to other residents or environments. Ensure that reusable equipment is appropriately cleaned and reprocessed prior to use on another resident and that single-use items are property discarded.

- ✔ Use "sharps" precautions to prevent injury from needles, scalpels, and other sharp edged instruments.

- ✔ Use mouthpieces, resuscitation, or ventilation devices as alternatives to mouth-to-mouth resuscitation in areas where the need for resuscitation is predictable.

Appendix B: Room Placement of Residents in Long-term Care Facilities

When making room placements, consider the volume and type of body substances produced by the residents and the ability of both residents to prevent transmission of potentially pathogenic enteric organisms they may be harboring.

Residents at Risk for TRANSMITTING Enteric Organisms

1. Does the resident have non-intact skin, open wounds, stasis ulcers, decubiti, burns, or indwelling devices?
2. Does the resident have diarrhea?
3. Does the resident have long-term fecal or bladder incontinence (i.e., body wastes not fully contained in stoma, catheter bag or incontinence diaper)?
4. Does the resident have other drainage which is not contained?
5. Is the resident unwilling or unable to cooperate in strategies to contain his/her body secretions?
7. Is the resident cognitively impaired in a way that may promote fecal contamination?

If "Yes" to <u>any</u> of the above, placement with an "at risk" resident is <u>not</u> advised.

Residents at Risk for BECOMING INFECTED with Enteric Organisms

1. Does the resident have non-intact skin, open wounds, stasis ulcers, decubiti, burns, or indwelling devices?
2. Does the resident have renal failure?
3. Is the resident significantly immunocompromised (e.g., neutropenic or on oral steroids or chemotherapy)?
4. Is the resident on long-term antibiotic therapy?
5. Is the roommate known to be colonized with Methicillin-resistant *S. aureus* (MRSA)?
6. Is the roommate unable to cooperate in the proposed infection control measures?
7. Is the roommate cognitively impaired in ways that may prohibit compliance with precautions?

If "Yes" to <u>any</u> of the above, placement with a resident at risk for transmitting VRE is <u>not</u> advised.

Appendix C

VANCOMYCIN RESISTANT ENTEROCOCCUS
Questions and Answers for Long-term Care Residents and Their Families

What Is VRE?

Enterococcus is a bacteria that normally lives in your digestive tract (bowels). Everyone has the enterococcus in their digestive system, but few people get sick from it. In the past when people got sick from enterococcus, we always could treat the infection with an antibiotic called vancomycin.

VRE stands for Vancomycin Resistant Enterococcus. VRE is a type of enterococcus that has developed resistance to the antibiotic vancomycin and to most other antibiotics. This means that vancomycin can no longer kill the bacteria. Someone can be **"Colonized"** with VRE (the bacteria is present, but does not cause disease) or **"Infected"** with VRE (the bacteria causes disease). Infections of the urinary tract, wounds and the blood are the most common sites.

How Do People Get VRE?

People with VRE infections often develop disease from the bacteria they already carry in their bodies. However, person-to-person transmission of this bacteria can also occur either through direct contact (e.g., unwashed hands) or indirect contact (e.g., by contaminated equipment or environmental surfaces).

How Do You Treat VRE?

VRE infection, not VRE colonization, is treated (i.e., when the bacteria causes actual disease). VRE infections are difficult to treat because the organism no longer responds to many antibiotics. At times, treatment is limited to antibiotic combinations or experimental therapy.

How Will VRE Affect recovery?

This depends on the individual resident and the type of VRE infection involved. Because treatment of VRE infection is often difficult, it may involve longer hospitalization and treatment with antibiotics. Health care workers also need to take special precautions (e.g., the use of gloves, gowns, etc.) to prevent the spread of VRE to other residents. With VRE colonization (the bacteria is present, but not causing disease), health care workers will take the same precautions to prevent spread, but recovery from other illnesses should not be significantly affected.

How long will VRE last?

The length of illness caused by VRE infection depends upon the severity of the infection, the response to antibiotic therapy, and the person's overall health. After infection has resolved the individual can, but does not always, remain colonized with VRE. Most individuals who are colonized with VRE never develop infection. Colonization can last indefinitely.

Can I give my family members VRE infection?

Healthy people are not usually at risk of serious VRE disease. Those at increased risk include people with chronic illnesses, recent surgery, poor immune systems and those with urinary catheters or intravenous lines.

What precautions should be followed when I go home?

Handwashing is the most important measure. If you require continued care at home then you, or whoever is caring for you, should wear gloves when handling body fluids (urine, wound drainage, feces. etc.) and wash hands with warm soapy water after providing such care, handling body fluids or touching surfaces contaminated with body fluids. Disposable items soiled with body fluids (dressings, diapers, used gloves, etc.) should be tied in a plastic bag before placing in the trash. Good household cleaning with a household disinfectant is adequate. Laundry can be done according to manufacturer's directions using standard detergent. Dishes and utensils can be washed as usual.

