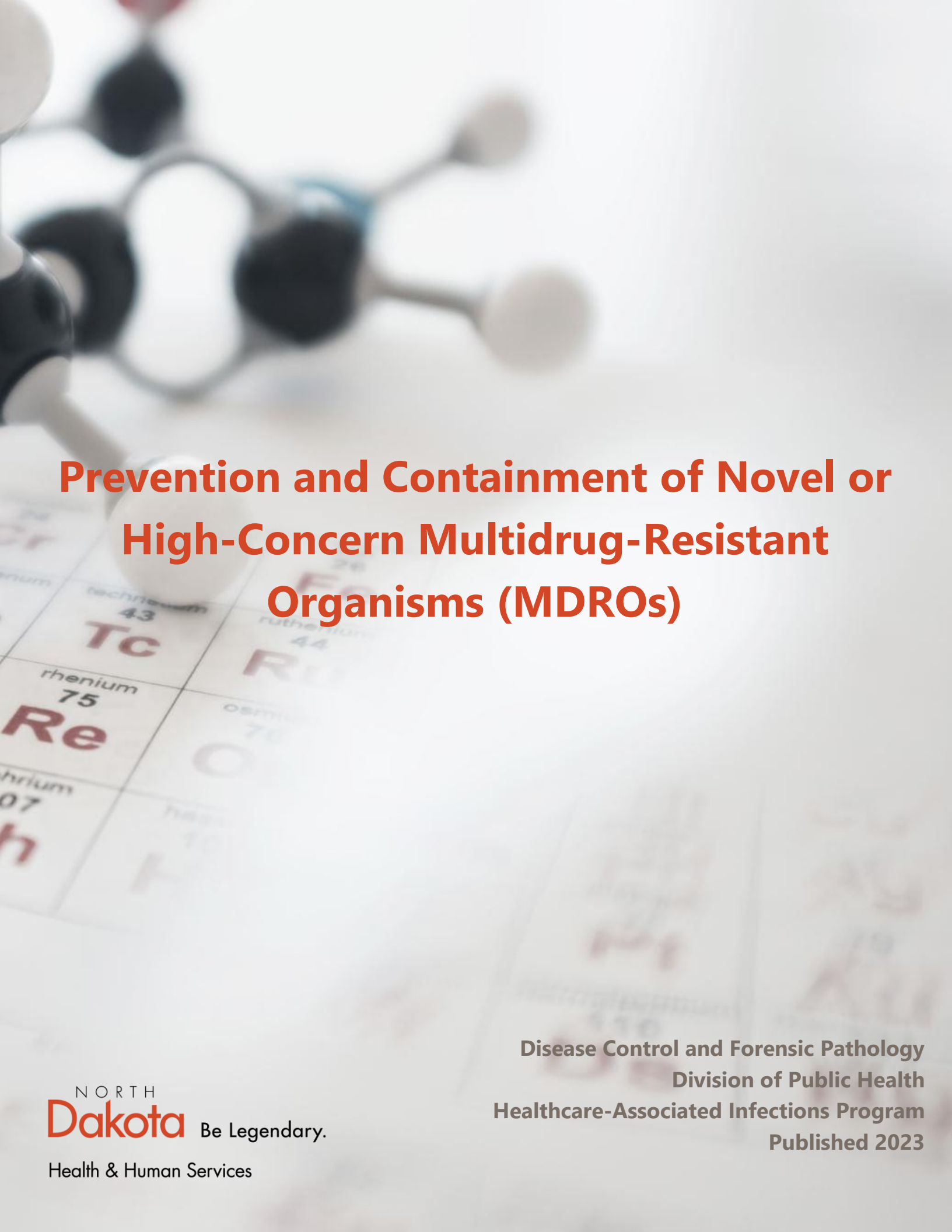

Prevention and Containment of Novel or High-Concern Multidrug-Resistant Organisms (MDROs)

Disease Control and Forensic Pathology
Division of Public Health
Healthcare-Associated Infections Program
Published 2023

NORTH Dakota Be Legendary.
Health & Human Services

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Roles and Responsibilities

The Healthcare-Associated Infection/Infection Prevention/Antibiotic Resistance (HAI/IP/AR) Coordinator and HAI Program Manager will oversee development and advancement of MDRO Prevention Strategies.

- Strategy 1: Conduct Education- plan to provide education on overall IPC prevent transmission in multiple different formats.
- Strategy 2: Improve IPC Practices- includes conducting prevention-based assessments before a concern or outbreak arises and focuses on higher risk settings.
- Strategy 3: Improve Communication- will continue to share resources via list serves and on quarterly IP calls.

The coordinator along with the HAI/MDRO and Outbreak Lead investigates potential outbreaks of HAIs and collaborates with the response team and facility to prevent further disease transmission. The Coordinator and Outbreak Lead responds to breaches of infection control or device/medication contamination that can represent risk for disease transmission. They are also responsible for surveillance and response activities related to multidrug-resistant organisms (MDROs), including novel, resistant organisms and supports antimicrobial stewardship and other prevention initiatives. During response activities the Coordinator and Outbreak Lead are responsible for the following:

- Coordinate the investigation, develop supplemental questionnaires, and collect data (interviews and/or chart reviews).
- Determine appropriate response tier based on laboratory and epidemiological information.
- Conduct on-site infection control assessment based on response tier.
- Coordinate with Division of Microbiology to collect appropriate specimens and coordinate screening logistics.
- Notify the Centers for Disease Control and Prevention (CDC) HAI program as needed at haioutbreak@cdc.gov.
- Provide recommendations to contain transmission.
- Analyze response data and complete report.

The AR Expert is an infectious disease physician who has experience in epidemiology and antibiotic stewardship program development. The AR Expert provides technical assistance to the HAI Coordinator and Program Manager for AR/AS interventions, assists with interpretation of data, and provides guidance for containment and prevention of MDROs and other organisms of high concern. During response activities the AR Expert is responsible for the following:

- Provide guidance during response activities to help ensure containment.
- Advise containment recommendations to program staff.
- Provide clinical guidance based on laboratory and epidemiologic interpretation.

The HAI Program Manager administers HAI activities and projects, including prevention activities and outbreak response. During these activities the Program Manager is responsible for the following:

- Assist with investigation coordination, including coordinating with the Division of Microbiology.
- Directs outbreak response priorities and containment response decisions.

- Ensures appropriate communication and notification of response to public health partners, providers, and NDHHS senior leadership.
- Assists with on-site infection control assessments and containment recommendations.

The AR Lab Expert receives isolates from clinical labs throughout the state. When these isolates are in-house the AR Lab Expert tests them for antibiotic resistance and carbapenem resistance genes. When an isolate that has a resistance gene is identified, our AR partners are notified. The AR Lab Expert works with our regional lab to provide surveillance testing as requested by the AR Expert, HAI Coordinator, Outbreak Lead and Program Manager. This testing will help determine if transmission has occurred in a certain area. During response activities the AR Lab Expert is responsible for the following:

- Provide guidance on and help coordinate sample collection, shipping, and handling.
- Coordinate with the Division of Disease Control, AR Regional Laboratory, and the CDC.
- Inform North Dakota clinical laboratories as needed.
- Communicate laboratory results to the HAI Coordinator, Outbreak Lead and Program Manager and report to CDC as required.

North Dakota's public health system is decentralized with 28 autonomous local public health agencies that have branch offices in 53 counties. The epidemiological and laboratory capacity for infectious and communicable diseases, and outbreak/containment response are provided by the NDHHS Infectious Diseases and Epidemiology Unit and Laboratory Services Section. Local public health departments will be notified by their regional field epidemiologist of a containment response. Assistance from local public health departments for a containment response will be made if local personal is needed for logistical purposes or if state capacity to respond is exceeded.

