01.22 – Control of Multi-Drug Resistant Organisms (MDRO)

Purpose

To describe the strategies to prevent transmission of multi-drug resistant organisms (MDROs) and extremely drug-resistant organisms (XDROs) in the healthcare setting.

Audience

All employees of UTMB hospitals, clinics, ambulatory surgery centers, and licensed independent practitioners, contract workers, volunteers, and students

This policy provides guidance for all MDROs in various healthcare settings of UTMB. The requirements in this policy are consistent with, but may be more specific than, the isolation policy 01.19.

In 2019, CDC released a document entitled Antibiotic Resistant Threats in the US. Drug resistant organisms were categorized as follows: urgent threats, serious threats, concerning threats, and watch list. Several of these organisms pose a threat of transmission in healthcare facilities and are addressed in this document.

Appendices A-C deal with active surveillance culturing, previously addressed only by department procedures and were not included in policies. Appendix D is a recap of all recommendations by organism and resistance pattern.

Organism-specific protocols

For organisms not specifically covered, see isolation policy (01.19), *C. difficile* policy (01.43), and drug-resistant tuberculosis (Policy 01.21). Organism-specific protocols will be reviewed at least annually and when new concerns emerge.

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Impact: In a healthcare setting, MRSA transmission can cause serious infections such as bacteremia, pneumonia and surgical site infections. If not treated quickly, MRSA infections can cause sepsis and death. MRSA is categorized as a serious threat.

Definition: An isolate with minimal inhibitory concentration (MIC) of >2 µg/ml to oxacillin or by detection of the *mec*A gene by nucleic acid amplification tests, such as the polymerase chain reaction (PCR)

Identification:

- Clinical isolates flagged in the electronic medical record (EMR)
- Active surveillance culturing of nares in ICUs and other high-risk patient populations (MRSA and MSSA) See appendices A & B
- Other surveillance cultures may be ordered by providers for pre-operative clearance

Decolonization

- If patient is positive for MRSA or MSSA, decolonize with a nasal disinfectant or topical antibiotic. Widespread use of topical antibiotics has been demonstrated to lead to resistance and therefore is suggested only for patients who need prolonged protection, e.g.,

dialysis patients. A topical antiseptic such as Nozin is preferred for widespread use. Skin decolonization by bathing with chlorhexidine gluconate (CHG) products is performed in high-risk patient populations.

- For pre-operative screening and/or decolonization, regimens are prescribed by the patient's care team.
- Employees will not be screened or decolonized unless epidemiologically linked to an infection.

Isolation:

- Contact precautions for MRSA (but not MSSA) isolated in actively draining wounds or with drainage from devices (e.g. percutaneous drains, LVAD drivelines etc.).
- TDCJ Hospital Galveston and NICU ONLY: Any patient with an active MRSA infection (i.e. bacteremia, pneumonia, intrabdominal, skin/soft tissue, osteomyelitis etc.) will be placed in Contact Precautions.
- Nasal colonization only (no recent history of MRSA infection): Contact Precautions in NICU; Standard Precautions (no isolation) in pediatric and adult units.

Discontinuing isolation:

- The initial site of infection has resolved and there is no drainage from ongoing wounds, infected drain sites, or infected devices, etc. or the patient is discharged; whichever comes first. (exceptions - NICU and TDCJ Hospital Galveston).

Employees

- Employees who have direct touch contact with patients, should not work while having an active MRSA infection. MRSA colonization is generally not a reason for exclusion for work unless linked to an outbreak.
- No active surveillance cultures of employees will be performed except as a part of an investigation.
- No decolonization is recommended for staff except as a part of outbreak management.

Environmental cultures: taken periodically in selected adult ICUs to check cleaning processes.

Reporting: MRSA bacteremia in hospitalized or ED patients is reportable to NHSN.

Refer to 01.42 – Methicillin Resistant Staphylococcus aureus Control Plan

Vancomycin resistant *Enterococcus* (VRE)

Impact: VRE is often passed from person to person by the contaminated hands of caregivers. VRE can get onto a caregiver's hands after they have contact with other people with VRE or after contact with contaminated

surfaces. VRE can also be spread directly to people after they touch surfaces that are contaminated with VRE.

Definition: *Enterococcus faecalis, Enterococcus faecium, or Enterococcus species unspecified (only those not identified to the species level)* that is resistant to vancomycin, by standard susceptibility testing methods or by results from any FDA-approved test for VRE detection from specific specimen sources.

Disc content	Interpretive Category and Zone Diameter Breakpoints			Interpretive Categories and MIC Breakpoints (µg/mL)		
30 µg	S	I	R	S	I	R
	≥ 17	15-16	≤ 14	≤ 4	8-16	≥32

Identification:

- Clinical isolates flagged in EMR

Isolation:

- Contact precautions for those who are colonized or infected with VRE while in inpatient units.

Decolonization: no

Environmental cultures: periodic cultures in adult ICUs to check on cleaning efficacy.

Discontinuing isolation:

- Clinical site of VRE infection must be resolved (e.g., no draining wounds).
- Patients have not had a positive VRE result since the initiation of isolation in 12 months
- Patient who has not been admitted for ≥ 12 months after initial flag placed: discontinue precautions without culture

Multi-drug resistant *Acinetobacter*

Impact: *Acinetobacter* has emerged as an important nosocomial pathogen. It survives well in the environment at a variety of temperatures, pH, and in both moist and dry environments. Treatment options are severely limited for MDR strains. Carbapenem-resistant *Acinetobacter baumannii* (CRAB) isolates are particularly concerning.

Definition: Any ***Acinetobacter*** spp. testing non-susceptible (i.e., resistant or intermediate) to at least one (1) agent within 3 or more antimicrobial classes of the following antimicrobial classes:

Class	Antimicrobial
Aminoglycosides	Amikacin Gentamicin Tobramycin

β-lactam/β-lactam β-lactamase inhibitor combination	Amoxicillin-Clavulanate Piperacillin/tazobactam
Carbapenems	Doripenem Ertapenem Imipenem Meropenem
Cephalosporins	Cefepime Cefotaxime Ceftazidime Cefoxitin Cefazolin Ceftriaxone
Fluoroquinolones	Ciprofloxacin Levofloxacin
Monobactam	Aztreonam
Penicillins	Ampicillin
Polymyxins	Polymyxin B Colistin
Sulbactam	Ampicillin/sulbactam
Tetracyclines	Tetracycline Tigecycline Minocycline

Identification:

- Clinical specimens
- Active surveillance cultures: patients in adjacent rooms (ring culturing)
- Environmental cultures: adjacent rooms, patient room after dc clean if feasible

Isolation: Contact precautions. Dedicated patient equipment for CRAB

Discontinuing isolation for MDR carbapenem-sensitive:

- Clinical site of infection has resolved
- Patients have not had a positive VRE result since the initiation of isolation in 12 months
- Patient who has not been admitted for ≥ 12 months after initial flag placed: discontinue precautions without culture

Discontinuing isolation for CRAB:

- Do not discontinue unless the following criteria are met
  Clinical cultures: No clinical isolate of CRAB in last 12 months

Environmental culturing if precautions not in place upon admission:

- Surfaces in patient's rooms, 2 adjacent rooms, and other areas in unit as needed.
- As needed to conduct an outbreak investigation

Reporting: All MDR *Acinetobacter* is reportable to the local health authority

Extended-beta lactamase

Impact: *Klebsiella*, *Escherichia, Enterobacter,* and some other genre of the Enterobacteriaceae family may cause serious infections in hospitalized

producing organisms (ESBL)

patients, particularly those who require the use of devices such as ventilators, central lines, and urinary catheters. According to the CDC, patients with bloodstream infections caused by ESBL-producing Enterobacteriaceae are about 57% more likely to die than those with bloodstream infections caused by a non ESBL-producing strain.