Appendix D:

VANCOMYCIN RESISTANT ENTEROCOCCUS
Questions and Answers for Health Care Workers and Other Employees of Long-term Care Facilities

What is VRE?

VRE stands for Vancomycin Resistant Enterococcus. VRE are strains of enterococcus bacteria that have developed resistance to the antibiotic vancomycin and most other antibiotics, including the aminoglycosides and ampicillin. Although bacteria have developed resistance to many antibiotics, resistance to vancomycin is new and of concern since vancomycin had been considered our "drug of last resort." An individual can be "**colonized**" with VRE (the bacteria is present but does not cause any disease), or "**infected**" with VRE (the bacteria causes clinically apparent symptoms of infection or illness). The most common sites of VRE colonization are in the stool, the urine, in wounds or bedsores or in the nasopharyngeal tract. The most common site for VRE infections are urinary tract infections, wound infections, and bloodstream infections. It is important to note that in only a small number of people does VRE cause clinically important infections. Those most at risk are those with severe underlying illness, or severe immunosuppression (e.g., cancer chemotherapy, AIDS).

How is VRE spread?

Because enterococci are found in the normal gastrointestinal and female genital tracts, most enterococcal infections are thought to be caused by organisms already in the patient. However, once VRE is passed out of the body (especially in people with diarrhea or poor hygiene) it can exist on bed clothing or objects in patients' rooms. Thus a health care worker can get VRE on their hands or uniforms by coming into contact with any object in the room. VRE is not spread by the airborne route.

How is VRE treated?

Only VRE infection, not colonization, is treated. VRE infection is difficult to treat because it is resistant to many antibiotics. Therapy is based on the antibiotics to which an individual isolate is sensitive. Often, however, treatment is limited to unproven combinations of antibiotics or experimental therapies. Again, VRE colonization is not treated.

How can I prevent the spread of VRE?

Handwashing, USING AN SOAP AND WARM RUNNING WATER FOR AT LEAST 10 SECONDS, IS THE SINGLE MOST IMPORTANT MEASURE TO CONTROL THE SPREAD OF VRE.

Preventing and controlling the spread of VRE requires coordinated efforts from all individuals directly or indirectly involved in resident care (nursing, medical, infection control, laboratory, pharmacy, housekeeping personnel, administration, etc.). All of the following should

be addressed:

1) Prudent Vancomycin use by clinicians;
2) Ongoing staff education regarding the problem of vancomycin resistance;
3) Early detection and prompt reporting by the microbiology laboratory of vancomycin resistance in enterococci and other gram-positive microorganisms;
4) Immediate implementation of appropriate infection-control measures to prevent person-to-person transmission of VRE when identified (i.e., handwashing, gloves and gowns for substantial contact with the resident or the resident's environment, use of supplies dedicated to the infected or colonized resident, and thorough environmental cleaning);
5) Clear communication between acute and long-term care facilities regarding VRE colonization or infection status prior to patient transfer.

Do I need to wear a mask?

No, unless splashing of blood and body fluid is anticipated (i.e., follow "Standard Precautions" [see Appendix A]).

Can I wear a patient gown as protective equipment?

No. Since patient gowns are generally made of cloth, body fluids contaminated with VRE may soak through and contaminate your clothes. A fluid resistant gown should be utilized when a gown is needed. It does not have to be sterile gown.

Can the resident room with another resident?

In most cases, adherence to Standard Precautions and good environmental cleaning should minimize the risk of transmission between residents. However, there are some exceptions that are listed in the VRE guidelines for long term care facilities.

Do I need to do anything special when handling linen, trash and dishes used by a VRE-colonized resident?

No. Usual facility protocols following "Standard Precautions" are adequate for these items.

What precautions should be taken during resident transport and utilization of ancillary departments by the resident?

Hand antisepsis of employees and the resident is key. Employees in ancillary departments should follow the same precautions as the clinical staff (e.g., gloves and gowns for substantial physical contact with the resident when contact with blood, body fluids or feces is anticipated).

What precautions should the resident's family or other visitors take?

Visitors should be encouraged to wash their hands with an antiseptic soap and water upon

leaving the room of any resident.

Can I catch VRE?

Healthy people are usually not at risk of serious, invasive VRE disease. Those at increased risk for VRE colonization and infection include individuals with severe underlying disease, immunosuppression, presence of an indwelling urinary or central venous catheter and prior recent use of vancomycin and other broad-spectrum antibiotics.

Can I bring VRE home to my family?

