

Vancomycin-intermediate *Staphylococcus aureus* (VISA) and Vancomycin-resistant *Staphylococcus aureus* (VRSA) Surveillance Protocol

Summary Paragraph about the Disease ^(2,3)

Staphylococcus aureus (*S. aureus*) simply known as “staph” is a Gram-positive, round-shaped bacterium commonly found on the skin flora and in the nostrils of healthy people. It may also be found in the lower reproductive tract of women. Approximately 20% of healthy adults have it on their skin and about 30% of the population carry *S. aureus* in their noses. Anyone can develop a *S. aureus* infection. However, those who are at greater risk include people with chronic conditions, such as diabetes, cancer, vascular disease, eczema, and lung disease. The percentages are usually higher for people who are patients in a hospital or who work in one. Skin infections are the most common infections caused by *S. aureus* and can look like pimples, boils, impetigo, or carbuncles. However, occasionally *S. aureus* bacteria can get into the bloodstream and cause serious infections which can be fatal, including:

- Bacteremia or Sepsis when bacteria spread to the bloodstream usually as a result of using catheters or having surgery.
- Pneumonia that predominantly affects people with underlying lung disease including those on mechanical ventilators.
- Endocarditis (infection of the heart valves), which can lead to heart failure.
- Osteomyelitis (bone infection), which can be caused by staph bacteria traveling in the bloodstream or put there by direct contact such as trauma, which includes puncture wound of foot or intravenous (IV) drug use.

VISA and VRSA are specific types of antimicrobial resistant *S. aureus*. However, as of October 2010, all VISA and VRSA isolates have been susceptible to other Food and Drug Administration (FDA) approved drugs. People who develop this type of staph infection may have underlying health conditions, such as diabetes and kidney disease, tubes going into their bodies (such as catheters), previous infections with methicillin-resistant *Staphylococcus aureus* (MRSA), and recent exposure to vancomycin and other antimicrobial agents.

As of May 2015, 14 VRSA infections have been reported in patients from the United States (US). All VRSA described to date have acquired the *vanA* vancomycin resistance gene and operon, commonly found in vancomycin-resistant enterococci (VRE). VISA/VRSA is thought to result from specific precursor organisms: MRSA containing a pSK41-type plasmid and VRE containing *vanA* encoded on an Inc18-like plasmid.

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To protect the health of the public, the West Virginia Reportable Disease Rule, 64CSR-7 requires VISA and/or VRSA to be reported to the local health department (LHD) within 24 hours of diagnosis for timely disease investigation and control.

Healthcare Provider Responsibilities ^(2,3)

1. Report all suspected cases of VISA/VRSA **within 24 hours** to the LHD by telephone and follow up with a written report. Be prepared to provide LHDs with information regarding patients as needed.
2. Notify facility's Infection Prevention/Control Practitioner immediately and institute control measures. Control measures may be found in *Appendix A* of this document.

Laboratory Responsibilities ^(2,3)

All automated susceptibility testing (AST) systems currently approved for use in the US can reliably detect VRSA. In addition to automated systems, VRSA isolates are detected by reference broth microdilution, agar dilution, gradient diffusion, and vancomycin screen agar plates [brain heart infusion (BHI) agar containing 6 µg/ml of vancomycin]. Disk diffusion is not recommended for testing vancomycin susceptibility in *S. aureus*.

VISA can be detected by automated Minimum Inhibitory Concentration (MIC) methods, although many commercial AST systems and gradient diffusion tend to produce vancomycin MICs that are 0.5 – 1 doubling dilutions higher than reference methods (i.e., broth microdilution or agar dilution). VISA isolates are not detected by disk diffusion because zone diameters produced by vancomycin are susceptible and VISA strains are indistinguishable. Vancomycin screen agar plates usually detect VISA for which the vancomycin MICs are 8 µg/ml, but further studies are needed to define the level of sensitivity of these methods for *S. aureus* for which the vancomycin MICs are 4 µg/ml.