Along with the surveillance testing the Laboratory Services Section also utilizes our regional AR lab for more specialized testing. This testing includes:

- Confirmation of laboratory results that we find discrepant.
- Supply identification and susceptibility testing for *Candida auris*.
- Provide carbapenem resistance and gene testing for *Acinetobacter baumannii*.

Goal and Purpose of Prevention

Conduct Education to Influential and Highly Connected Facilities

Improve IPC Practices through Prevention-driven IPC Assessments

Facilitate Communication between Healthcare Facilities and HHS

This document also serves as guidance for prevention of novel or targeted multidrug-resistant organisms or resistance mechanisms. Starting MDRO prevention activities early is expected to avert the greatest number of transmissions related to delayed intervention. The relative impact of different prevention activities varies by facility risk category and the epidemiologic stage of an MDRO. In non-endemic settings, MDRO prevalence is expected to continue to rise despite the use of prevention strategies, but at a slower rate compared to if these strategies are not implemented.

Prevention Operating Procedure

This proactive approach to MDRO detection is predicted to limit spread more effectively and efficiently than response-based strategies alone. The activities in the MDRO Prevention Plan complement the MDRO Containment strategies described throughout this document.

I. In preparation to implement prevention activities HAI Coordinator, Outbreak Lead, and HAI Program Manager will coordinate and seek input from the HAI/AR Engagement Committee.
II. Outreach for prevention activities will cover the entirety of North Dakota's high-risk facilities which have been identified and includes two Long-Term Acute Care Facilities (LTAC) and seventy-eight Skilled Nursing Facilities (SNFs).
III. MDROs of focus include *Candida auris*, carbapenemase producing Carbapenem-resistant Enterobacterales (CP-CRE), carbapenemase producing Carbapenem-resistant *Pseudomonas aeruginosa* (CP-CRPA), carbapenemase producing Carbapenem-resistant *Acinetobacter baumannii* (CP-CRAB) and pan-resistant organisms.
IV. In order to improve local clinical laboratory capacity to identify Carbapenem-resistant organisms (CROs), NDHHS Laboratory Services plans to make sure each clinical lab has current CLSI guidelines and determine what resources they might need to screen isolates and will also assess if clinical labs have the ability to ship isolates to the ND Public Health Laboratory.
    a. ND Public Health Lab will continue to run CARB-R cartridges on mCIM positive isolates. Any isolate that cannot be determined will get sent to MDH for confirmatory testing.

b. ND Public Health Lab has been able to expand the types of isolates being routinely submitted and has increased from just testing CRE's to expanding to do more than Enterobacteriaceae and Pseudomonas (i.e., CRAB).
c. NDHHS has already sent out information by email to all clinical laboratory contacts in the state to enhance isolate forwarding to the ND Public Health Lab. Furthermore, HAI Coordinator/Outbreak Lead will identify and notify lab AR Coordinator to follow up with laboratories and facilities that fail to submit specimens.

V. HAI Coordinator, Outbreak Lead and ICAR team will conduct education on core IPC practices and commonly identified gaps in healthcare facilities throughout the state. Education will occur in-person, remote and through webinars and short training videos.
   a. During MDRO and/or IPC-based assessments education will include transmission prevention via core prevention processes such as hand hygiene, proper PPE use and environmental services.
   b. ICARs are offered on a regular basis to facilities, especially when having a COVID-19 outbreak or have identified MDRO of concern.
   c. Education is offered on a continuous and as needed basis and if related to MDRO/outbreak then education would focus on these infectious diseases.
   d. For LTCFs, education will include use of enhanced barrier precautions to limit and prevent spread of novel and targeted MDROs.
   e. Types of healthcare personnel targeted for education would include but not limited to nurses, environmental services staff, certified nurse aids (CNAs), certified medication aids (CMAs), infection prevention specialists, therapist (PT, OT, ST), non-clinical staff, laundry, dietary, and activities staff.

VI. Additional education will focus on antimicrobial stewardship programs. This will be provided by Antibiotic Stewardship lead (AS Lead) contracted through North Dakota State University Center for Collaboration and Advancement in Pharmacy (NDSU CAP).
   a. AS Lead will also speak at conferences, IP quarterly calls, and webinars as requested.
   b. Education focuses on antimicrobial stewardship, promoting vaccines, MDROs including CRE, CRAB, C. Auris, and S. pneumoniae, as well as other infectious diseases and will occur remote and in-person.
   c. Targeted facility types for antimicrobial stewardship educations includes LTACHs, ACH, SNF, CAHs, and OP services.
   d. Physicians, nurses, infection preventionists and pharmacists are our targeted audience.
   e. AS Lead has also created a state antibiogram website to raise awareness of antibiotic resistance around North Dakota. To view antibiogram susceptibility information for your region, click here.

VII. HAI Coordinator, Outbreak Lead and ICAR Team will seek to improve IPC practices in higher-risk settings such as dialysis and LTACHs and in those experiencing outbreaks.
   a. Recurring MDRO-focused prevention ICARs will be offered to facilities with MDROs yearly and as needed depending on facility willingness to participate.
   b. Preferred method for ICARs is in-person and will target nurses, CNAs, CMAs, IPs, therapists, and other non-clinical staff.
   c. Facilities will be identified by reaching out to those who have outbreaks, follow-up with IPC issues, increased SIRs and CADs, known CPOs, and by request from facility.
   d. Practices that will be under observation during MDRO-targeted IPC assessments will include hand hygiene, environmental services, personal protective equipment, water management, laundry, transmission-based precautions, dietary, injection safety and point of care testing.

e. Feedback is provided to facilities verbally at time of in-person visit as well as written.
f. Plan to follow up with facilities by phone six months after assessment or if large number of gaps, we would prefer to do a follow up in-person.

VIII. Communication of updated recommendations, resources, emerging infectious diseases or outbreaks will be shared with facilities by sending to IP list serves. Quarterly MDRO reports will be presented on IP calls. Certain documents and/or resources may also be highlighted and shared on calls as well.

a. Education and training on best practice for communication from facilities to public health will occur on quarterly IP calls and updated documents such as updated reportable conditions document will be shared by email with any new additions or changes noted.
b. Health alerts for clinicians and laboratories when novel or targeted MDROs are identified in a region, or when response to changing epidemiology will be shared by email to contacts on IP list serves and on quarterly IP calls. AR Lab Coordinator would share these health alerts with clinical laboratories throughout the state.

Prevention Strategies

Conduct Education

Well-directed education can increase healthcare personnel and facility administration engagement and adherence to recommended interventions. Heath departments should educate healthcare personnel about strategies to detect and prevent the spread of novel and targeted MDROs, MDRO transmission fundamentals, IPC principles, and the characteristics of novel or targeted MDROs in their jurisdiction.

All facilities receiving infection control assessment and response (ICAR) activities will receive education on MDRO prevention and transmission with basic IPC actions (hand hygiene, PPE, cleaning, and disinfection, etc.,). In addition to this education, mini trainings on most common gaps identified during ICARs will be used during monthly TEAMs meetings to "Connect the Chain with HAI Team" to discuss how infection prevent is everyone's job. These mini training presentations will also be used to perform on-site education with frontline staff when gaps are observed during visits. Other group education opportunities include frontline healthcare workers and professionals' conferences.

Improve Infection Prevention and Control (IPC) Practices

Core IPC practices are designed to reduce pathogen transmission and infections among patient/residents at healthcare facilities across the continuum of care. Good adherence to these practices is predicted to limit transmission of novel and targeted MDROs overall.