Again, healthy people are not usually at risk of serious, invasive VRE disease. While VRE can live on linens and clothing, these items generally do not transmit the organism. However, wear a protective garment at work if you are at risk of contaminating your clothing with wound or other body fluids or drainage. If you have contaminated your clothing with wound drainage or other potentially infectious body fluids or drainage, change your clothes before going home. Contaminated clothing can be washed as per manufacturers instructions with laundry detergent and hot water. Always thoroughly wash hands before going home from work.

Appendix E: RECOMMENDATIONS FOR PRUDENT VANCOMYCIN USE

(From: "Recommendations for Preventing the Spread of Vancomycin Resistance." Hospital Infection Control Practices Advisory Committee, Centers' for Disease Control and Prevention. 1995)

SITUATIONS IN WHICH THE USE OF VANCOMYCIN IS APPROPRIATE/ACCEPTABLE:

- ☺ Treatment of serious infections due to beta-lactam resistant gram-positive microorganisms. Vancomycin may be less rapidly bactericidal than beta-lactams for susceptible staphylococci.
- ☺ Treatment of infections due to gram-positive microorganisms in patients with serious allergy to beta-lactam antimicrobials.
- ☺ Treatment of severe and potentially life-threatening antibiotic-associated colitis (AAC); or treatment of AAC that fails to respond to metronidazole therapy.
- ☺ Prophylaxis, as recommended by the American Heart Association, for endocarditis following certain procedures in patients at high risk for endocarditis.
- ☺ Prophylaxis for major surgical procedures involving implantation of prosthetic materials or devices, e.g., cardiac and vascular procedures and total hip replacement, at institutions with a high rate of infections due to methicillin-resistant *Staphylococcus aureus* (MRSA) or methicillin-resistant *Staphylococcus epidermidis* (MRSE). A single dose administered immediately before surgery is sufficient unless the procedure lasts more than 6 hours, in which case the dose should be repeated. Prophylaxis should be discontinued after a maximum of two doses.

SITUATIONS IN WHICH THE USE OF VANCOMYCIN IS DISCOURAGED:

- ☹ Routine surgical prophylaxis other than in a patient with life-threatening allergy to beta-lactam antibiotics.
- ☹ Empiric antimicrobial therapy for a febrile neutropenic patient, unless there is strong evidence at the outset that the patient has an infection due to gram-positive microorganisms (e.g., inflamed exit site of Hickman catheter), and the prevalence of infections due to MRSA in the hospital is substantial.
- ☹ Treatment in response to a single blood culture positive for coagulase-negative staphylococcus, if other blood cultures drawn in the same time frame are negative (i.e., if contamination of blood cultures is likely). Because contamination of blood cultures with skin flora (e.g., S. epidermidis) could result in inappropriate administration of vancomycin, phlebotomists and other personnel who obtain blood cultures should be trained to minimize microbial contamination of specimens
- ☹ Continued empiric use for presumed infections in patients whose cultures are negative for beta-lactam-resistant gram-positive microorganisms.
- ☹ Systemic or local (e.g., antibiotic lock) prophylaxis for infection or colonization of indwelling central or peripheral intravascular catheters.
- ☹ Selective decontamination of the digestive tract.
- ☹ Eradication of MRSA colonization.
- ☹ Primary treatment of Antibiotic Associated Colitis.
- ☹ Routine prophylaxis for very low-birth-weight infants (i.e., weighing <1,500 g [3 lbs 4 oz])
- ☹ Routine prophylaxis for patients on continuous ambulatory peritoneal dialysis or hemodialysis.
- ☹ Treatment (chosen for dosing convenience) of infections due to beta-lactam sensitive gram-positive microorganisms in patients with renal failure.
- ☹ Use of vancomycin solution for topical application or irrigation.

ENHANCING COMPLIANCE WITH RECOMMENDATIONS:

Key parameters of vancomycin use can be monitored through the facility's quality assurance/improvement process or as part of the drug-utilization review of the pharmacy and therapeutics committee and the medical staff.

Appendix F: SAMPLE LETTER TO PHYSICIANS ADMITTING TO, OR CARING

FOR PATIENTS IN LONG TERM CARE FACILITIES
SUBJECT: Prevention and Management of Vancomycin Resistant Enterococci (VRE)

Dear Colleague:

As you know, enterococci are a common cause of nosocomial infections and vancomycin is often the last weapon available for treatment. The emergence of vancomycin resistance within enterococci is an issue of great concern. **Vancomycin Resistant Enterococci (VRE) are now being seen across Georgia in both acute and long term care facilities.** *(If available, insert information about VRE from your own facility).* The majority of VRE strains are also resistant to ampicillin and aminoglycosides. Thus, therapeutic options are limited to combinations of antimicrobial or experimental compounds with unproven efficacy. This leads to increased morbidity, mortality, and health care costs. Equally disturbing is the recent emergence of Vancomycin insensitive *Staphylococcus aureus* and *Staphylococcus epidermidis*.