All *S. aureus* strains for which the vancomycin MIC is ≥ 4 µg/ml are unusual and should not be discarded until the MICs have been confirmed by a validated method. Laboratories should:

1. Ensure that the strain is in pure culture and confirm the organism identification.

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2. Lab reports of suspected *S. aureus* with intermediate susceptibility to vancomycin with a MIC >4 µg should be reported **within 24 hours** to the LHD by telephone and follow up with a written report.
3. Isolates of VISA and/or VRSA with a MIC of 4 µg/ml or greater should have confirmatory testing completed either by the facility lab with appropriate capabilities such as an eTest or should be forwarded to a reference lab for confirmation testing.
4. Isolates with a MIC >8 µg/ml shall be submitted to the West Virginia Office of Laboratory Services (OLS). OLS may be accessed as follows:
 - Phone: (304) 558-3530
 - Web: dhhr.wv.gov/ols/labs/Pages/microbiology.aspx
 - Mailing address: 167 11th Ave. South Charleston, WV 25303

Submit paper copies of laboratory reports to the LHD via fax.

Local Health Responsibilities ⁽²⁾

1. Information needed for investigation
 - a. Determine if the case meets the case definition (see Case Definition, pg. 7).
 - b. Verify/confirm diagnosis by assuring testing was performed in accordance with the most current guidelines from the Centers for Disease Control and Prevention (CDC).
 - c. Establish extent of illness to rapidly assess extent of transmission.
 - d. Notify all healthcare settings attended by the patient during the potential transmission period.
 - e. Complete the West Virginia Electronic Disease Surveillance System (WVEDSS) form.
 - f. Collaborate with DIDE and facility's infection control to conduct a thorough investigation which may include a *Contact Investigation*.

State Health Responsibilities ⁽²⁾

1. Educate the public about VISA and VRSA transmission.
2. Educate providers and laboratories to report confirmed and probable cases of VISA and VRSA **within 24 hours** of diagnosis or lab report to the LHD.
3. Educate laboratories to submit appropriate VISA and VRSA isolates cultured to OLS.

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4. Provide consultation, education, and guidance to providers, laboratories, and LHD.
5. Provide assistance to LHD and healthcare facilities to conduct *Control Investigations*.
6. Provide assistance to the LHD in implementing control measures as needed.

Disease Control Objectives ^(2,3)

To prevent the spread of VISA/VRSA, infection control precautions should be implemented immediately and remain in place until a pre-defined endpoint, such as the patient has been culture-negative three times during a period of three weeks or the patient's infection has healed. The endpoint should be determined on a case-by-case basis taking into consideration the infection site and setting and in consultation with the state health department.

Infection Control Recommendations by Setting (Exhibit B) should be considered; however, these may need to be customized for specialized healthcare settings, such as dialysis or home healthcare.

The risk of transmission to household members, even those with extensive contact, is extremely low. Household members should practice good hand hygiene (frequent washing with soap and water or use of alcohol-based hand rubs). Additionally, if household members are providing care to the VISA/VRSA patient (such as changing the dressing of an infected wound), these persons should follow the same precautions as listed for home healthcare.

Disease Prevention Objectives ^(2,3)

Hand hygiene and infection control measures mentioned previously under *Disease Control Objectives* can minimize the likelihood of acquiring this disease. The judicious use of antibiotics when treating individuals with infections also combats the likelihood of getting an antimicrobial resistant infection.

Disease Surveillance Objectives

1. Detect first case of VISA/VRSA when it occurs in West Virginia.
2. Detect secondary cases of VISA/VRSA colonization or infection.
3. Characterize persons with VISA/VRSA, including medical history, underlying disease, and risk factors (including breaks in skin integrity, previous hospitalization, and previous antibiotic use).

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Occupational Health ⁽²⁾

1. Use standard and contact precautions with strict adherence to hand hygiene.
2. Use contact precautions (gown and glove) to enter the room area **IF** extensive contact is anticipated or contact with infected areas is planned (debridement or dressing of colonized or infected wound).
3. Per standard precautions, wear mask and eye protection or face shield if performing procedures likely to generate splash or splatter of VISA/VRSA contaminated material (e.g., blood, body fluids, secretions, and excretions).
4. Perform hand hygiene using appropriate agents (e.g., alcohol-based hand sanitizer or hand washing with soap and water).