Infection prevention and control assessments are an important part of prevention and containment responses. An IPC assessment can help identify possible issues that could contribute to transmission of MDROs. When a concerning MDRO is identified in a facility, stopping transmission is the priority. Direct observation of care and infection control practices may reveal issues not apparent if only reviewing policies and procedures with staff. Most of the time, the point of transmission is not identified, even with very detailed investigation and review. The basic elements of an infection control program and practices are designed to prevent the spread of infection in healthcare settings. Assessment can ensure these are in place and being practiced consistently to reduce the risk of transmission.

IPC assessments will be performed using a the CDC Infection Control Assessment and Response (ICAR) tools. Assessments will focus on domains most relevant to MDRO transmission by contact (i.e., hand hygiene, personal protective equipment use, environmental cleaning, reprocessing of medical equipment and devices (e.g., mobile medical equipment, devices and equipment used for respiratory care, dialysis machines) and practices to prevent transmission from wastewater plumbing). ICAR team will include observations of infection control practices and make verbal and written recommendations to address observed gaps. To improve IPC practices in skilled nursing facilities, MDRO Prevention Plans should include implementation of Enhanced Barrier Precautions (EBP).

IPC assessments will be conducted on-site whenever possible. If an on-site assessment cannot be conducted promptly, will consider performing a remote video assessment in the interim, prior to an on-site assessment. If multiple facilities are identified as part of the healthcare investigation, will consider using remote video assessment to rapidly initiate identification and mitigation of IPC gaps and determine which facilities to prioritize on-site assessments first. If a facility recently participated in a MDRO-focused infection control assessment (i.e., in the last three months, as part of MDRO response or prevention activities), a repeat assessment may not be needed. However, assess the facility's progress in mitigating previously identified infection control gaps.

Follow-up will be done with the facility within six months' time from the IPC assessment to assess if recommendations have been implemented or if potential gaps remain. If the facility was found with significant gaps during the initial assessment, the six-month follow-up will include a repeat assessment. Continued transmission will also warrant a repeat on-site assessment. Following any assessment, if corrections for identified gaps are not found to be corrected, continued follow-up will be made with additional hands-on education and assessment.

Facilitate Communication

Communication between healthcare facilities and public health, and between facilities that share patients/residents, is critical for maximizing the impact of other prevention strategies.

Communication between public health and healthcare facilities ensures situational awareness of MDRO epidemiology in the region and recommended measures to detect MDROs and prevent spread. Best practice updates, health alerts and new guidance documents will be shared by email to IP list serves as well as on Quarterly IP and Engagement Group calls.

Effective communication whenever a patient/resident infected or colonized with an MDRO is transferred within or between healthcare facilities, increases the likelihood appropriate IPC actions will be implemented continuously through transitions of care, decreasing the likelihood of MDROs spreading to others. At a minimum, the type of MDRO and the necessary infection control actions to be taken (e.g., implementation of Transmission-Based Precautions) should be communicated. An example North Dakota's interfacility transfer form is available here.

Goals and Purpose of Response

Identifying Affected Patient/residents	Ensuring Control Measures Implemented to Contain Spread	Determining if Transmission and Dissemination is Occruing

Characterizing the Organism or Mechanism to Guide Further Response Actions, Patient/resident Mangement, and Future Response

This document serves as guidance for the initial response for the containment of novel or targeted multidrug-resistant organisms or resistance mechanisms. It is not intended to describe all the actions that might be required for control of an outbreak (e.g., sustained transmission within a facility or region). In addition, further evaluation might be required based on the findings of the initial containment response.

Response Operating Procedure

MDRO AR alerts are received by the Infectious Diseases and Epidemiology Unit from the Laboratory Services Section. Tier 1 and Tier 2 organism alerts are verbally communicated to Disease Control because contact investigations usually are warranted and should be started promptly. Tier 3 organisms will have abbreviated response procedures and typically do not warrant an immediate alert response. For all Tiers, the facility where the patient/resident was admitted from prior to culture results should be notified of the results as well as the ordering facility. Surveillance data should be reviewed for additional cases reported from that facility.

The following procedure is intended for Tier 1 and Tier 2 AR alert notifications (steps may occur simultaneously and not necessarily in the order listed):

I. Verify with the AR Lab Expert the organism, resistance mechanism, and available susceptibilities.
II. AR Lab Expert notifies the ordering facility laboratory of the test results. The HAI Coordinator or Outbreak Lead notifies the facility's infection preventionist (IP) or director of nursing (DON).
III. Complete Maven case investigation if not done so already (field epidemiologist or HAI program staff).
    a. Review CSTE case definition if applicable - https://wwwn.cdc.gov/nndss/case-definitions.html.
    b. Ensure hospitalizations in previous 3 months are listed and if a novel mechanism (i.e., New Deli Metallo-B-lactamase) MUST have healthcare exposures outside the U.S. in past 12 months, including procedures and treatments completed.
    c. Depending on the organism, mechanism, and known epi, the HAI Coordinator or Outbreak Lead may need to collect additional healthcare exposure data than what is in our Electronic Disease

Surveillance System (EDSS), Maven. What data is collected is variable and determined on a case-by-case basis by the HAI Coordinator and/or HAI Program Manager. May utilize CRE, CRAB, Novel Enzyme Prod Gene Interview Form.docx created utilizing outbreak questionnaires from CDC and Minnesota Department of Health (MDH).

IV. If the organism was identified upon admission or shortly thereafter, notify the facility where the patient/resident was admitted from. The infection preventionist or director of nursing is the contact for notifications. Notification is made via a telephone call from the HAI Coordinator, Outbreak Lead, or another member of the HAI program to the facility contact.
    a. Collect risk/exposure information: roommate, patient/resident on contact isolation, indwelling devices of patient/resident and roommate (if applicable), continent (if not, is it contained), shared bathroom/shower/whirlpool, mobility, shared equipment, attend therapy/OT/PT/RT.

V. Review infection control data – ICAR assessments, facility history of recent MDRO cases, outbreak reports, recent survey with infection control issues, etc. This data is collected via phone conversation, review of laboratory reports, or chart review. Health Facilities can assist with acquisition of recent facility survey data.

VI. In certain situations, will notify supervisor, field epidemiologist, and AR Expert of the alert within 24 hours of receipt.

VII. Determine level of response based on laboratory and epidemiological data (e.g., Tier 1, Tier 2, or Tier 3).
    a. Decisions for testing and/or colonization screening of contacts will be made based on the response Tier (Tiered responses are described below) coupled with epidemiological data and information about the facility's infection control and prevention practices. The facility performing the colonization screening or providing patient/resident notification will also be consulted and provide input.
    b. Screening plan will be presented to Disease Control and Forensic Pathology Section Director and/or Assistant Director and the Laboratory Services Section Director or designee.
    c. The AR Regional Laboratory (MDH) will also be notified of the response plan for colonization screening – ARLNMN@state.mn.us or 651-201-5581.
    d. The CDC Division of Healthcare Quality Promotion are also available to consult for screening decisions – haioutbreak@cdc.gov.