As the family name implies, they are normal inhabitants of the human bowel. They are spread primarily by person-to-person contact but may also spread from contact with a contaminated environment. In some cases, carbapenems are the only antibiotic class available for treatment, which is leading to the emergence of carbapenem resistance.

Definition: ESBLs are enzymes that mediate resistance to extended-spectrum (third generation) cephalosporins (e.g., ceftazidime, cefotaxime, and ceftriaxone) and monobactams (e.g., aztreonam) but do not affect cephamycins (e.g., cefoxitin and cefotetan) or carbapenems (e.g., meropenem or imipenem). Although this definition applies to any species in the *Enterobacteriaceae* family, the emphasis will be placed on the species with those deemed to be clinically significant for UTMB: *Klebsiella pneumoniae*, *Klebsiella oxytoca, Escherichia coli*, *Enterobacter cloacae*, and *Enterobacter aerogenes.*

Identification:

- Clinical isolates
- Active surveillance cultures for investigations or to discontinue isolation

Isolation: Contact precautions

Environmental cultures: only as a part of an outbreak investigation.

Discontinuing isolation:

- Initial site of infection resolved (e.g., no draining wounds)
- Screening to discontinue isolation precautions:
    - Patients have not had a positive ESBL result since the initiation of isolation in 12 months
    - Patient who has not been admitted for $\geq$ 12 months after initial flag placed: discontinue precautions without culture

Carbapenem resistant Enterobacteriaceae

Impact: CRE are resistant to most, if not all antibiotics. For many years carbapenem antibiotics were used effectively for treatment of many microorganisms resistant to all the other antibiotics available.

Definition: As with ESBLs, any species found in the Enterobacteriaceae family may be carbapenem resistant. The emphasis will be placed on ***Escherichia coli***, ***Klebsiella oxytoca, Klebsiella pneumoniae***, ***Enterobacter* cloacae, and *Enterobacter aerogenes*** isolates testing resistant to imipenem, meropenem, doripenem, or ertapenem by standard susceptibility testing methods (i.e., minimum inhibitory concentrations of ≥4 mcg/mL for doripenem, imipenem and meropenem or ≥2 mcg/mL for ertapenem) OR by production of a carbapenemase (i.e., KPC, NDM, VIM, IMP, OXA-48) demonstrated using a

recognized test (e.g., polymerase chain reaction, metallo-β-lactamase test, modified-Hodge test, Carba-NP).

Identification:

- Clinical specimens
- Active surveillance cultures: patients in adjacent rooms (ring culturing)
- Environmental cultures: adjacent rooms, pt room after dc clean if feasible

Isolation

- Contact precautions
- Physicians and other healthcare workers may not take a stethoscope, cell phone or iPad into the room unless they are covered by the gown and are not removed from under the gown while in the room

Environmental cultures if patient was not isolated upon admission:

- Surfaces in patient's rooms, 2 adjacent rooms, and other areas in the unit as needed.
- As needed to conduct an outbreak investigation

Discontinuing isolation: Do not discontinue unless the following criteria are met:

1. Clinical cultures: No clinical isolate of CRE in the last 12 months
2. Patient who has not been admitted for ≥ 12 months after initial flag placed: discontinue precautions without culture

Reporting: All CRE is reportable to the local health authority

Other resistant gram-negative bacteria (e.g., *Pseudomonas*, *Serratia*)

Impact: *Pseudomonas aeruginosa* is typically the greatest threat because it is a common cause of healthcare-associated infections including pneumonia, bloodstream infections, urinary tract infections, and surgical site infections. Some strains are resistant to almost all antibiotics. Report Carbapenem-resistant *Pseudomonas* (CRPA) to GCHD.

Definition: Gram-negative organisms which are non-susceptible (i.e., resistant or intermediate) to 1 or more agents within 3 or more antimicrobial classes to which they should be sensitive.

Identification:

- Clinical cultures
- Active surveillance cultures (ring culturing) as indicated.

Isolation: Contact precautions

Environmental cultures: as needed to conduct an outbreak investigation

Discontinuing isolation: Do not discontinue unless the following criteria are met

1. Clinical cultures: No clinical isolate in the last 12 months
2. Patient who has not been admitted for ≥ 12 months after initial flag placed: discontinue precautions without culture

Extensively Drug- Resistant Organisms (XDRO)

Impact: Bacteria or fungi that are classified as XDRO are epidemiologically significant due to their resistance to all first-line antimicrobials. They are also species that have been identified as causes of outbreaks in healthcare facilities.

Definition: Bacteria that are non-susceptible (Intermediate (I) or Resistant (R)) to all first-line antimicrobials for that species.

Identification:

- Clinical cultures
- Active surveillance cultures: patients in adjacent rooms (ring culturing)

Isolation:

- Extreme Drug Resistant Organism (XDRO) precautions
- Physicians and other healthcare workers may not take a stethoscope, cell phone or iPad into the room unless they are covered by the gown and are not removed from under the gown while in the room

Environmental cultures: as needed to conduct an outbreak investigation and as needed

Discontinuing isolation: Isolation remains throughout duration of admission. Patient's chart will remained flagged in the event they are readmitted. Criteria for discontinuing isolation will be made on a case-by-case basis.

Other efforts: The Medical Director or Operations Manager of Infection Control & Healthcare Epidemiology (ICHE) will communicate and work with faculty physicians to prevent the patient from acquiring additional infections as well as the spread of these bacteria. This includes but is not limited to recommending the discontinuation of invasive devices. ICHE staff will perform surveillance cultures on all patients on unit for a minimum of four weeks after first positive XDR culture is identified.

Room decontamination: Refer to cleaning procedures for *Candida auris*

Candida auris

See APPENDIX E for Candida auris Management Protocol

Impact: *C. auris* is an emerging multidrug-resistant (MDR) yeast that has caused outbreaks of invasive healthcare-associated infections with high mortality. This organism represents a serious global health threat. Some strains of *C. auris* have elevated minimum inhibitory concentrations (MICs) to the three major classes of antifungals, severely limiting treatment options.

Definition*:* Resistance to at least one major class of antifungals.

Isolation: XDRO Contact Precautions for patients colonized or infected with C.auris as confirmed by surveillance or clinical culture(s). Additionally, patients

exposed via contact with a colonized or infected patient, or their environment, should also be placed in isolation.

Environmental cultures: as needed to conduct an outbreak investigation (See additional guidance in Appendix E)

Disinfection of room daily and post-discharge with bleach-based disinfectant and UV light as available. (See additional guidance in Appendix E)

Reporting: All *Candida auris* is reportable to the local health authority

Vancomycin intermediate (VISA) and vancomycin resistant S. aureus (VRSA

Impact: VISA and VRSA infections are rare. CDC considers VRSA to be a public health threat. Like any strain of *S. aureus*, VISA and VRSA may cause serious, even life-threatening infections.