Public Health Significance ^(2,3)

In the early 1940s, *S. aureus* was uniformly susceptible to penicillin; however, widespread resistance to penicillin and semisynthetic penicillinase-antimicrobial agents led to reliance on vancomycin for documented methicillin-resistant *S. aureus*. Reports in the 1990s suggested that the susceptibility of *S. aureus* to vancomycin was changing. In May 1996, the first documented infection VISA (minimum inhibitory concentration [MIC] = 4-8 µg/ml) was reported in a patient in Japan. Subsequently, infections with VISA strains have been reported in patients from the US, Europe, and Asia. To date, all VISA examined have had non-transferable resistance mechanisms, which are not maintained in the absence of vancomycin. Furthermore, expression of the VISA phenotype appears to have substantial fitness costs for the organism. For these reasons, VISA is considered less of a public health threat than VISA/VRSA.

Approximately 20% of healthy adults have it on their skin and about 30% of the population carry *S. aureus* in their noses. Anyone can develop *S. aureus* infection; however, those who are at greater risk include people with chronic conditions such as diabetes, cancer, vascular disease, eczema, and lung disease. The percentages are usually higher for people who are patients in a hospital or who work there.

The 16th case of VRSA was confirmed by the Centers for Disease Control and Prevention (CDC) in 2021. To date, West Virginia has not had any cases of VRSA.

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Clinical Description ^(2,3)

Most *S. aureus* infections can look like pimples, boils, impetigo, carbuncles, or other skin conditions and most can be treated. However, occasionally *S. aureus* bacteria can get into the bloodstream and cause serious infections which can be fatal, including:

- Bacteremia or Sepsis when bacteria spread to the bloodstream usually as a result of using catheters or having surgery.
- Pneumonia which predominantly affects people with underlying lung disease including those on mechanical ventilators.
- Endocarditis (infection of the heart valves) which can lead to heart failure.
- Osteomyelitis (bone infection) which can be caused by staph bacteria traveling in the bloodstream or put there by direct contact such as trauma which includes puncture wound of foot or intravenous (IV) drug use.

It is important to understand the term “colonization.” This refers to the presence of microorganisms in or on a person who does not have clinical signs or symptoms of infection. However, a patient may be simultaneously VISA/VRSA-infected and VISA/VRSA-colonized (such as by having a VISA/VRSA wound infection and VISA/VRSA colonization of the nares).

Etiologic Agent ^(2,3)

S. aureus, simply known as “staph,” is a Gram-positive, round-shaped bacterium commonly found present on the skin flora and in the nostrils of healthy people. It may also be found in the lower reproductive tract of women.

Reservoir ⁽²⁾

Humans and rarely animals.

Mode of Transmission ^(2,3)

S. aureus is transmitted by close physical contact with infected persons or materials that may carry the organism (e.g., soiled bandages). Hands are the most important instrument for transmitting infection. Airborne spread has been demonstrated in infants with associated viral respiratory disease.

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Incubation Period

Variable and indefinite; unknown.

Period of Communicability

VISA/VRSA is communicable until the patient has completed appropriate therapy, and until respiratory and skin isolates are proven to be no longer present, as long as purulent lesions continue to drain, or the carrier state persists.

Outbreak Recognition

A single case is classified as an outbreak.

Case Definition ⁽²⁾

The definitions for classifying isolates of *S. aureus* with reduced susceptibility to vancomycin are based on the laboratory breakpoints established by the Clinical and Laboratory Standards Institute (CLSI). The CLSI breakpoints for *S. aureus* and vancomycin were last modified in 2009.

Vancomycin-susceptible *S. aureus* (VSSA) Vancomycin MIC ≤ 2 $\mu\text{g/ml}$

Vancomycin-intermediate *S. aureus* (VISA) Vancomycin MIC = 8 $\mu\text{g/ml}$

Vancomycin-resistant *S. aureus* (VRSA) Vancomycin MIC ≥ 16 $\mu\text{g/ml}$

- For cases with an MIC ranging from 9-15 $\mu\text{g/ml}$, the state health department will contact the CDC for additional guidance and clarification.