VIII. Colonization screening and testing coordination is the responsibility of the HAI Coordinator, Outbreak Lead, AR Lab Expert, and HAI Program Manager. The MN AR Regional Laboratory should be kept informed during this process. MN AR Regional Lab will perform colonization screening or other containment testing and will also provide swabs for collection.
    a. If a minimal number of screenings are needed, the NDHHS Laboratory Services Section may conduct the testing – this is a joint-decision between the Disease Control HAI program and Laboratory Services Section.
    b. The HAI Coordinator or Outbreak Lead and facility IP/DON will decide what day specimen collection will take place. The AR Lab Expert and MN AR Regional Lab will be informed to ensure needed specimen holding times, testing supplies and staff are all in line with the plan. The MN AR Regional Lab will send swabs directly to the facility (or to the NDHHS at our request).
    c. Directions for collection can be found at Forms for the Infectious Disease Laboratory - MN Dept. of Health (state.mn.us)
    d. The facility will ship specimens directly to the MN AR Regional Lab using an account number provided by the MN AR Regional Lab. The MN AR Regional Lab has a spreadsheet that needs to accompany the specimens. Usually, the facility will complete this and include with the

specimens. Either the facility or the MN AR Regional Lab can provide a copy of the spreadsheet to the HAI Coordinator. An example of a submission spreadsheet is located in the ELC HAI folder located at X:\PROGRAM\ELC\Surveillance\HAI\ARLN and CRE K6.

IX. Colonization screening and testing results will be communicated through the following mechanisms:
   a. Tests performed at the NDHHS Laboratory Services Section – results sent to the submitting facility and HAI Coordinator, Outbreak Lead and Program Manager.
   b. Tests performed at the MN AR Regional Lab – results sent simultaneously to the submitting facility, HAI Coordinator, Outbreak Lead and Laboratory Services Section.
   c. The HAI Coordinator/Outbreak Lead will follow up with the facility IP or DON to ensure receipt of results and to discuss any needed implementation of infection control practices as a result of newly identified cases (if any).

X. Set up time for those involved in the response to be updated on response activities. Depending on the need, this can be done daily, weekly, bi-weekly, etc. The following positions are typically invited to the routine updates: HAI Coordinator, Outbreak Lead, Program Manager, Disease Control and Forensic Pathology Director and Assistant Director, Field Epidemiologist, Laboratory Services Section Director, AR Lab Expert, Health Facilities Director (if assisting with response), Communications Officer (if public notification, or media response), other people involved in the containment response (e.g., LPHU administrator, other epidemiologists involved in response).

XI. Decide if patient/resident notifications need to be made. Media and patient/resident notification resources can be found at https://www.cdc.gov/injectionsafety/pntoolkit/index.html. Sample letters are located at enter link for letters on x drive here: Y:\PROGRAM\ELC\Surveillance\HAI\Outbreaks\Breach Reports\PCM 2018

XII. Depending on the organism and situation, a look-back of specimens for the past 3-6 months may be warranted.

XIII. For all tiers, if on-going transmission is thought to be occurring, whole-genome sequencing will be coordinated and completed at MN AR Regional Lab. It will be the responsibility of AR Coordinator, HAI Coordinator and/or Outbreak Lead to ensure isolates are sent to NDPHL.

Data Collection and Management

Epidemiological data will be stored and managed in NDHHS's EDSS, Maven. A case in Maven will be created for every individual screened as a part of a containment response. If anyone tests or screens positive, the individual will be classified as a case and will have relevant epidemiological case information collected in Maven. Question packages in Maven include a standard set of questions for the identified organism if that organism is on the NDHHS mandatory reportable conditions list. If the organism is not explicitly listed on the mandatory reportable conditions list, it will be entered as an *Unexplained or Emerging Critical Illness/Death*. The outbreak module will be used to standardize data collection. Questions for case investigation will be developed in the outbreak module, outbreak questions tab, so that once the case is linked to the outbreak, the created questions will show up as a question package in the Maven case.

All containment responses will use the Maven outbreak module to manage response data and to link cases and individuals screened. If colonization screening is being performed, each individual screened will be entered as a case and linked to the event. The Maven outbreak module will be used to collect data such as, on-site assistance, number of cases, number screened, laboratory support, control measures implemented, etc. ICAR

assessments, health alerts, and other response documents will be attached to the event in the attachment section.

Targeted Organisms for Detection and Response

Tier 1 Organisms

- Organisms for which no current treatment options exist (pan-resistant) and that have the potential to spread more widely within a region.
- Organisms and resistance mechanisms that have never (or very rarely) been identified in the United State and for which experience is extremely limited and a more expensive evaluation is needed to define the risk for transmission.

Pan-Resistant Bacteria

Candida auris

Tier 2 Organisms

- MDROs that are primarily associated with healthcare settings and are not commonly identified in the region.
- Organisms may be found more commonly in other areas of the United States and information is available about how transmission of these organisms occurs and the groups primarily at risk.

Carbapenemase-producing *Enterobacteriaceae* with uncommon mechanisms.

- **New Deli Metallo-beta-Lactamase (NDM)**
- **Verona Integron-encoded Metallo-beta-Lactamase (VIM)**
- **Imipenemase Metallo-beta-Lactamase (IMP)**
- **Oxacillinase-48-type Carbapenemases (OXA-48)**

Carbapenemase-producing *Pseudomonas spp.* (may include other organisms with carbapenemase production)

Vancomycin-resistant *Staphylococcus aureus* (VRSA)

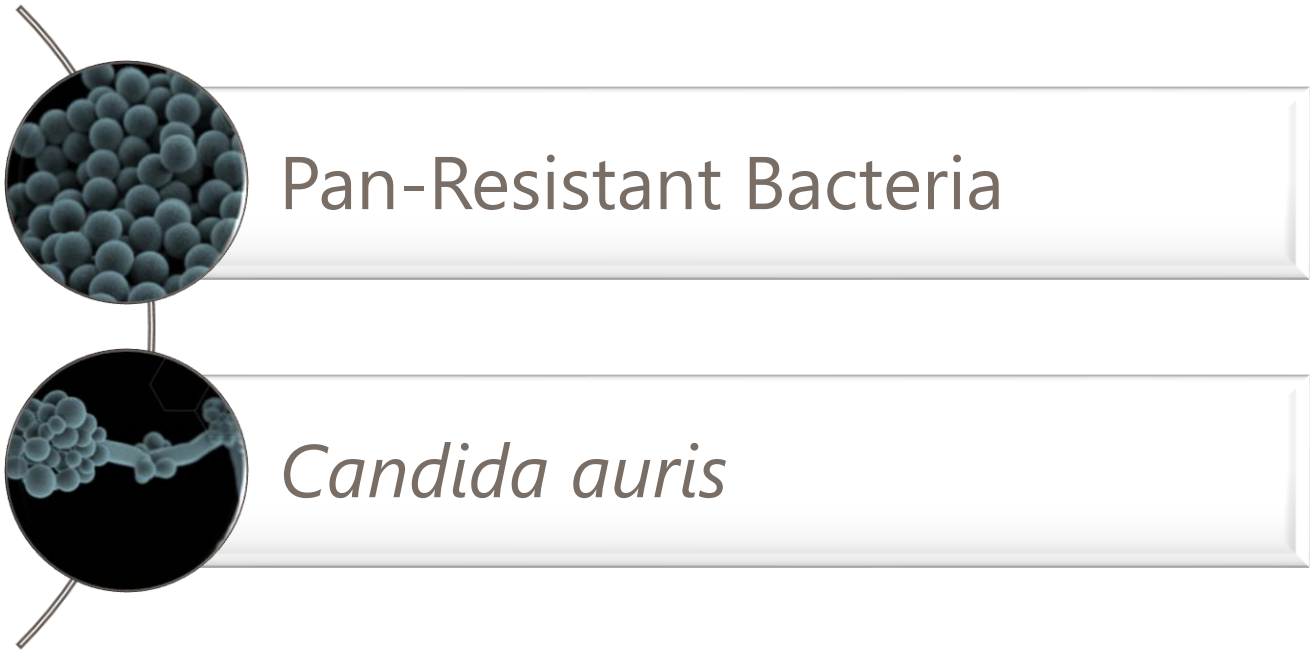
Carbapenem-resistant *Acinetobacter baumannii (CRAB)*

Carbapenemase-producing *Burkholderia cepacian*

Tier 3 Organisms

- MDROs targeted by the facility or region that have been identified regularly but are not considered to be endemic.
- Organisms may be found more commonly in other areas of the United States and information is available about how transmission of these organisms occurs and the groups primarily at risk.