VISA strains should be monitored for increasing vancomycin resistance.

Definition: VISA: decreased susceptibility to vancomycin (minimum inhibitory concentration [MIC], 4 – 8 µg/ml). VRSA: fully resistant to vancomycin (MIC ≥ 16 µg/ml). Note: these definitions are irrespective of sensitivity to methicillin.

Identification:

- Clinical isolates (verify results have been confirmed by Microbiology supervisor)
- Active surveillance cultures collected for VRSA (but not VISA) as outlined in appendix C
- Use cultures rather than PCR to permit strain analysis if indicated (sent for PFGE)
- Periodic testing (e.g., weekly?) of the index patient and/or others found to be colonized will be conducted to inform the duration of control measures

Decolonization: of VISA or VRSA carriers will be performed as indicated.

- Two or more negative results obtained at least 7 days apart while off antibiotic therapy (for at least one week) that would be expected to be active against this organism should be obtained before colonization is considered resolved and a change in infection control precautions is considered.

Isolation-hospitals:

- Contact precautions (gown and gloves for room entry).
- Minimize the number of persons who enter the room.
- 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 VRSA contaminated material (e.g., blood, body fluids, secretions, and excretions).
- Dedicate non-disposable items that cannot be cleaned and disinfected between patients (e.g., adhesive tape, cloth-covered blood pressure cuffs) for use only on the patient with VRSA.
- **Monitor and strictly enforce compliance with Contact Precautions**.

- Educate and inform the appropriate healthcare personnel about the presence of a patient with VRSA and the need for contact precautions.
- Dialysis: provide dialysis in the patient's room.

Isolation-clinics and other ambulatory healthcare settings:

- How can we communicate this to clinics beyond flag? Add Note for ambulatory sites: call/page ICHE.
- Contact Precautions (gown and gloves) to enter room/care area if extensive contact is anticipated or contact with infected areas is planned (e.g., debridement or dressing of colonized or infected wound).
- Per Standard Precautions, wear mask and eye protection or face shield if performing procedures likely to generate splash or splatter (e.g., wound manipulation, suctioning) of VRSA contaminated material (e.g., blood, body fluids, secretions, and excretions).
- Dedicate non-disposable items that cannot be cleaned and disinfected between patients (e.g., adhesive tape, cloth-covered blood pressure cuffs) for use only on the patient with VRSA.
- Minimize the number of persons who care for the VRSA colonized/infected patient (e.g., dedicate a single staff person).
- Ensure meticulous cleaning of the room/patient care area at the end of each visit.
- Educate and inform the appropriate personnel about the presence of a patient with VRSA and the need for contact precautions.
- In the event the patient needs to be admitted or referred to another facility, the receiving facility must be notified of the patient's VRSA status.

Environmental cultures: collected weekly in rooms/care spaces adjacent to room housing VISA/VRSA patient until patient is discharged or culture-negative.

Reporting:

- VISA and VRSA are reportable to the local health authority
- Consult with public health authority to transfer a patient to another facility or to discontinue isolation

Reporting Tiers and Texas Notifiable MDROs

CDC defines four tiers for epidemiology responses to novel or targeted MDROs. The definitions for each tier are outlined below.

Tier 1:

Tier 1 encompasses organisms or resistance mechanisms that have never (or very rarely) been identified in the United States and for which experience is extremely limited. A more extensive evaluation is needed to define the risk for transmission and the extent of spread. Examples of Tier 1 organisms and mechanisms include the initial identifications of Candida auris and mcr-1-carrying Enterobacterales in the United States. After the risk for transmission

and extent of spread are well-defined, these organisms are typically moved to lower tiers.

Tier 2:

Tier 2 organisms include (1) MDROs that are primarily associated with healthcare settings and are not commonly identified in the region and (2) organisms for which no current treatment options exist (pan-not susceptible) and that have the potential to spread more widely within a region (e.g., have plasmid-mediated resistance mechanisms). These organisms might be more common in other areas of the United States. Information is available about how transmission of these organisms occurs and the groups primarily at risk.

Generally, these have either not been previously identified in the region or have been limited to sporadic cases or small outbreaks (i.e., correspond to “not detected” or “limited to moderate spread” epidemiologic stages). However, these MDROs might be found more commonly in other areas of the United States or even in other regions or patient sharing networks within the same jurisdiction. In most of the U.S., carbapenem resistant Enterobacterales (CRE) with OXA-48 or metallo-β-lactamase carbapenemases (e.g., New Delhi Metallo-β-lactamase (NDM), Verona-integron-mediated carbapenemase (VIM), and imipemenemase (IMP)) and carbapenemase-producing Pseudomonas spp. meet the Tier 2 criteria. In some areas of the United States, carbapenem-resistant Enterobacterales producing Klebsiella pneumoniae carbapenemase (KPC-CRE) and C. auris also meet the Tier 2 criteria because they are not commonly identified.

Tier 3:

Organisms in this group include MDROs targeted by the facility or region for epidemiologic importance that have been identified frequently across a region, indicating advanced spread, but are not considered endemic. These organisms might be more common in other areas of the United States. Information is available about how transmission of these organisms occurs and the groups primarily at risk.

Examples include KPC-CRE and Acinetobacter baumannii with plasmid-mediated oxacillinases with carbapenemase activity (e.g., OXA-23-like, OXA-24/40-like) and C. auris in certain regions of the United States where these organisms are more regularly identified but are not endemic.

Tier 4:

These MDROs are endemic in a region and have been targeted by public health for their clinical significance and potential to spread rapidly (e.g., to other regions where they are less common or from healthcare settings into the community).

See APPENDIX F for Summary of Response Recommendations for MDRO Containment by Tier

Appendix A:
Active Surveillance for Epidemiologically Significant Organisms in Adult Units

Purpose: To identify epidemiologically significant organisms for the purpose of implementing isolation precautions and for trending. This procedure describes only response to organisms identified by active surveillance. Additional organisms identified by clinical cultures require isolation precautions and may require follow-up surveillance cultures if epidemiologic linkage is suspected.

Procedure: Active surveillance for epidemiologically significant organisms is performed in all the adult ICU's. Methods used are PCR and cultures. Selective media is used to facilitate detection of significant organisms.

Specifics:

A. Epidemiologically significant organisms identified by active surveillance

1. All adult ICUs: MRSA and MSSA (for purposes of decolonization)
2. BICU: *Pseudomonas* and *Acinetobacter*
3. Other adult or pediatric units (excluding nurseries):
   a. Follow-up cultures to assess the need for continued isolation
   b. Cultures collected to investigate a single case of an unusual and epidemiologically significant organism or a cluster of infections with possible epidemiologic linkage

B. Frequency of testing

1. MRSA/MSSA: all new admissions to adult ICUs for purposes of decolonization. Not isolated if being decolonized or has not draining wounds.
2. Burn ICU: weekly
3. Follow-up cultures: reassess patients with contact precautions in place to evaluate the need for continued isolation
4. Investigations
   a. MDR *Acinetobacter,* CRE, CRAB, CRPA (carbapenem resistant pseudomonas), XDRO organisms
      1) Circumstances: when patients colonized or infected are identified.
      2) Process: ring culturing if isolation precautions were not present upon admission
         a) Start with patients in same nursing assignment. If cultures are negative, continue with weekly cultures for patients in those rooms until index patient is discharged.
         b) If a patient in an adjacent room is positive, expand the ring to patients adjacent to that patient. Continue until no new positive patients are identified.
         c) Request Microbiology to save isolates for additional studies (e.g. PFGE) if needed.
      3) Continue weekly culturing until all infected/colonized patients have been discharged.
   b. Other organisms: plan investigation with Healthcare Epidemiologist and communicate to the manager and medical director of the unit.