Preventive Interventions ^(2,3)

1. Conduct a *Contact Investigation*. The *Contact Investigation plan (Appendix B)* should be developed in consultation with local and state health departments using the below criteria.
2. For VISA cases, this is only recommended if transmission is suspected where the identification of the *vanA* gene is present during testing. The *vanA* gene allows the organism to transfer the resistance mechanism to other organisms in the presence of

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vancomycin. To date, all VISA specimens examined have had non-transferable resistance mechanisms.

3. VISA is still clinically important, and laboratories should ensure that treating physicians and infection control are notified.
4. The detection of VISA/VRSA should trigger an investigation that includes a Contact Investigation regardless of whether transmission is suspected.
5. **Once the Contact Investigation is complete, priority should be given to contacts who have had extensive interaction with the VISA/VRSA patient during a defined period before the VISA/VRSA culture date.** The length of this period depends on recent culture results, the setting in which the patient received healthcare, and the clinical assessment. For patients with multiple recent cultures, the time from last vancomycin-susceptible culture to first vancomycin-resistant culture can be considered the period from which contacts should be identified.
6. Prior to collecting any specimens, verbal consent from each contact should be obtained.
7. Culture anterior nares, wounds, drains or other clinically relevant sites (e.g., catheter exit sites) of index patients.
8. Individuals identified as having:
 - a. Extensive interaction
 - i. Culture nares and skin lesions colonized/infected with VISA/VRSA.
 - ii. Culture hands only if concerned about transient colonization after recent contact (previous 48 hours).
 - iii. If no contacts among this group are positive for VISA/VRSA, the decision to culture those with less interaction should be made with state health department consultation.
 - b. Moderate or minimal interaction:
 - i. Culture only if “extensive interaction” contacts have positive results.
 - ii. Culturing the anterior nares of those health care workers (HCW) with extensive interaction on a regular basis with infected or colonized patients may also be considered.
9. Evaluate Efficacy of Infection Control Precautions:
 - a. Adherence to hand hygiene and contact precautions should be assessed at facilities caring for VISA/VRSA patients.

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- b. Facilities that might care for the patient should be notified so that they can “flag” the patient’s record so that upon admission appropriate infection control precautions will be put in place.
10. The likelihood of acquiring this disease is minimized by judicious use of antibiotics when treating individuals with severe infections, along with appropriate handwashing and other infection control measures.

Treatment

Treatment should include appropriate antimicrobial prescribing by healthcare providers according to the susceptibility of the isolate along with implementation of recommended infection control guidelines.

Surveillance Indicators ⁽²⁾

Surveillance monitoring includes:

- The number of positive VISA/VRSA reports received within 24 hours.
- The percentage of reports where contact investigations were conducted.
- The percentage of cases reported that meet the case definition.

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References

1. Centers for Medicare and Medicaid Services. State Operations Manual: Appendix PP - Guidance to Surveyors for Long Term Care Facilities (https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_pp_guidelines_ltcf.pdf accessed May 2016) [Current version of this document may differ from original.]
2. Investigation and control of Vancomycin-Resistant *Staphylococcus aureus* (VISA/VRSA) 2015 Update. www.cdc.gov/hai/pdfs/VISA/VRSA-Investigation-Guide-05_12_2015.pdf
3. VISA/VRSA in Healthcare Settings. (2015). www.cdc.gov/staphylococcus-aureus/about/vancomycin-resistant-staph.html

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Appendix A - Control Measures