Tier 1 Organisms



Initial Response Measures

- Upon identification of the organism or mechanism in a laboratory, the laboratory or healthcare facility should promptly notify the patient/resident's primary caregiver, patient/resident care personnel, and other healthcare staff per facility policies. Generally, local and state public health departments, and federal public health authorities should also be notified.
- If the index patient/resident is currently admitted to a healthcare facility:
    - Implement Contact Precautions for the index patient/resident until the health department and healthcare facility can assess the risk for transmission. Skilled nursing facilities considering use of Enhanced Barrier Precautions for a Tier 1 organism or mechanism should first consult with public health. Facilities should ensure adequate supplies are available to implement these measures and communicate any anticipated supply shortages to their public health authority.
    - Prioritize the facility where the index patient/resident is currently admitted for a rapid infection control assessment to identify and address any potential gaps in infection prevention and control.
- The patient/resident and family should be notified about the results and infection control measures.
- If the MDRO was present on admission, notification of the transferring facility should occur so appropriate review can occur at that facility.
- For Tier 1 organisms in which there is limited information regarding transmissibility and duration of colonization, periodic testing (e.g., monthly) of the index patient/resident and/or others found to be colonized should be conducted in consultation with public health to inform prevention measures.

- As there is often a time lag between specimen collection and identification of a novel organism or mechanism, retesting of the index patient/resident should be performed if more than a month has elapsed since collection of the specimen that yielded the Tier 1 organism.
- Retesting of the site(s) that were positive initially from clinical cultures is usually indicated, particularly non-sterile sites such as a wound or urine.
- Discontinuing Transmission-based precautions is not routinely recommended for patient/residents infected or colonized with Tier 1 organisms. Decisions about discontinuing Transmission-based Precautions should be made in consultation with public health authorities.

Healthcare Investigation

- Review the patient/resident's healthcare exposures from at least 30 days prior to the initial positive specimen collection up to the present. Exposures of interest include overnight stays in healthcare settings, outpatient visits, and home health visits to identify facilities where transmission could have occurred.
    - Prioritize collecting information about the index patient/resident's admission/discharge dates, care location(s) within a facility, presence and duration of roommates, types of care received (e.g., respiratory therapy, wound care, hemodialysis, invasive mechanical ventilation, functional status (e.g., bedbound, incontinent of stool), laboratory culture and screening results for the organism of interest, timing of healthcare facility implementation of transmission-based precautions (if any), and history of travel and/or healthcare outside the U.S. in the prior 12 months.
    - Additional epidemiological case level data such as chronic medical conditions, recent antimicrobial exposure, and detailed information about medical procedures may be gathered after the initial healthcare investigation commences, to avoid delays in assessing for and preventing spread.
- If information is available about the time that the organism was most likely acquired (e.g., patient/resident was hospitalized outside of the United States in a country where the organism and mechanism is known or believed to be common), then consider this period the risk period for transmission for investigation.
    - If the suspected time of acquisition is longer than 30 days prior to identification of the Tier 1 organism, review all healthcare exposures since the time of suspected acquisition, with particular focus on settings with high acuity and long lengths of stay.

Contact Investigation

In general, contact investigations should be initiated at all healthcare facilities (i.e., acute care hospitals and post-acute care facilities) identified as part of the healthcare investigation, prioritizing the facility where the index patient/resident is currently located and settings with highest risk of transmission, as determined by the healthcare investigation. Depending on the type of exposure and organism, contact investigations may also include healthcare facilities where the patient/resident received care but did not stay overnight (e.g., outpatient clinics) and community contacts. For most Tier 1 organisms, the

frequency and modes of transmission will not be well understood, and therefore screening approaches are more expansive than for Tier 2 and 3 organisms. Collaborate with the AR Lab Network and CDC for appropriate methods to detect Tier 1 organisms.

Patient/resident screening to assess for transmission:

- If the index patient/resident had an overnight stay in a healthcare facility, screen epidemiologically linked patient/residents regardless of whether the index patient/resident was being managed with Contact Precautions or Enhanced Barrier Precautions.
    - Screen patient/residents who shared a room or bathroom with the index patient/resident even if they have been discharged from the facility to another healthcare facility or a private residence.
    - Screen the patient/resident(s) *currently* admitted to rooms where the index patient/resident stayed at least one night in healthcare facilities identified during the healthcare investigation, due to the risk of persistent environmental contamination for some organisms (e.g., carbapenem-resistant *Acinetobacter baumannii*; *Candida auris*) and transmission through the premise plumbing for others (e.g., carbapenemase-producing Enterobacterales and *Pseudomonas spp*.).
    - Screen patient/residents who were on the same ward as the index patient/resident and/or patient/residents who shared healthcare personnel (HCP), including ancillary staff, if they are currently in a healthcare facility, even if it's a different facility from where they overlapped with the index case.
    - Perform point prevalence surveys (PPS) in units where the patient/resident was admitted.
    - If screening resources are limited, prioritize screening for patient/residents who overlapped with the index case on same unit for three or more days or with characteristics that increase their risk of MDRO acquisition (e.g., presence of invasive medical devices and lines, bedbound, etc.), and those currently in healthcare settings with high-acuity patient/residents and longer lengths of stay.
        - Flag charts of any contacts not screened for preemptive Contact Precautions and admission screening if these individuals are readmitted to the facility in the following six months.

Patient/resident screening when transmission is suspected or ongoing:

- Perform additional, wider point prevalence surveys if there is evidence or suspicion of ongoing transmission, such as clinical isolates from multiple patient/residents or if screening identifies new cases.
    - If contacts who have moved units or facilities are identified as cases, then contacts on the units where they have been admitted should also be screened to identify transmission.
    - Follow up point prevalence surveys are indicated to better define the extent of transmission and the epidemiology of the organism in the facility and the region.
        - On units with suspected or confirmed transmission, periodic (e.g., every two weeks) point prevalence surveys are generally recommended until transmission is controlled. Control of transmission may be demonstrated with two consecutive point prevalence surveys with no new MDRO cases identified or, in facilities with high colonization pressure (i.e., >30%), substantially decreased transmission.

        - Conduct a point prevalence survey at facilities (or on units) that frequently receive patient/residents from units with transmission to define the extent of spread.
    - If transmission does not decrease across multiple point prevalence surveys, consider pausing or increasing the interval between point prevalence surveys (e.g., performed every 4-6 weeks) while reassessing and implementing measures to improve infection control. Resume more frequent point prevalence surveys (e.g., every 2 weeks) after improving infection control.
        - Implement measures to prevent outbreaks at facilities that receive patient/residents from facilities with ongoing transmission. This could be discharge screening from the transferring facility or preemptive Contact Precautions and/or admission screening at receiving facilities.
    - Once control is achieved, some healthcare facilities may still have relatively high colonization pressure (i.e., prevalence). Consider continuing point prevalence surveys at these facilities at increasing intervals (e.g., monthly and then quarterly) to ensure control is maintained.
    - Implement broader measures to prevent further spread in the region Example measures include clinical alerts, education for clinical laboratories and healthcare facilities, prevention-driven infection control assessments and colonization screening, and improved interfacility communication.
- Screen outpatient/residents who were seen in the same clinic as the index patient/resident if contact between the patient/resident and the clinic healthcare personnel or environment was extensive (e.g., wound care, invasive procedure) or if patient/residents were exposed to common devices (e.g., whirlpools, endoscopes, etc.) and cleaning of the devices might not have been adequate.