C. Specimen Sites

1. New admission to ICU: nasal specimen for PCR (MRSA/MSSA)

2. Investigation for suspected or confirmed MDRO outbreaks: plan will include sites and frequency of testing
3. Follow-up cultures: as appropriate to the organism (e.g., nasal for previous clinical isolate positive for MRSA, perirectal for clinical isolate previously positive for VRE)

D. Action

1. MRSA/MSSA in a patient newly admitted to an ICU: Initiate nasal decolonization with Nozin and assure CHG bathing is performed daily.
2. Other surveillance cultures performed for investigations or follow up on previous clinical isolates: implement Isolation as indicated
   a. Inform Nursing unit
   b. Select appropriate type of isolation precautions
   c. Enter new order for isolation
      1) Select New Order
      2) Select Preference, click on isolation screen
      3) Select isolation category and click Accept
      4) Sign orders: Director
   d. Enter into Epic ISO/INF:
      1) Select appropriate category
      2) Click on category to add a note: date, organism, specimen site
      3) Update note with new results of clinical or follow-up cultures.
3. Discontinue isolation
   a. # specimens/type to discontinue isolation or patient has not been readmitted within the last year.
   b. Discontinue the order-condition no longer warrants
   c. ISO/INF flag: click on resolve

Appendix B:
Title: Active Surveillance for Epidemiologically Significant Organisms in the Neonatal Intensive Care Unit

Purpose: To identify epidemiologically significant organisms for the purpose of implementing isolation precautions and for trending.

Procedure: Active surveillance cultures for epidemiologically significant organisms is performed in the NICU as described below.

A. Epidemiologically Significant Organisms Identified by Active Surveillance

1. Routine monitoring: MRSA and MSSA
2. Investigative (time-limited): based upon trends in clinical cultures, including but not limited to organisms such as drug-resistant *Acinetobacter*, CRE, ESBLs (genus-specific), *Pseudomonas,* and *Serratia.* Surveillance culturing is not limited to patient culturing and may include environmental specimen collection.

B. Frequency of Testing: NICU

Routine: weekly surveillance for MRSA/MSSA using PCR molecular test. Test order will be placed by the NICU practitioner/physician every Tuesday morning.

1. Nasal swabs will be collected by bedside nurses in the morning and submitted to the microbiology laboratory. The results will be available within 24 hours and will be visible to all providers in EPIC EMR.

C. Specimens collected

1. MRSA/MSSA: nasal swab
2. Investigative: may include oropharyngeal swab, sputum (for ventilated patients), perirectal swab, and ostomy bag drainage. This will be determined at the onset of the investigation.

D. Action

1. Order isolation as indicated
   a. Inform Nursing unit
   b. Select New Order in EPIC
   c. Select Preference, click on isolation screen
   d. Select isolation category and click Accept
   e. Sign orders: Provider: Healthcare Epidemiologist Enter progress note in
2. ISO/INF flag in EPIC
   a. Choose appropriate category
   b. Click on flag and category to enter comment: date, site cultured positive,
3. Follow up cultures (patient with previous positive culture)
   a. If patient remains positive, ensure isolation precautions are appropriate and enter a progress note
   b. If patient has a negative culture, enter a progress note with the number of cultures that have been negative and note on isolation flag as well
   c. When on negative nasal PCR/culture for MRSA or 2 negative cultures are obtained a week apart, discontinue isolation:

i) Review Orders, select Isolation, discontinue
ii) Resolve the ISO/INF status
iii) Progress note: note isolation is discontinued and reason)

4. If a cluster is identified (clinical and/or surveillance cultures): discuss need for strain typing with Epidemiologist.
   a. If strain typing is indicated, notify Clinical Microbiology to save and package isolates for shipping
   b. Notify DSHS that we will send specimens

Appendix C:
Active Surveillance for VISA/VRSA

Patients colonized or infected with VISA/VRSA

- Culture multiple sites (minimum, 2 to 3 sites per patient). Both frequently colonized sites such as anterior nares, throat, axilla, groin, or perirectal area and clinically relevant sites such as wounds and drains should be selected. Can determine which sites on a case-by-case basis.
- Specimens may be collected to determine colonization with vancomycin-resistant enterococci (VRE) carriage status (i.e., rectal, peri-rectal). Any VRE recovered may be of laboratory interest and should be saved for further testing. Any VRSA, MRSA or VRE that are isolated should be saved for further evaluation

Persons with Extensive contact with VISA/ VRSA include:

- Patients who share the VISA/VRSA patient's room
- Nursing or patient-care providers involved in direct patient care who:
    - Clean/bathe/rotate/ambulate the patient or have other prolonged contact
    - Change dressings
    - Enter room frequently (>3 entries per shift)
    - Handle secretions and body fluids, including respiratory secretions
    - Manipulate intravenous lines
- Physicians who:
    - Care for wound dressings or perform debridement (outside of Operating Room)
    - Conduct extensive exams on the VRSA patient
- Ancillary staff who have prolonged physical patient contact,
  including physical therapy or rehabilitation personnel, dialysis or respiratory technicians, and home health aides

Specimens from persons with extensive contact with VISA/VRSA patient:
Culture multiple (e.g., 2 to 3) frequently colonized sites, such as anterior nares, throat, groin, axilla, or peri-rectal area, plus any skin lesions (e.g., abscess or dermatitis, open wounds)

Moderate contact

- Patients who: Share patient care areas and healthcare providers for extended periods with the VRSA patient (e.g., patients receiving dialysis on same shift as VRSA patient or hospitalized in a different room but with same providers for several days while patient not in Contact Precautions)
- Nursing or patient-care providers who:
    - Deliver medications
    - Cross-cover patient only
- Physicians who:
    - See patient on daily rounds, without conducting extensive exams
    - Perform surgical or invasive procedures where sterile barriers or aseptic techniques are used
    - Ancillary staff who have limited interactions (e.g., radiology technicians)
    - Family members or household contacts who:
        - Live with or have physical contact with the VRSA patient but do not meet the criteria for extensive interaction

Persons with minimal contact with VRSA patient include:

- Patients
    - On same ward but for short periods of time or while patient in CP
    - Seen in same outpatient clinic on same day as patient B. Nursing or patient-care providers who:
    - Work on the same floor without formal cross-coverage of patient
    - Perform predominately administrative duties
- Physicians who: Consult infrequently without extensive exam
    - Visit during teaching rounds only
- Ancillary staff who:
    - Monitor patient-care equipment and do not have known contact with secretions
    - Provide dietary or maintenance services and do not interact directly with the patient

Specimens for persons with moderate to little contact with VRSA patient:

Decisions about culturing those with moderate or minimal interactions should be made in consultation with public health authorities. In general, those with minimal interactions do not require screening unless there is substantial transmission among the other groups.