1. Acute Care Settings

- a. Isolate the patient in a private room.
- b. Minimize the number of people caring for the patient (assign dedicated staff to care for the VISA/VRSA patient).
- c. Implement the appropriate infection control precautions during patient care.
 - i. Use standard and contact precautions (gown and glove for room entry).
 - ii. Per standard precautions, wear facemask and eye protection or face shield if performing procedures likely to generate splash or splatter (e.g., wound manipulation, suctioning) of VISA/VRSA contaminated material (e.g., blood, body fluids, secretions, and excretions).
 - iii. Perform hand hygiene using appropriate agents (e.g., alcohol-based hand sanitizer or hand washing with soap and water).
 - iv. Dedicate items to VISA/VRSA patients that cannot be cleaned and disinfected between patients.
 - v. Monitor and strictly enforce compliance with hand hygiene and contact precautions.
- d. Educate and inform the appropriate healthcare personnel about the presence of a patient with VISA/VRSA and the need for contact precautions.
- e. Facilities should flag the patient's chart to indicate infection/colonization with VISA/VRSA.
- f. Consult with the local and/or state health department before transferring or discharging the patient.
- g. Ensure that the patient's VISA/VRSA status and required infection control precautions are communicated at transfer.

2. Dialysis Settings

To date, VISA/VRSA has been isolated in hemodialysis patients. Hemodialysis clinics are expected to follow standard precautions and additional infection control recommendations specific to hemodialysis settings. Providers should pay attention to the following precautions when caring for a VISA/VRSA patient.

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- a. Wear disposable gown and gloves when caring for the patient or touching the patient's equipment at the dialysis station; carefully remove and dispose of gown and gloves. Perform hand hygiene when leaving the patient station.
 - b. If available, use a separate room that is not in use for Hepatitis B isolation for patient treatment. If a separate room is not available, dialyze the patient at a station with as few adjacent stations as possible.
 - c. Items brought into the dialysis station should be disinfected after use. Items not able to be disinfected should be discarded.
 - d. Thoroughly disinfect the dialysis station (chairs, beds tables, and machines) between patients. Information specific to disinfection in dialysis facilities is available at: www.cdc.gov/dialysis-safety/about/index.html
 - e. Educate and inform the appropriate personnel about the presence of a patient with VISA/VRSA and the need for contact precautions.
 - f. If the patient needs to be admitted or referred to another facility, the receiving facility must be notified of the patient's VISA/VRSA status.
3. Other Outpatient Settings
- a. Healthcare providers in outpatient settings should follow the same VISA/VRSA precautions as hospital-based healthcare providers.
 - i. Use standard and contact precautions with strict adherence to hand hygiene.
 - ii. Use contact precautions (gown and glove) to enter the room area **IF** extensive contact is anticipated or contact with infected areas is planned (debridement or dressing of colonized or infected wound).
 - iii. Per standard precautions, wear mask and eye protection or face shield if performing procedures likely to generate splash or splatter of blood, body fluids, secretions, and/or excretions).
 - iv. Perform hand hygiene using appropriate agents (e.g., alcohol-based hand sanitizer or hand washing with soap and water).
 - v. Dedicate items to VISA/VRSA patients that cannot be cleaned and disinfected between patients.
 - b. Minimize the number of people who care for the VISA/VRSA colonized/infected patient (e.g., dedicate a single staff person).

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- c. Ensure meticulous cleaning of the room/patient care area at the end of each patient encounter.
 - d. Educate and inform the appropriate personnel about the presence of a patient with VISA/VRSA and the need for contact precautions.
 - e. If the patient needs to be admitted or referred to another facility, the receiving facility must be notified of the patient's VISA/VRSA status.
4. Home Healthcare Settings
- a. Home healthcare providers should generally follow the same VISA/VRSA precautions as hospital-based healthcare providers.
 - i. Wear a gown and gloves upon entering the area of the house where the patient care will be provided.
 - ii. Per standard precautions, wear a mask and eye protection or face shield if performing procedures are likely to generate splash or splatter.
 - iii. Perform hand hygiene using appropriate agents (i.e. alcohol-based hand sanitizer or hand washing with soap and water).
 - b. Minimize the number of persons with access to the VISA/VRSA colonized/infected patient.
 - c. Dedicate non-disposable items that cannot be cleaned and disinfected between patients for use only on a single patient.
5. Nursing Homes ⁽¹⁾
- While nursing homes are considered the resident's home, precautions should still be taken to prevent the spread of infection to protect the resident, those who care for the resident, visitors, and those who cohabitate with the resident. Precautions should be the least restrictive possible for the resident based on his/her clinical situation and used for the least amount of time.
- a. Isolate the patient in a private room for the least amount of time possible and take measures to reduce or minimize any potential psychosocial negative effects of isolation. The facility should proactively ensure that individual needs/activities are met to prevent anger, withdrawal, or other mood changes.
 - b. Limit movement of a resident with VISA/VRSA and allow outside of his/her room for medically necessary purposes only.
 - c. Minimize the number of people caring for the patient (assign dedicated staff to care for the VISA/VRSA patient).