Vancomycin use has been consistently identified as a risk factor for colonization and infection with VRE. It is recommended that all hospitals and other health care facilities, including those where VRE have never been detected, develop guidelines for appropriate therapeutic and prophylactic use of antimicrobials, especially vancomycin. **Attached are recommendations for prudent vancomycin use published by the Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee (HICPAC)** *(Attach appendix E or your facility's recommendations).* **We ask that each provider become familiar with and adopt such practices, thus minimizing the risk for his/her current and future patients.**

Person-to-person spread of VRE via the hands of health care workers, use of shared patient equipment, and environmental contamination have all been documented modes of nosocomial transmission. The Georgia VRE Workgroup, a multi-disciplinary advisory group convened by the Division of Public Health, Georgia Department of Human Resources, *(or insert a group developed by your facility)* has published "Guidelines for the Management and Prevention of VRE in Healthcare Facilities, with a Focus on Long Term Care" *(or your own facility's plan).* This outlines the necessary infection control measures to prevent nosocomial spread within institutions and is available from *(insert name / location in your facility -- or attach]*. We ask that each provider become familiar with these recommendations and assist in their implementation.

Thank you for your assistance in addressing this serious health threat within our facility and community. If you have further questions or comments on this issue, please contact *(name of contact person in facility)* at *(phone number or location).*

Sincerely,

Appendix G: Recommendations for Preventing the Spread of Vancomycin Resistance Recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC)

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SUMMARY

Since 1989, a rapid increase in the incidence of infection and colonization with vancomycin-resistant enterococci (VRE) has been reported by U.S. hospitals. This increase poses important problems, including a) the lack of available antimicrobial therapy for VRE infections, because most VRE are also resistant to drugs previously used to treat such infections (e.g., aminoglycosides and ampicillin), and b) the possibility that the vancomycin-resistant genes present in VRE can be transferred to other gram-positive microorganisms (e.g., Staphylococcus aureus). An increased risk for VRE infection and colonization has been associated with previous vancomycin and/or multi antimicrobial therapy, severe underlying disease or immunosuppression, and intra abdominal surgery. Because enterococci can be found in the normal gastrointestinal and female genital tracts, most enterococcal infections have been attributed to endogenous sources within the individual patient. However, recent reports of outbreaks and endemic infections caused by enterococci, including VRE, have indicated that
patient-to-patient transmission of the microorganisms can occur either through direct contact or through indirect contact via a) the hands of personnel or b) contaminated patient-care equipment or environmental surfaces.

This report presents recommendations of the Hospital Infection Control Practices Advisory Committee for preventing and controlling the spread of vancomycin resistance, with a special focus on VRE. Preventing and controlling the spread of vancomycin resistance will require coordinated, concerted efforts from all involved hospital departments and can be achieved only if each of the following elements is addressed: a) prudent vancomycin use by clinicians, b) education of hospital staff regarding the problem of vancomycin resistance, c) early detection and prompt reporting of vancomycin resistance in enterococci and other gram-positive microorganisms by the hospital microbiology laboratory, and d) immediate implementation of appropriate infection-control measures to prevent person-to-person transmission of VRE.

INTRODUCTION

From 1989 through 1993, the percentage of nosocomial enterococcal infections reported to CDC's National Nosocomial Infections Surveillance (NNIS) system that were caused by vancomycin-resistant enterococci (VRE) increased from 0.3% to 7.9% (1). This overall increase primarily reflected the 34-fold increase in the percentage of VRE infections in patients in intensive-care units (ICUs) (i.e., from 0.4% to 13.6%), although a trend toward an increased percentage of VRE infections in non-ICU patients also was noted (1). The occurrence of VRE in

NNIS hospitals was associated with larger hospital size (i.e., a hospital with greater than or equal to 200 beds) and university affiliation (1). Other hospitals also have reported increased endemic rates and clusters of VRE infection and colonization (2-8). The actual increase in the incidence of VRE in U.S. hospitals might be greater than reported because the fully automated methods used in many clinical laboratories cannot consistently detect vancomycin resistance, especially moderate vancomycin resistance (as manifested in the VanB phenotype) (9-11).

Vancomycin resistance in enterococci has coincided with the increasing incidence of high-level enterococcal resistance to penicillin and aminoglycosides, thus presenting a challenge for physicians who treat patients who have infections caused by these microorganisms (1,4). Treatment options are often limited to combining antimicrobials or experimental compounds that have unproven efficacy (12-14). The epidemiology of VRE has not been clarified; however, certain patient populations are at increased risk for VRE infection or colonization. These populations include critically ill patients or those with severe underlying disease or immunosuppression (e.g., patients in ICUs or in oncology or transplant wards); persons who have had an intra abdominal or cardio-thoracic surgical procedure or an indwelling urinary or central venous catheter; and persons who have had a prolonged hospital stay or received multi antimicrobial and/or vancomycin therapy (2-8). Because enterococci are part of the normal flora of the gastrointestinal and female genital tracts, most infections with these microorganisms have been attributed to the patient's endogenous flora (15). However, recent studies have indicated that VRE and other enterococci can be transmitted directly by patient-to-patient contact or indirectly by transient carriage on the hands of personnel (16) or by contaminated environmental surfaces and patient-care equipment (3,8,17).