Culture of anterior nares, additional body site (groin, axilla, or peri-rectal area), and skin lesions (e.g., abscess or dermatitis, open wounds) should be considered.

APPENDIX D:

Organism	Drug Resistance	Precautions Clin Isolate	Precautions Colonization	Criteria to DC isolation	Ring Cultures	Env Cultures
A. baumannii	At least 1 drug in 3 or more drug classes	Contact	Contact	No clinical isolate of A.baumannii in last 12 months	No*	No*
A. baumannii	Carbapenem-resistant (CRAB)	Contact	Contact	Do not dc unless • **No clinical isolate of CRAB in last 12 months** • **No open wound**	If not isolated on admission	If not isolated on admission
Candida auris	All isolates	XDRO	XDRO	Requires ICHE approval. If approved, 2 neg axilla and groin cultures 1 week apart	If not isolated on admission	If not isolated on admission
Enterobacter sp.	Extended beta lactamases (ESBL)	Contact	Contact	No clinical isolate of ESBL in last 12 months	No*	No*
Enterobacter sp	Carbapenems (CRE)	Contact	Contact	Do not dc unless • **No clinical isolate of CRE in last 12 months** • **No open wound**	If not isolated on admission	If not isolated on admission
Enterococcus faecium or *E. faecalis*	Vancomycin	Contact	Contact	**No clinical isolate of VRE in last 12 months**	No*	No*
E. coli	Extended beta lactamases (ESBL)	Contact	Contact	No clinical isolate of ESBL in last 12 months	No*	No*
E. coli	Carbapenem R CRE)	Contact	Contact	Do not dc unless • **No clinical isolate of CRAB in last 12 months** • **No open wound**	If not isolated on admission	If not isolated on admission
Gram-negative bacilli not listed	Pan-resistant (not covered elsewhere)	XDR		Do not DC (consider on case-by-case basis)	If not isolated on admission	If not isolated on admission
K. pneumoniae, other	Extended beta lactamases (ESBL)	Contact	Contact	No clinical isolate of ESBL in last 12 months	No*	No*

Klebsiella species						
K. pneumoniae, other Klebsiella species	Carbapenem-resistant	Contact	Contact	Do not dc unless • **No clinical isolate of CRAB in last 12 months** • **No open wound**	If not isolated on admission	If not isolated on admission
K. pneumoniae, other Klebsiella species	Pan-resistant	XD Contact	XD Contact	Do not DC (consider on case-by-case basis)	If not isolated on admission	If not isolated on admission
Pseudomonas	Carbapenem resistant	Contact	Contact	Do not dc unless • **No clinical isolate of CRPA in last 12 months** • **No open wound**		
S. aureus	Methicillin (wounds ONLY)	Contact	Standard	No open, draining wounds	Only for outbreak	No
S aureus	Vancomycin (I or R)	Extremely drug resistant organisms (XD Contact)	XD Contact	No clinical isolate in last 12 months		

*Ring cultures and/or environmental cultures only if outbreak suspected.

APPENDIX E:
Candida auris Management Protocol

Purpose: To outline infection control procedures and steps to manage suspected and confirmed C. auris infections and colonization. This document is an extension of UTMB's "Transmission Based Precautions Policy" and may be modified based on new guidelines and risk assessments performed by ICHE.

Impact: *C. auris* is an emerging multidrug-resistant (MDR) yeast that has caused outbreaks of invasive healthcare-associated infections with high mortality. This organism represents a serious global health threat. Some strains of *C. auris* have elevated minimum inhibitory concentrations (MICs) to the three major classes of antifungals, severely limiting treatment options.

Screening for C. auris Colonization:
Screening for C. auris colonization will be implemented for high-risk patients on admission if indicated by a risk assessment and data supports an increase in cases in local areas.

1. **Who to screen:**
    a. All patients with a history of admission within the past 90 days from a long-term facility (skilled nursing facility (SNF), assisted living, nursing home (NH), long-term acute care, rehab, group home, etc) and TDCJ patients will be screened on admission. As determined by ICHE, additional populations may be screened depending on risk assessment.
    b. Transmission occurs via contact with an infected or colonized patient or environment. Thus, other patients with close contacts to patients with confirmed C.auris infection or their environment warrants screening. Two negative surveillance cultures are required at least one week apart.
    c. In the event of an outbreak, healthcare workers may also be screened at the discretion of infection control.
    d. Patients who have had an overnight stay in a healthcare facility outside the United States in the previous one year, especially if in a country with documented C. auris cases. Strongly consider screening when patients have had such inpatient healthcare exposures outside the United States and have infection or colonization with carbapenemase-producing Gram-negative bacteria. C. auris co-colonization with these organisms has been observed regularly.
2. **Steps to screen:**
    a. Identify high risk patients on admission and place in transmission based XDRO contact isolations (see Section E below) until further assessment and screening is completed.
    b. All High-risk patients identified by ICHE will be screened by collecting C. auris cultures from axilla and groin on each admission.
        i. Patients with no history or unknown history of C. auris will be screened on admission one time. Each chart will be reviewed by ICHE to confirm that one negative screen is sufficient to discontinue isolation. Infection Control will consider known outbreak locations to determine if additional screening is needed.
    c. Patients with history of C. auris will be on isolation indefinitely.
3. **Identification:** (from clinical isolates)

a. Diagnostic instruments based on matrix-assisted laser desorption/ionization-time of flight (MALDI-TOF) can differentiate *C. auris*, but not all devices currently include *C. auris* in the reference database to allow for detection.
b. Molecular methods based on sequencing the D1-D2 region of the 28s rDNA can also identify *C. auris*.
c. Diagnostic methods other than MALDI-TOF and sequencing may not be able to distinguish *C. auris* from other yeasts.

4. **Testing:**
   a. All specimens will be tested by PCR.
   b. Positive results will reflex to culture to meet state reporting requirements.
5. **Laboratory Safety Instructions:**
   a. Use at least lab coat and gloves, and eye protection if spatter or splash may occur.
   b. Use a biological safety cabinet (BSL2) when manipulating known or suspected *C. auris* isolates. *C. auris* can contaminate surfaces extensively, and it is difficult to eradicate. We do not know if *C. auris* can colonize the skin of otherwise healthy people. Yeast isolates confirmed **NOT** to be *C. auris* may be processed on the bench if your institution's safety policy allows.
   c. To disinfect surfaces contaminated with *C. auris*, use either 10% bleach (made fresh daily) or a product with Environmental Protection Agency (EPA) approval specifically for *C. auris*. Note that the list of products approved by EPA is being updated as more is learned about this emergent pathogen. The most recent list of approved products can be found in CDC's environmental disinfection guidance. It is important to note that products with *C. albicans* or fungicidal claims may not be effective against *C. auris*, and accumulating data indicate products solely dependent on quaternary ammonium compounds are **NOT** effective.
   d. After work with *C. auris* is complete, decontaminate the biological safety cabinet with 10% bleach (or another product from #3 above) for your institution's recommended contact time for this disinfectant (but for at least 10 minutes). Wipe off excess bleach solution after the recommended contact time is met (i.e., after at least 10 minutes). To minimize bleach damage to equipment, use 70% ethanol after bleach treatment.
   e. Remove PPE and clean hands before leaving the laboratory, according to your institution's policy and methods.
   f. Dispose of contaminated materials as infectious waste following your institution's standard guidelines.
   g. Perform environmental cultures on the safety cabinet and work bench used to work up C. auris cultures. Follow instructions below under "Sample Collection".