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- d. Implement the appropriate infection control precautions during patient care.
 - i. Use standard and contact precautions (gown and glove for room entry).
 - ii. Per standard precautions, wear facemask and eye protection or face shield if performing procedures likely to generate splash or splatter (e.g., wound manipulation, suctioning) of VISA/VRSA contaminated material (e.g., blood, body fluids, secretions, and excretions).
 - iii. Perform hand hygiene using appropriate agents (e.g., alcohol-based hand sanitizer or hand washing with soap and water).
 - iv. Dedicate items to VISA/VRSA patients that cannot be cleaned and disinfected between patients.
 - v. Monitor and strictly enforce compliance with hand hygiene and contact precautions.
- e. Educate and inform the appropriate healthcare personnel about the presence of a patient with VISA/VRSA and the need for contact precautions.
- f. Facilities should flag the patient's chart to indicate infection/colonization with VISA/VRSA.
- g. Consult with the local and/or state health department before transferring or discharging the patient.
- h. Ensure that the patient's VISA/VRSA status and required infection control precautions are communicated at transfer.

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Appendix B - Contact Investigation Criteria

Individuals with EXTENSIVE interaction with a VISA/VRSA patient

- a. Patients who:
 - i. Share the VISA/VRSA patient's room.
- b. Nursing patient care providers involved in direct patient care who:
 - i. Clean/bathe/rotate/ambulate the patient or have prolonged contact.
 - ii. Change dressings.
 - iii. Make frequent visits (>3 visits per shift).
 - iv. Handle secretions and body fluids, including respiratory secretions.
 - v. Manipulate intravenous lines.
- c. Physicians who:
 - i. Care for wound dressings or perform debridement (outside Operating Room).
 - ii. Conduct extensive exams on the VISA/VRSA patient.
- d. Ancillary staff who:
 - i. Have prolonged physical patient contact including physical therapy or rehabilitation personnel, dialysis or respiratory technicians, and home health aides.
- e. Family members or household contacts who:
 - i. Provide primary care.
 - ii. Had/have prolonged close physical contact with the patient or their immediate environment (e.g., sleep in the same bed or same room).

Individuals with MODERATE interaction with VISA/VRSA patient

- a. Patients who:
 - i. Share patient care areas and healthcare providers for extended periods with the VISA/VRSA patient (e.g., patients receiving dialysis on the same shift as VISA/VRSA patient or hospitalized in a different room but with the same providers for several days while patient is not in contact precautions).
- b. Nursing patient-care providers who:
 - i. Deliver medications.

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- ii. Cross-cover patient only.
- c. Physicians who:
 - i. See patients on daily rounds, without conducting extensive exams.
 - ii. Perform surgical or invasive procedures where sterile barriers or aseptic techniques are used.
- d. Ancillary staff who:
 - i. Have limited interactions (e.g., radiology technicians).
- e. Family members or household contacts who:
 - i. Live with or have physical contact with the VISA/VRSA patient but do not meet criteria for extensive interaction.

Individuals with MINIMAL interaction with VISA/VRSA patient

- a. Patients who:
 - i. Are on the same ward but for short periods of time or while the patient is in contact precautions.
 - ii. Are seen in the same outpatient clinic on the same day as the patient.
- b. Nursing or patient-care providers who:
 - i. Work on the same floor without formal cross-coverage of patients.
 - ii. Are seen in the same outpatient clinic on the same day as the patient.
- c. Physicians who:
 - i. Consult infrequently without extensive exam.
 - ii. Visit during teaching rounds only.
- d. Ancillary staff who:
 - i. Monitor patient-care equipment and do not have known contact with secretions.
 - ii. Provide dietary or maintenance services and do not interact directly with the patient.