The potential emergence of vancomycin resistance in clinical isolates of Staphylococcus aureus and Staphylococcus epidermidis also is a public health concern. The vanA gene, which is frequently plasmid-borne and confers high-level resistance to vancomycin, can be transferred in vitro from enterococci to a variety of gram-positive microorganisms (18,19), including S. aureus (20). Although vancomycin resistance in clinical strains of S. epidermidis or S. aureus has not been reported, vancomycin-resistant strains of Staphylococcus haemolyticus have been isolated (21,22).

In November 1993 and February 1994, the Subcommittee on the Prevention and Control of Antimicrobial-Resistant Microorganisms in Hospitals of CDC's Hospital Infection Control Practices Advisory Committee (HICPAC) responded to the increase in vancomycin resistance in enterococci by meeting with representatives from the American Hospital Association, the American Society for Microbiology, the Association for Professionals in Infection Control and Epidemiology, the Infectious Diseases Society of America, the Society for Healthcare Epidemiology of America, and the Surgical Infection Society. Meeting participants agreed with the need for prompt implementation of control measures; thus, recommendations to prevent the spread of VRE were developed. Public comments were solicited and incorporated into the draft recommendations. In November 1994, HICPAC ratified the following recommendations for

preventing and controlling the spread of vancomycin resistance, with special focus on VRE. HICPAC recognizes that a) data are limited and additional research will be required to clarify the epidemiology of VRE and determine cost-effective control strategies, and b) many U.S. hospitals have concurrent problems with other antimicrobial-resistant organisms (e.g., methicillin-resistant S. aureus {MRSA} and beta-lactam and aminoglycoside-resistant gram-negative bacilli) that might have different epidemiologic features and require different control measures.

RECOMMENDATIONS

Each hospital -- through collaboration of its quality-improvement and infection-control programs; pharmacy and therapeutics committee; microbiology laboratory; clinical departments; and nursing, administrative, and housekeeping services -- should develop a comprehensive, institution-specific, strategic plan to detect, prevent, and control infection and colonization with VRE. The following elements should be addressed in the plan.

Prudent Vancomycin Use

Vancomycin use has been reported consistently as a risk factor for infection and colonization with VRE (2,4,7,8,17) and may increase the possibility of the emergence of vancomycin-resistant S. aureus (VRSA) and/or vancomycin-resistant S. epidermidis (VRSE). Therefore, all hospitals and other health-care delivery services, even those at which VRE have never been detected, should a) develop a comprehensive, antimicrobial-utilization plan to provide education for their medical staff (including medical students who rotate their training in different departments of the health-care facility), b) oversee surgical prophylaxis, and c) develop guidelines for the proper use of vancomycin (as applicable to the institution).

Guideline development should be part of the hospital's quality-improvement program and should involve participation from the hospital's pharmacy and therapeutics committee; hospital epidemiologist; and infection-control, infectious-disease, medical, and surgical staffs. The guidelines should include the following considerations:

Situations in which the use of vancomycin is appropriate or acceptable:

For treatment of serious infections caused by beta-lactam- resistant gram-positive microorganisms. Vancomycin may be less rapidly bactericidal than are beta-lactam agents for beta-lactam- susceptible staphylococci (23,24).

For treatment of infections caused by gram-positive microorganisms in patients who have serious allergies to beta-lactam antimicrobials.

When antibiotic-associated colitis fails to respond to metronidazole therapy or is severe and potentially life-threatening.

Prophylaxis, as recommended by the American Heart Association, for endocarditis following certain procedures in patients at high risk for endocarditis (25).

Prophylaxis for major surgical procedures involving implantation of prosthetic materials or

devices (e.g., cardiac and vascular procedures {26} and total hip replacement) at institutions that have a high rate of infections caused by MRSA or methicillin-resistant S. epidermidis. A single dose of vancomycin administered immediately before surgery is sufficient unless the procedure lasts greater than 6 hours, in which case the dose should be repeated. Prophylaxis should be discontinued after a maximum of two doses (27-30).

Situations in which the use of vancomycin should be discouraged:

Routine surgical prophylaxis other than in a patient who has a life-threatening allergy to beta-lactam antibiotics (28).