Transmission Based XDRO Contact Isolation Precautions:
Patients with positive cultures for C. auris will be placed in isolation for extremely drug-resistant organisms (XDRO) indefinitely (colonization or infected site). Patient who meets criteria for screening under section B.1. will require XDRO isolation until negative surveillance cultures are finalized.

The following steps are required to prevent transmission to patients, visitors and staff in patients who require isolation as above:

1. Colonization and infection with C. auris will be placed in XDRO contact isolation

2. **Door:** Place XDRO contact isolation sign on the patient door. This signage is to remain on the door until the room has been released by Infection Control for patient use.
3. Ensure availability of all necessary PPE
4. **Documentation:**
    a. An isolation order must be entered into the EMR each admission.
    b. "Flag" the patient's record to alert healthcare personnel to institute recommended infection control measures in case of readmission.
5. **Private Room:** necessary for all patients in this category.
6. **Limit Patient Contact** to those directly involved in patient care, no large teams.
7. **Visitors:** Limit to immediate family only. Require isolation attire (gowns, gloves, and mask) and require hand hygiene to enter and leave the room.
8. **Gloves** Wear gloves (clean, nonsterile gloves are adequate) when:
    a. Entering the room.
    b. Change gloves after having contact with infective material that may contain high concentrations of microorganisms (e.g., wound).
    c. Remove gloves before leaving the patients environment and wash hands immediately with an antimicrobial soap and water.
9. **Gowns:** Wear a gown when entering the room.
    a. Remove gown before leaving patient's room.
    b. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces.
10. **Facial Protection:** Wear surgical mask and eye protection during any aerosolizing procedures such as suction of respiratory secretions and intubation/extubation.
11. **Food Trays** Patients will be served meals on regular food trays.
12. **Patient Care Equipment:** dedicated to patient.
13. **Patient Transport** Limit the movement and transport of the patient from the room for essential purposes only. If the patient is transported, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or equipment. Patients on XDRO Contact Precautions must be transported on a stretcher or wheelchair covered with a sheet or other physical barrier. It is not necessary for the patient or the transporter to wear gown and/or gloves during transport. The transporter should wear a gown and gloves to assist the patient in and out of the wheelchair/stretcher. Use alcohol hand sanitizer or wash with an antimicrobial soap or after gloves are removed.

Notification

1. Communication of a new positive patient will be sent out to leadership to ensure all are aware.
2. When positive patients are discharged, nursing staff should notify their assigned Infection Preventionist or the Healthcare Epidemiology department.
3. Once the room has been appropriately cleaned by EVS, EVS should release the room.

Environmental Disinfection:

Patient room/environment and equipment will be disinfected with hospital approved products with EPA-registered claims for C. auris (List P: link below):

1. https://www.epa.gov/pesticide-registration/list-p-antimicrobial-products-registered-epa-claims-against-candida-auris
2. Preferred product on list P when adequate supply is available: Sodium Hypochlorite
3. When supply shortages are encountered, products on list K with EPA claims against Clostridioides difficile spores may be used: https://www.epa.gov/pesticide-registration/list-k-epas-registered-antimicrobial-products-effective-against-clostridium
4. **After discharge:**
    a. **Inpatient room:**
        i. Terminal cleaning of patient room and surrounding documentation spaces must be completed. Terminal includes removal of curtains, shower curtains, pillows, linen and surfaces that cannot be disinfected. These items should be bagged and removed prior to terminal cleaning commencing. Curtains and linen should be placed in the soiled utility room for laundering. Pillows should be disposed of with trash in the room.
        ii. Apart from the listed above items, all other items/equipment (i.e., IV poles, SCD machine, fans, bedside commode, etc.) must remain in the room until the room has been released by Infection Control.
        iii. Environmental swab collection may be performed after terminal cleaning is completed at the discretion of the ICHE department.
        iv. Confirmed positive Candida auris patient's room only: After discharge, the patient's room must remain closed until the following steps are met:
            - Two complete rounds of bleach-based terminal cleaning, followed by UV light disinfection, must be performed for the room to be released for use. See table 2 for reference.
            - If the patient has been in the room for less than 24 hours, one completed round of bleach-based terminal cleaning and UV light disinfection should be completed.
            - In the event of an outbreak, additional requirements may be implemented at the discretion of Healthcare Epidemiology that may include closing of the room until environmental sampling is collected and/or resulted.
        v. Rule-out Candida auris patient rooms (patient is discharged before lab result is available): After discharge, the patient's room must remain closed until the following steps are met:
            - One complete round of bleach-based terminal cleaning is complete. Additional action is at the discretion of infection control.
    b. **Hospital outpatient rooms/space, including all procedural areas:**
        i. Terminal cleaning of patient room/environment must be completed. Terminal includes removal of curtains, pillows, linen and surfaces that cannot be disinfected. These items should be bagged and removed prior to terminal cleaning commencing.
        ii. Procedural areas, including operations rooms and emergency departments/Outpatient room/space (e.g., Bay):

- If a rule-out or confirmed patient has been in the room, one complete round of bleach-based terminal cleaning and UV light treatment should be completed. Additional action is at the discretion of infection control.

5. **Environmental Surface Sampling:**
   Surface samples must be collected from high touch surfaces and patient equipment as follows:

   a. Inpatient:
      i. Isolation patient room
      ii. Surrounding documentation spaces
      iii. Medication room when requested by ICHE
      iv. Outbreak situations: additional environmental culturing will be required at the direction of ICHE
   b. Outpatient:
      i. Environmental culturing may be required at the direction of ICHE
      ii. Any exposed adjacent spaces when requested by ICHE.