Healthcare personnel screening:

- Screen HCP with extensive index patient/resident contact (e.g., high-contact patient/resident care activities such as bathing, toileting, wound care, or providing care to the patient/resident for an extended period) if the risk of HCP colonization following contact with a patient/resident colonized or infected with the novel organism/mechanism is not known or if epidemiology suggests that the organism may have spread to patient/residents from colonized or infected HCP or from colonized or infected patient/residents to HCP.
    - Home health workers who cared for the patient/resident for extended periods of time at home should also be considered among the potential HCP contacts.
    - Prior to screening HCP, decisions should be made about how colonized or infected HCP will be managed (e.g., work restrictions and rescreening).

Household contact screening:

- Screen close household contacts (e.g., contacts who help care for the index patient/resident or share a bed or bathroom with the patient/resident). Similarly, consider screening family and friends who do not reside with the index patient/resident but are physically cared for the patient/resident.
    - Screen additional household contacts if specific actions might be implemented for those found to be colonized. For example, if household contacts have health issues that might result in admission to a healthcare facility in the near future (e.g., following six months), screening results might influence the need for transmission-based precautions at admission.
    - If household contacts are HCP, prior to pursuing screening, consider what actions will be taken if they are colonized (e.g., work restrictions and rescreening).

Contact screening in other settings:

- Evaluate residential care settings, such as intermediate care facilities and some group homes, to determine if screening is appropriate:
    - Screen roommates and residents who share a bathroom or living space with the index patient/resident (e.g., use a common day room) or have common caregivers. This most typically will be all residents of a group home and all residents of a housing unit (e.g., a floor) in an intermediate care facility.
    - Consider screening staff if practices result in significant exposure to the staff member (e.g., assisting residents with MDROs with toileting and bathing without use of personal protective equipment or hand hygiene).
    - Prior to screening residents and staff in congregate living settings, decide how colonized or infected individuals will be managed (e.g., changing rooms or bathrooms for residents and work restrictions and rescreening for staff). Congregate living settings should not deny housing based on MDRO colonization.
- Some situations might warrant screening in other non-healthcare settings (e.g., resistant organism from a young child who attends daycare). As for all screening, a decision should be made prior to screening of what actions will be taken for a positive, negative, or indeterminate test result, and that information should be communicated to the patient/resident (or guardian) as part of the test consent process.

Clinical Laboratory Prospective and Retrospective Surveillance

- Clinical laboratories that perform cultures from healthcare facilities where the index patient/resident received care in the previous 30 days should be targeted for prospective and retrospective surveillance in order to identify organisms with similar resistance profiles from clinical cultures.
    - Perform *prospective* surveillance for at least 3 months after identification of the index patient/resident or, if transmission is identified through surveillance or screening, three months after the last case is identified.
        - Ensure the clinical laboratory promptly submits all isolates identified during prospective surveillance for resistance mechanism testing. The laboratory performing mechanism testing should save isolates because additional testing at public health laboratories might be indicated.
    - Perform *retrospective* surveillance (laboratory lookbacks) of results from these clinical laboratories to identify organisms with similar resistance patterns, extending six months prior to identification of the index case (or to the time of suspected acquisition, if shorter). If available, these retrospective isolates should be tested (e.g., at a public health laboratory) to see if they have the same resistance mechanism as the organism of interest.
- Prospective and retrospective surveillance approaches should augment, and are not intended to replace, state, tribal, local, and territorial case reporting, and isolate submission requirements.

Environmental Cultures

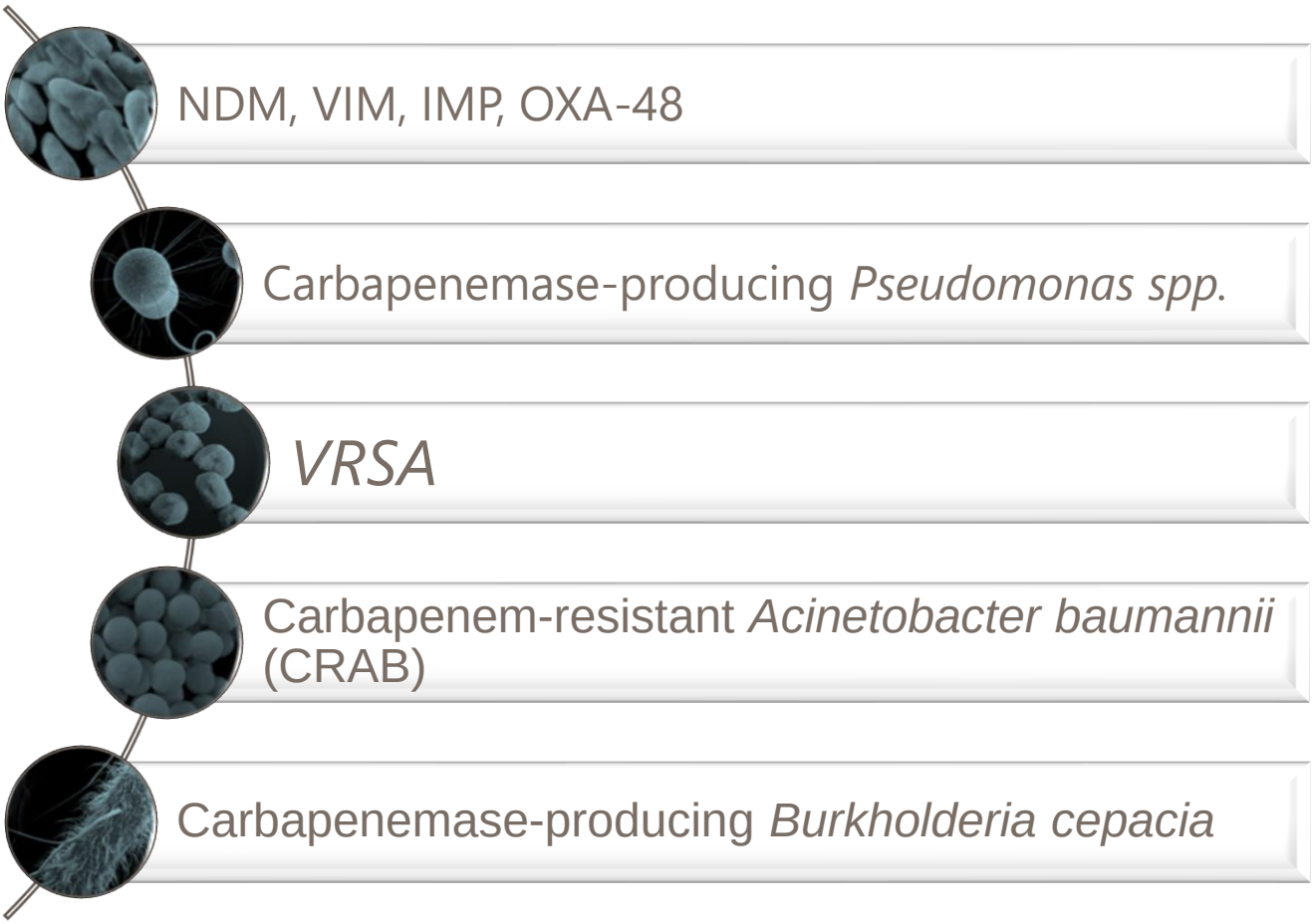
- The threshold to do environmental cultures should generally be lower for Tier 1 organisms than for organisms for which the role of the environment in transmission (e.g., environmental persistence, effectiveness of disinfectants) is understood. Cultures should primarily be reserved for:

- Organisms with a known persistence in the environment (e.g., Acinetobacter spp.) and transmission is identified or suspected.
- Situations in which questions about the degree to which an organism contaminates the environment or the effectiveness of standard cleaning and disinfection methods against the organism are unknown.
- Situations where epidemiological data suggest an environmental reservoir is contributing to transmission and transmission continues despite control measures.
- If questions are primarily about the completeness of cleaning, as opposed to environmental persistence and effectiveness of disinfectants in the clinical setting, then consider using non-culture-based techniques (e.g., removal of fluorescent markings) in lieu of or prior to culture-based approaches.