Empiric antimicrobial therapy for a febrile neutropenic patient, unless initial evidence indicates that the patient has an infection caused by gram-positive microorganisms (e.g., at an inflamed exit site of Hickman catheter) and the prevalence of infections caused by MRSA in the hospital is substantial (31-37).

Treatment in response to a single blood culture positive for coagulase-negative staphylococcus, if other blood cultures taken during the same time frame are negative (i.e., if contamination of the blood culture is likely). Because contamination of blood cultures with skin flora (e.g., S. epidermidis) could result in inappropriate administration of vancomycin, phlebotomists and other personnel who obtain blood cultures should be trained to minimize microbial contamination of specimens (38-40).

Continued empiric use for presumed infections in patients whose cultures are negative for beta-lactam-resistant gram-positive microorganisms (41).

Systemic or local (e.g., antibiotic lock) prophylaxis for infection or colonization of indwelling central or peripheral intravascular catheters (42-48).

Selective decontamination of the digestive tract.

Eradication of MRSA colonization (49,50).

Primary treatment of antibiotic-associated colitis (51).

Routine prophylaxis for very low-birthweight infants (i.e., infants who weigh less than 1,500 g {3 lbs 4 oz}) (52).

Routine prophylaxis for patients on continuous ambulatory peritoneal dialysis or hemodialysis (48,53).

Treatment (chosen for dosing convenience) of infections caused by beta-lactam-sensitive gram-positive microorganisms in patients who have renal failure (54-57).

Use of vancomycin solution for topical application or irrigation.

Enhancing compliance with recommendations:

Although several techniques may be useful, further study is required to determine the most effective methods for influencing the prescribing practices of physicians (58-61). Key parameters of vancomycin use can be monitored through the hospital's quality assurance/ improvement process or as part of the drug-utilization review of the pharmacy and therapeutics committee and the medical staff.

Education Programs

Continuing education programs for hospital staff (including attending and consulting physicians, medical residents, and students; pharmacy, nursing, and laboratory personnel; and other direct patient-care providers) should include information concerning the epidemiology of VRE and the potential impact of this pathogen on the cost and outcome of patient care. Because detection and containment of VRE require an aggressive approach and high performance standards for hospital personnel, special awareness and educational sessions might be indicated.

Role of the Microbiology Laboratory in the Detection, Reporting, and Control of VRE

The microbiology laboratory is the first line of defense against the spread of VRE in the hospital. The laboratory's ability to promptly and accurately identify enterococci and detect vancomycin resistance is essential for recognizing VRE colonization and infection and avoiding complex, costly containment efforts that are required when recognition of the problem is delayed. In addition, cooperation and communication between the laboratory and the infection-control program will facilitate control efforts.

Identification of Enterococci

Presumptively identify colonies on primary isolation plates as enterococci by using colonial morphology, a Gram stain, and a pyrrolidonyl arylamidase (PYR) test. Although identifying enterococci to the species level can help predict certain resistance patterns (e.g., Enterococcus faecium is more resistant to penicillin than is Enterococcus faecalis) and may help determine the epidemiologic relatedness of enterococcal isolates, such identification is not routinely necessary if antimicrobial susceptibility testing is performed. However, under special circumstances or as laboratory resources permit, biochemical tests can be used to differentiate between various enterococcal species. Although most commercially available identification systems adequately differentiate E. faecalis from other species of enterococci, additional tests for motility and pigment production are required to distinguish Enterococcus gallinarum (motile and nonpigmented) and Enterococcus casseliflavus (motile and pigmented) from E. faecium (nonmotile and nonpigmented).

Tests for Antimicrobial Susceptibility

Determine vancomycin resistance and high-level resistance to penicillin (or ampicillin) and aminoglycosides (62) for enterococci isolated from blood, sterile body sites (with the possible exception of urine), and other sites as clinically indicated. Laboratories routinely may test wound and urine isolates for resistance to vancomycin and penicillin or ampicillin if resources permit (see Screening Procedures for Detecting VRE in Hospitals Where VRE Have Not Been Detected).

Laboratories that use disk diffusion should incubate plates for 24 hours and read zones of inhibition by using transmitted light (62,63). Minimum inhibitory concentrations can be determined by agar dilution, agar gradient dilution, broth macrodilution, or manual broth

microdilution (62-64). These test systems should be incubated for 24 hours. The fully automated methods of testing enterococci for resistance to vancomycin currently are unreliable (9-11).