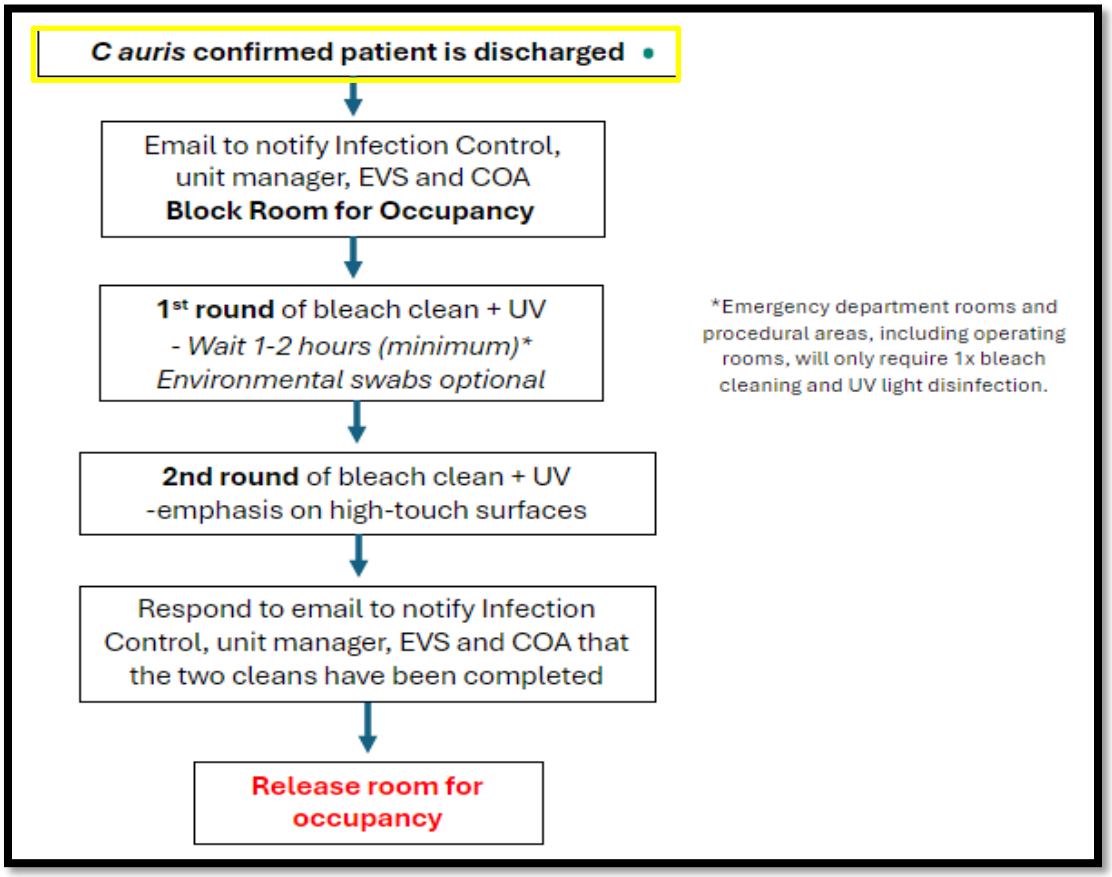
6. **Sample Collection:**
   a. Wash hands, don clean gloves, and mask. Change PPE between rooms/spaces.
   b. Use sterile water as a wetting agent.
   c. Swabs:
      - eSwab collection & preservation
        OR
      - Remel BactiSwab™: Liquid Stuart Plastic Shaft
   d. Poor sterile water in a sterile container. Use new sterile water and new sterile container for each room/space. Date sterile water bottle with the date opened and discard after 28 days.
   e. Dip swab once in sterile water and culture surface of interest.
   f. Place swab in tube.
   g. Label tube with printed labels

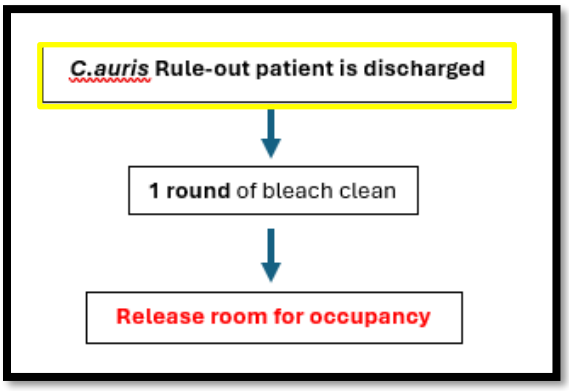
Table 1: Examples of high touch surfaces for sampling:

Room/Area High Touch Area	
Patient Room	
Swab 1	1. Door (includes handles and areas within the vicinity of the handle that people may touch) 2. Bed/Patient Chair/Call Light (includes bed rails and mattress) 3. Commit to Sit chair
Swab 2	4. IV pole (includes pole, handles and any pumps on the machine that remain) 5. Monitor (if applicable) 6. Monitor Leads 7. Workstation (includes keyboard, mouse, barcode scanner and screen)
Swab 3	8. Tables (overbed & patient side table) 9. Sink area (includes sink area and any shelving adjacent) 10. Visitor area (include the couch and any surface the visitor may touch)
Swab 4	11. Thermostat/O2 and Suction/Light switches (includes knobs and connections) 12. Bathroom (door, sink, shower chair, bedside commode, toilet)

Additional items within the room may be cultured at the discretion of ICHE staff (may include, but not limited to SCD machines, fans)

Table 2: Environmental Workflow





Appendix F:

Summary of Response Recommendations for MDRO Containment by Tier

Epidemic Stages	No cases identified Limited spread	Limited to moderate spread	Moderate to advanced spread	Endemic
Tiers with definitions	**Tier 1** Organisms or resistance mechanisms never or very rarely identified in the United States	**Tier 2** Mechanisms and organisms not regularly found in a region. Pan-not susceptible organisms with the potential for wider spread in a region	**Tier 3** Mechanisms and organisms regularly (i.e., frequently) found in a region but not endemic.	**Tier 4** Mechanisms and organisms that are endemic.
Healthcare Investigation[1]				
Review the patient's healthcare exposures prior to and after the positive culture	Always Typical review period: 30 days prior to culture collection to present	Always Typical review period: 30 days prior to culture collection to present	Always Typical review period: Current admission and sometimes immediately prior admission	**Prioritize prevention;** containment principles generally do not apply
Contact Investigation[1]				
Screening of healthcare contacts (i.e., residents and patients)[2]	Always	Always	Usually	**Prioritize prevention;** containment principles generally do not apply
Household contact screening	Usually	Rarely	Rarely	
Healthcare personnel screening	Usually	Rarely	Rarely	
Additional Actions if Transmission Identified in Healthcare				
Recurring response-driven point prevalence surveys[3]	Always	Always	Rarely	**Prioritize prevention;** containment principles generally do not apply
Evaluate potential spread to healthcare facilities that regularly share patients with the index healthcare facility[4]	Usually	Usually	Rarely	
Clinical Laboratory Surveillance				
Retrospective lab surveillance[6]	Always	Always	Rarely	**Prioritize prevention;** containment principles generally do not apply
Prospective lab surveillance[5]	Always	Always	Always	
Environmental Cultures				
Environmental sampling	Sometimes	Rarely	Rarely	**Prioritize prevention;** containment

				principles generally do not apply
Infection Control Measures				
Notify healthcare providers; promptly implement appropriate transmission-based precautions	Always	Always	Always	**Prioritize prevention;** containment principles generally do not apply
Infection control assessment with observations of practice	Always	Always	Sometimes	
Clear communication of patient status with transferring facilities	Always	Always	Always	

PPS: point prevalence survey

* ALWAYS: actions that should be a part of every response for a given response tier; USUALLY: actions that are indicated for most responses, but that might not be applicable for all novel and targeted MDRO responses for a given response tier; SOMETIMES: actions that that might apply, with implementation informed based on the specific scenario (including the setting and organism); RARELY: actions that generally are not performed for novel and targeted MDRO responses for organisms of a given response tier, but could be considered in certain situations. Decisions about implementing actions labeled “sometimes” or “rarely” should be made in consultation with public health.

[1] For Tier 1 and 2 organisms/mechanisms, healthcare exposures and healthcare contacts from the 30 days prior to identification of the target organism should be investigated unless information is available about the time the organism was most likely acquired. This includes any healthcare facility where the patient had an overnight stay during that time period. In some investigations, outpatient facilities and emergency departments might also be included. For Tier 3 organisms, investigation of healthcare exposures and healthcare contacts is generally limited to the current admission; however, if the admission immediately prior was within 30 days of specimen collection and occurred at a facility where the organism has never or rarely been identified, this may also be included in the investigation.