Adherence to Infection Control Measures

- Healthcare facilities should:
  - Educate and inform the HCP and index patient/resident's visitors about the organism and precautions to prevent transmission.
  - Ensure adequate supplies are available to implement Transmission-Based or Enhanced Barrier Precautions. Notify public health if adequate supplies are not available to implement recommended precautions.
  - Conduct ongoing adherence monitoring of infection control practices and provide feedback to HCPs.
  - Flag affected patient/residents' medical records to initiate appropriate infection control precautions upon readmission.
  - Make plans for how receiving facilities will be notified of affected patient/residents' MDRO status, if the patient/resident is transferred, including notification to health department prior to transfer.
- Health departments or other experts should conduct on-site IPC assessments at all healthcare facilities identified in the healthcare investigation (i.e., that cared for patient/residents with the targeted MDRO), regardless of whether transmission is identified, and any outpatient facilities where patient/residents or HCP may have had extensive contact with the index patient/resident.
  - If multiple healthcare facilities were identified as part of the healthcare investigation, prioritize assessments for the facility currently caring for the index patient/resident and high-acuity post-acute care facilities (e.g., LTACs)
  - If the patient/resident(s) with Tier 1 organisms will be transferred to another healthcare facility, provide education about the organism and precautions to prevent transmission. Consider proactively performing an infection control assessment, especially if the facility is a long-term care facility.
- Healthcare facilities and health departments should ensure the index patient/resident's MDRO status and required infection control precautions are communicated at transfer to higher or lower levels of care.
  - A decision to discharge a patient/resident from one level of care to another (e.g., moving a patient/resident from an intensive care unit to a medical ward) or to another healthcare facility should be based on clinical criteria and not colonization status.

Tier 2 Organisms



Initial Response Measures

- Upon identification of the organism or mechanism in a laboratory, the laboratory or healthcare facility should promptly notify the patient/resident's primary caregiver, patient/resident care personnel, and other healthcare staff per facility policies. Generally, local and state public health departments should also be notified.
- If the index patient/resident is currently admitted to a healthcare facility:
    - Health departments and healthcare facilities should ensure implementation of appropriate infection control measures (e.g., Contact Precautions), which may vary depending on the healthcare setting, and adequate supplies to implement these measures.
    - Prioritize the facility for rapid infection control assessment and address potential gaps in IPC.
- The patient/resident and family should be notified about the results and infection control measures.
- If the MDRO was present on admission, notification of the transferring facility should occur so appropriate review can occur at that facility.

Healthcare Investigation

- Review the patient/resident's healthcare exposures from at least 30 days prior to the initial positive specimen collection up to the present. Exposures of interest include overnight stays in healthcare settings, outpatient/resident visits, and home health visits to identify facilities where transmission could have occurred.
    - Prioritize collecting information about the index patient/resident's admission/discharge dates, care location(s) within a facility, presence and duration of roommates, types of care received (e.g., respiratory therapy, wound care, hemodialysis, invasive mechanical ventilation, functional status (e.g., bedbound, incontinent of stool), laboratory culture and screening results for the organism of interest, timing of healthcare facility implementation of transmission-based precautions (if any), and history of travel and/or healthcare outside the U.S. in the prior 12 months.
    - Additional epidemiological case level data such as chronic medical conditions, recent antimicrobial exposure, and detailed information about medical procedures may be gathered after the initial healthcare investigation commences, to avoid delays in assessing for and preventing spread.
- If information is available about the time that the organism was most likely acquired (e.g., patient/resident was hospitalized outside of the United States in a country where the organism and mechanism is known or believed to be common), then consider this period the risk period for transmission for investigation. If this period is longer than 30 days, review the entire period from the time of suspected acquisition for healthcare exposures.

Contact Investigation

In general, the recommendations below apply to inpatient healthcare exposures of the index-patient in the 30 days prior to the identification of the target organism, unless information is available about the time that the organism was most likely acquired. If the target organism is identified after an index-patient is transferred to a different facility (e.g., transfer from an acute care hospital to a post-acute care facility) a contact investigation should be initiated at both facilities. Depending on the type of exposure and organism, contact investigations may sometimes include healthcare facilities where the patient/resident received care but did not stay overnight (e.g., outpatient clinics) and community contacts.

Patient/resident screening to assess for transmission:

- If the index patient/resident had recent inpatient healthcare exposure, screen epidemiologically linked patient/residents. Screening should occur even if the index patient/resident was being managed with Contact Precautions or Enhanced Barrier Precautions (see exceptions below).
    - Screen roommates and patient/residents who shared a bathroom with the index patient/resident. Screen these contacts even if they have been discharged from the facility to another inpatient setting. If discharged to home, consider notifying the contact and offering screening or flagging the chart to facilitate preemptive Contact Precautions and admission screening if they are readmitted in the next six months.

- Screen the patient/resident currently admitted to room(s) and bed spaces where the index patient/resident stayed at least one night in healthcare facilities identified during the healthcare investigation, due to the risk of persistent environmental contamination for some organisms (e.g., carbapenem-resistant *Acinetobacter baumannii* or *Candida auris*) and transmission through the premise plumbing for others (e.g., carbapenemase-producing Enterobacterales and *Pseudomonas spp*.).
- In most situations, perform broader screening to comprehensively assess for transmission.
- Options - Broader screening using point prevalence surveys is preferred. Alternatively, broader screening may initially target contacts who are at higher risk due to overlap on the same ward as the index patient/resident and presence of a risk factor for MDRO acquisition (e.g., bedbound, high levels of care, receipt of antimicrobials, or mechanical ventilation), and who are still admitted.
- Considerations - When deciding whether to use a risk-factor-based approach, PPS, or both strategies in combination, consider individual facility characteristics, local epidemiology, characteristics of index patient/resident, feasibility of identifying contacts, and laboratory capacity.
    - If it will take several days to identify higher risk contacts or if most higher risk contacts have been discharged from a facility, perform a unit-wide point prevalence survey promptly.
    - Consider flagging charts of contacts who have been discharged, to facilitate preemptive Contact Precautions and admission screening if they are readmitted in the next six months. If these individuals have been discharged to high-acuity post-acute care, health departments should consider screening these individuals.
- Prioritization - A healthcare investigation can identify multiple healthcare facilities where the index patient/resident had contacts. Prioritize the most extensive contact screening (e.g., both screening of higher risk contacts and unit-wide PPS) for:
    - Healthcare settings with high acuity patient/residents and longer lengths of stay, including some hospital units with longer lengths of stay and patient/residents at higher risk of MDRO acquisition and infection (e.g., burn ICU, units that care for solid organ or hematopoietic transplant patient/residents).
    - Any setting where the index case likely acquired the organism during their stay (e.g., targeted organism identified in patient/resident without any risk factors prior to hospitalization).
- Exceptions - In some situations, broader screening may not be recommended by public health. For example,
    - During a response to a single case in an acute care hospital unit with a short average length of stay where patient/residents are ambulatory and not mechanically ventilated, broader screening could be limited to situations where the index case is currently admitted or recently discharged (<7 days prior).
    - If the index patient/resident's length of stay was very short (e.g., <24 hours), screening may not be indicated.