When VRE Are Isolated From a Clinical Specimen

Confirm vancomycin resistance by repeating antimicrobial susceptibility testing using any of the recommended methods (see Tests for Antimicrobial Susceptibility), particularly if VRE isolates are unusual in the hospital, OR streak 1 uL of standard inoculum (0.5 McFarland) from an isolated colony of enterococci onto brain heart infusion agar containing 6 ug/mL of vancomycin, incubate the inoculated plate for 24 hours at 35 C (95 F), and consider any growth indicative of vancomycin resistance (62,63,65). Immediately, while performing confirmatory susceptibility tests, notify the patient's primary caregiver, patient-care personnel, and infection-control personnel regarding the presumptive identification of VRE so that appropriate isolation precautions can be initiated promptly (see Preventing and Controlling VRE Transmission in All Hospitals). Follow this preliminary report with the (final) result of the confirmatory test. Additionally, highlight the report regarding the isolate to alert staff that isolation precautions are indicated.

Screening Procedures for Detecting VRE in Hospitals Where VRE Have Not Been Detected

In some hospital microbiology laboratories, antimicrobial susceptibility testing of enterococcal isolates from urine or nonsterile body sites (e.g., wounds) is not performed routinely; thus, identification of nosocomial VRE colonization and infection in hospitalized patients may be delayed. Therefore, in hospitals where VRE have not yet been detected, implementing special measures can promote earlier detection of VRE.

Antimicrobial susceptibility survey. Perform periodic susceptibility testing on an epidemiologic sample of enterococcal isolates recovered from all types of clinical specimens, especially from high-risk patients (e.g., those in an ICU or in an oncology or transplant ward). The optimal frequency of testing and number of isolates to be tested will vary among hospitals, depending on the patient population and number of cultures performed at the hospital. Hospitals that process large numbers of culture specimens need to test only a fraction (e.g., 10%) of enterococcal isolates every 1-2 months, whereas hospitals processing fewer specimens might need to test all enterococcal isolates during the survey period. The hospital epidemiologist can help design a suitable sampling strategy.

Culture survey of stools or rectal swabs. In tertiary medical centers and other hospitals that have many critically ill patients (e.g., ICU, oncology, and transplant patients) at high risk for VRE infection or colonization, periodic culture surveys of stools or rectal swabs of such patients can detect the presence of VRE. Because most patients colonized with VRE have intestinal colonization with this organism, fecal screening of patients is recommended even though VRE infections have not been identified clinically (2,4,16).

The frequency and intensity of surveillance should be based on the size of the population at risk and the specific hospital unit(s) involved. If VRE have been detected in other health-care facilities in a hospital's area and/or if a hospital's staff decides to determine whether VRE are present in the hospital despite the absence of recognized clinical cases, stool or rectal-swab culture surveys are useful. The cost of screening can be reduced by inoculating specimens onto selective media containing vancomycin (2,17,66) and restricting screening to those patients who have been in the hospital long enough to have a substantial risk for colonization (e.g., 5-7 days) or who have been admitted from a facility (e.g., a tertiary-care hospital or a chronic-care facility) where VRE have been identified.

After colonization with VRE has been detected, all the enterococcal isolates (including those from urine and wounds) from patients in the hospital should be screened routinely for vancomycin resistance, and efforts to contain the spread of VRE should be intensified (i.e., by strict adherence to handwashing and compliance with isolation precautions) (see Preventing and Controlling VRE Transmission in All Hospitals). Intensified fecal screening for VRE might facilitate earlier identification of colonized patients, leading to more efficient containment of the microorganism.

Preventing and Controlling Nosocomial Transmission of VRE

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

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

Preventing and Controlling VRE Transmission in All Hospitals

The following measures should be implemented by all hospitals, including those in which VRE have been isolated infrequently or not at all, to prevent and control transmission of VRE.

Notify appropriate hospital staff promptly when VRE are detected (see When VRE Are Isolated From a Clinical Specimen).

Inform clinical staff of the hospital's policies regarding VRE-infected or colonized patients. Because the slightest delay can lead to further spread of VRE and complicate control efforts, implement the required procedures as soon as VRE are detected. Clinical staff are

essential to limiting the spread of VRE in patient-care areas; thus, continuing education regarding the appropriate response to the detection of VRE is critical (see Education Programs).

Establish system(s) for monitoring appropriate process and outcome measures (e.g., cumulative incidence or incidence density of VRE colonization, rate of compliance with VRE isolation precautions and handwashing, interval between VRE identification in the laboratory and implementation of isolation precautions on the wards, and the percentage of previously colonized patients admitted to the ward who are identified promptly and placed on isolation precautions). Relay these data to the clinical, administrative, laboratory, and support staff to reinforce ongoing education and control efforts (67).

Initiate the following isolation precautions to prevent patient-to-patient transmission of VRE:

Place VRE-infected or colonized patients in private rooms or in the same room as other patients who have VRE (8).

Wear gloves (clean, nonsterile gloves are adequate) when entering the room of a VRE-infected or colonized patient because VRE can extensively contaminate such an environment (3,8,16,17). When caring for a patient, a change of gloves might be necessary after contact with material that could contain high concentrations of VRE (e.g., stool).