[2] This may include targeted screening of contacts at highest risk for acquisition and/or unit point prevalence surveys.

[3] Periodic (e.g., every two weeks) response-driven PPS should be conducted until transmission is controlled, defined as two consecutive PPS with no new cases identified or, in facilities with high colonization pressure, substantially decreased transmission. If high levels of transmission persist across multiple point prevalence surveys in long-term care settings, consider increasing the interval between surveys (e.g., performing every 4-6 weeks) or temporarily pausing them while reassessing infection control and implementing interventions.

[4] Conduct a laboratory lookback covering at least 6 months (Tier 1) and 3 months (Tier 2) prior to identification of index case.

[5] Prospective surveillance of clinical cultures should be conducted for 3 months after the last identified case.

[6] A public health investigation should also be initiated at healthcare facilities known to regularly share patients with healthcare facilities where transmission has occurred, such as post-acute care facilities. At a minimum, this should include notification of the facility and a request to retrospectively and prospectively evaluate clinical cultures for the phenotype of interest. This could also include admission screening of patients at the facility (e.g., transfers from the index facility) and/or point prevalence surveys of high-risk patients or units

Appendix G

Antibiotic Classification

Class	Generic	Brand
Aminoglycosides	Amikacin	Amikin
	Gentamicin	Garamycin
	Tobramycin	Nebcin
Carbapenems	Ertapenem	Invanz
	Imipenem/cilastatin	Primaxin
	Meropenem	Merrem
First generation cephalosporins	Cefadroxin	Duricef
	Cefazolin	Ancef
	Cephalexin	Keflex
Second generation cephalosporins	Cefaclor	Ceclor
	Cefoxitin	
	Cefotetan	Cefotan
	Cefuroxime	Ceftin
Third generation cephalosporins	Cefixime	Suprax
	Cefdinir	Omnicef
	Cefpodoxime	Vantin
	Ceftazidime	Fortaz
	Ceftriaxone	Rocephin
Fourth generation cephalosporins	Cefepime	Maxipime
Fifth generation cephalosporins	Ceftaroline	Teflaro
	Ceftobiprole	Zeftera
Glycopeptides	Vancomycin	Vancocin
	Telavancin	Vibativ
	Dalbavancin	Dalvance
	Oritavancin	Orbativ
Lincosamides	Clindamycin	Cleocin
Lipopeptide	Daptomycin	Cubicin
Macrolide	Azithromycin	Zithromax
	Clarithromycin	Biaxin
	Erythromycin	Erythocin
Monobactam	Aztreonam	Azactam
Nitrofurans	Nitrofurantoin	Macrobid/Macrodantin
Oxazolidinones	Linezolid	Zyvox
	Tedizolid	Sivextro
Penicillins	Amoxicillin	Amoxil
	Ampicillin	
	Dicloxacillin	
	Nafcillin	
	Methicillin	
	Oxacillin	
	Penicillin G	
	Penicillin V	

	Piperacillin	
Beta lactam/beta lactamase inhibitors	Aztreonam/avibactam	Emblaveo
	Amoxicillin/clavulanate	Augmentin
	Ampicillin/sulbactam	Unasyn
	Piperacillin/tazobactam	Zosyn
	Ceftazidime/avibactam	Avycaz
	Ceftolozane/tazobactam	Zerbaxa
	Meropenem/vaborbactam	Vabomere
	Impenem/cilastatin/relebactam	Recarbrio
Polymyxins	Polymyxin B	
	Colistin	
Quinolones	Ciprofloxacin	Cipro
	Levofloxacin	Levaquin
	Moxifloxacin	Avelox
	Delafloxacin	Baxdela
Sulfonamides	Trimethoprim/sulfamethoxazole	Bactrim
Tetracyclines	Doxycycline	VIbramycin
	Minocycline	Minocin
	Tetracycline	
	Omadacycline	Nuzyra
	Eravacycline	Xerava
	Tigecycline	Tygacil
Other	Metronidazole	Flagyl
	Fosfomycin	Monurol

References:

1. Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, June 2007. 2007 Guideline for Isolation Precautions:
2. Infection Prevention and Control Recommendations for Patients in U.S. Hospitals who are Suspected or Confirmed to have Selected Viral Hemorrhagic Fevers (VHF) | Viral Hemorrhagic Fevers (VHFs) | CDC, October 31, 2024
3. Guidance for Control of Carbapenem-Resistent Enterobacteriaceae, 2012 CRE Tooklit
4. Infection Control Guidance: Candida auris | Candida auris (C. auris) | CDC. April 24, 2024
5. Shenoy, E.S. et al. CID 2013:57 (15 July). Discontinuation of Contact Precautions for Methicillin-Resistant Staphylococcus aureus: A Randomized Controlled Trial Comparing Passive and Active Screening with Culture and Polymerase Chain Reaction.
6. Cidoctaro P, Flaks-Manov, Oved M, Schattner A, et al, Predictors of persistent carbapenem-resistant Enterobacteriaceae carriage upon readmission and score development. Infect Control Hosp Epidemiol 2016; 37:188-196.

7. Goodman KE, Simner PJ, Tamma PD, Milstone AM. Infection control implications of heterogeneous resistance mechanisms in carbapenem-resistant Enterbacteriacea (CRE). Expert Rev AntiInfect Ther; 2016:95-108
8. Investigation and Control of Vancomycin- Resistant Staphylococcus aureus (VRSA): 2015 Update, Division of Healthcare Quality Promotion Centers for Disease Control and Prevention Updated: April 2015
9. Popoola A et al. Infect Control Hosp Epidemiol. 2016. Active Surveillance Cultures and Decolonization to Reduce *Staphylococcus aureus* Infections in the Neonatal Intensive Care Unit.
10. Preeti, M.N. JAMA. 2014;311(14):1438-1439. doi:10.1001/jama.2014.1666. National Burden of Invasive Methicillin-Resistant *Staphylococcus aureus* Infection
11. A.-P. Magiorakos, A. Srinivasan, R. B. Carey, Y. Carmeli, M. E. Falagas, C. G. Giske, S. Harbarth, J. F. Hinndler et al. Multidrug-resistant, extensively drug-resistant and pandrug-resistant bacteria.... Clinical Microbiology and Infection, Vol 8, Iss. 3 first published 27 July 2011 [via Wiley Online Library].
12. CDC. Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms (MDROs): Updated December 2022
13. CDC. Antibiotic Resistance Threats in the United States, 2013. ar-threats-2013-508.pdf
14. Background F. Environmental-Sampling: January 8, 2024. F. Environmental Sampling | Infection Control | CDC
    A. Infection Prevention and Control for Candida auris: https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html
    B. Infection Control & Healthcare Epidemiology Policies and Procedures: 01.19 – Isolation Precautions
    C. Safety Guidelines for Working with C. auris isolates | Candida auris (C. auris) | CDC
15. Texas Antibiotic Resistance Lab Network Response Plan and Epi-Lab Work Plan

    ARLN Response Plan | July 2023