Wear a gown (a clean, nonsterile gown is adequate) when entering the room of a VRE-infected or colonized patient a) if substantial contact with the patient or with environmental surfaces in the patient's room is anticipated, b) if the patient is incontinent, or c) if the patient has had an ileostomy or colostomy, has diarrhea, or has a wound drainage not contained by a dressing (8).

Remove gloves and gown before leaving the patient's room and immediately wash hands with an antiseptic soap or a waterless antiseptic agent (68-71). Hands can be contaminated via glove leaks (72-76) or during glove removal, and bland soap does not always completely remove VRE from the hands (77).

Ensure that after glove and gown removal and handwashing, clothing and hands do not contact environmental surfaces in the patient's room that are potentially contaminated with VRE (e.g., a door knob or curtain) (3,8).

Dedicate the use of noncritical items (e.g., a stethoscope, sphygmomanometer, or rectal thermometer) to a single patient or cohort of patients infected or colonized with VRE (17). If such devices are to be used on other patients, adequately clean and disinfect these devices first (78).

Obtain a stool culture or rectal swab from 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 (4), 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 all cultures from multiple body sites (including stool or rectal swab, perineal area, axilla or umbilicus, and wound, Foley catheter, and/or colostomy sites, if present).

Because patients with VRE can remain colonized for long periods after discharge from the hospital, 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. This information should be computerized so that placement of colonized patients on isolation precautions will not be delayed because the patients' medical records are unavailable.

Local and state health departments should be consulted when developing a plan regarding the discharge of VRE-infected or colonized patients to nursing homes, other hospitals, or home-health care. This plan should be part of a larger strategy for handling patients who have resolving infections and patients colonized with antimicrobial-resistant microorganisms.

Hospitals With Endemic VRE or Continued VRE Transmission

The following measures should be taken to prevent and control transmission of VRE in hospitals that have endemic VRE or continued VRE transmission despite implementation of measures described in the preceding section (see Preventing and Controlling VRE Transmission in All Hospitals).

Focus control efforts initially on ICUs and other areas where the VRE transmission rate is highest (4). Such areas can serve as reservoirs for VRE, allowing VRE to spread to other wards when patients are well enough to be transferred.

Where feasible, cohort the staff who provide regular, ongoing care to patients to minimize the movement/contact of health-care providers between VRE-positive and VRE-negative patients (4,8).

Hospital staff who are carriers of enterococci have been implicated rarely in the transmission of this organism (8). However, in conjunction with careful epidemiologic studies and upon the direction of the infection-control staff, examine personnel for chronic skin and nail problems and perform hand and rectal swab cultures of these workers.

Remove from the care of VRE-negative patients those VRE-positive personnel linked epidemiologically to VRE transmission until their carrier state has been eradicated.

Because the results of several enterococcal outbreak investigations suggest a potential role for the environment in the transmission of enterococci (3,8,16,17,79,80), institutions experiencing ongoing VRE transmission should verify that the hospital has adequate procedures for the routine care, cleaning, and disinfection of environmental surfaces (e.g., bed rails, bedside commodes, carts, charts, doorknobs, and faucet handles) and that these procedures are being followed by housekeeping personnel. To verify the efficacy of hospital policies and procedures, some hospitals might elect to perform focused environmental cultures before and after cleaning rooms that house patients who have VRE.

All environmental culturing should be approved and supervised by the infection-control program in collaboration with the clinical laboratory (3,8,16,17,79,80).

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.

Detecting and Reporting VRSA and VRSE

The microbiology laboratory has the primary responsibility for detecting and reporting the occurrence of VRSA or VRSE in the hospital. All clinical isolates of S. aureus and S. epidermidis should be tested routinely, using standard methods, for susceptibility to vancomycin (62). If VRSA or VRSE is identified in a clinical specimen, confirm vancomycin resistance by repeating antimicrobial susceptibility testing using standard methods (62). Restreak the colony to ensure that the culture is pure. The most common causes of false-positive VRSA reports are susceptibility testing on mixed cultures and misidentifying VRE, Leuconostoc, S. haemolyticus, or Pediococcus as VRSA (81,82).

Immediately (i.e., while performing confirmatory testing) notify the hospital's infection-control personnel, the patient's primary caregiver, and patient-care personnel on the ward on which the patient is hospitalized so that the patient can be placed promptly on isolation precautions (depending on the site{s} of infection or colonization) adapted from previous CDC guidelines (83) and those recommended for VRE infection or colonization in this report (see Preventing and Controlling Nosocomial Transmission of VRE). Furthermore, immediately notify the state health department and CDC, and send the isolate through the state health department to CDC (telephone {404} 639-6413) for confirmation of vancomycin resistance.

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