- For cases with organisms having novel mechanisms identified and who have also received healthcare out of the US in the past 12 months, we will notify CDC via email: HAIAR@cdc.gov

Patient/resident screening when transmission is suspected or ongoing:

- Wider point prevalence surveys are indicated if there is evidence or suspicion for ongoing transmission (e.g., isolates from multiple patient/residents) or if initial targeted screening of high-risk patient/residents identifies new cases.
    - If new cases are identified, periodic (e.g., every two weeks) point prevalence surveys are recommended until transmission is controlled. Control is generally defined as two consecutive point prevalence surveys with no new MDRO cases identified, or, in facilities with high colonization pressure (i.e., >30%), substantially decreased transmission.
        - In healthcare facilities with high colonization pressure, consider continuing point prevalence surveys at increasing intervals (e.g., monthly, and then quarterly) after transmission is controlled, to ensure transmission remains low.
        - Assess whether facilities would benefit from proactive, prevention-focused point prevalence surveys and infection control assessments after response activities conclude.
    - 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.
        - If screening is paused or performed with reduced frequency, implement measures such as admission screening from facilities with ongoing transmission or preemptive Contact Precautions and/or admission screening at receiving facilities to prevent new outbreaks.
    - Admission screening can help distinguish importation from ongoing transmission within a healthcare facility, such as in situations where the Tier 2 organism or mechanism is believed to be present at other facilities in the region.
        - Prioritize admission screening in settings with good adherence to recommended infection control practices, due to higher likelihood that identification on admission will reduce intra-facility transmission.
            - Public health laboratory-supported admission screening may be available for a time-limited period.
            - After an initial pilot period, the facility and public health should evaluate the utility of continuing admission screening as a long-term prevention strategy.
        - Implement measures to reduce the risk of further MDRO spread within the region at facilities known to regularly admit/receive patient/residents from the facility where transmission occurred. At a minimum, notify the facilities and request retrospective and prospective evaluation of clinical cultures to identify organisms with similar resistance patterns. Consider performing an infection control assessment and admission screening and/or PPSs, particularly at high-acuity post-acute care facilities, especially if the facility is not engaged in prevention activities or there has been a long interval between the last infection control assessment or point prevalence survey.
- Screen outpatient who were seen in the same clinic as the index patient/resident if contact between the patient/resident and the clinic healthcare personnel or environment was extensive (e.g., wound care, invasive procedure) and gaps in adherence to infection control practices are identified or if patient/residents were exposed to common devices (e.g., whirlpools, etc.) and infection control practices such as cleaning of the devices may not have been adequate.

- Rescreening patient/residents known to have the novel or targeted MDRO that is the focus of the investigation is not recommended.

Healthcare personnel screening:

- In the absence of known or suspected transmission from HCP or other strong epidemiologic links, HCP screening **is not** recommended.

Household contact screening:

- Screen household contacts who have extensive contact (e.g., share a bed or assist with personal care) with the index patient/resident if the household contact has frequent inpatient healthcare exposure to determine if transmission-based precautions are necessary for their subsequent admissions.
- Consider screening other household contacts if household transmission is suspected.
- If household contacts are HCP, prior to pursuing screening consider what actions will be taken if they are colonized (e.g., work restrictions and rescreening).

Contact screening in other settings:

- Evaluate residential care settings to determine if screening is appropriate.
    - Prioritize roommates and residents who share a bathroom with the index patient/resident and residents with frequent inpatient exposure. If transmission is identified, consider broader screening to inform infection control measures in the facility (e.g., dedicating certain bathrooms for use by positive or negative residents) and in the event the resident is transferred to a higher level of care.
    - Consider screening staff if practices result in significant exposure to the staff member (e.g., assisting residents with MDROs with toileting and bathing without use of personal protective equipment or hand hygiene) and the staff member has frequent hospital admissions, or if there is known or suspected transmission to or from a staff member.
    - Prior to screening residents and staff in residential care settings, decide how colonized or infected individuals will be managed (e.g., changing rooms or bathrooms for residents, work restrictions and rescreening for staff). Congregate living settings should not deny housing based on MDRO colonization.
        - Some situations might warrant screening in other non-healthcare settings (e.g., resistant organism from a veterinary setting or a young child who attends daycare), where the risk of transmission is not well-understood but is theoretically high, or experience has demonstrated potential for transmission.

Clinical Laboratory Prospective and Retrospective Surveillance

- Engage clinical microbiology laboratories that serve healthcare facilities identified in the healthcare investigation (or in the period since suspected acquisition) for prospective and retrospective surveillance to identify organisms with similar resistance profiles from clinical cultures.
- Laboratories should perform prospective surveillance for at least three months after identification of the index patient/resident or, if transmission is identified through surveillance or screening, three months after the last case is identified.

- All isolates identified during prospective surveillance should be promptly tested to investigate whether they have the same mechanism of resistance as the index case; isolates should be saved as additional testing at the state, regional or CDC laboratory might be indicated.

- Perform retrospective surveillance (laboratory lookbacks) of results from these clinical laboratories to identify organisms with similar resistance patterns, extending three months prior to identification of the index case (or to the time of suspected acquisition, if shorter). If available, these retrospective isolates should be tested (e.g., at a public health laboratory) to see if they have the same mechanism of resistance as the index case.

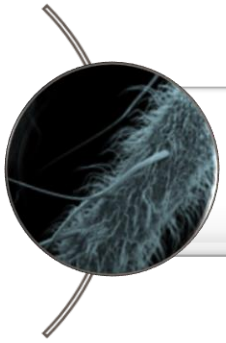
Environmental Cultures

- Environmental cultures are recommended only if transmission is identified or suspected and there is epidemiologic evidence implicating an environmental reservoir in ongoing transmission.

Adherence to Infection Control Measures

- Healthcare facilities should:
  - Educate and inform the HCP and index patient/resident's visitors about the organism and precautions to prevent transmission.
  - Ensure adequate supplies are available to implement Transmission-Based or Enhanced Barrier Precautions. Notify public health if adequate supplies are not available to implement recommended precautions.
  - Conduct ongoing adherence monitoring of infection control practices and provide feedback to HCPs.
  - Flag affected patient/residents' medical records to initiate appropriate infection control precautions upon readmission.
  - Make plans for how receiving facilities will be notified of affected patient/residents' MDRO status, if the patient/resident is transferred, including notification to health department prior to transfer.
- Health departments or other experts should conduct on-site IPC assessments at all healthcare facilities identified in the healthcare investigation (i.e., that cared for patient/residents with the targeted MDRO), regardless of whether transmission is identified, and any outpatient facilities where patient/residents or HCP may have had extensive contact with the index patient/resident.
  - If multiple healthcare facilities were identified as part of the healthcare investigation, prioritize assessments for the facility currently caring for the index patient/resident and high-acuity post-acute care facilities (e.g., LTACHs)
- Healthcare facilities and health departments should ensure the index patient/resident's MDRO status and required infection control precautions are communicated at transfer to higher or lower levels of care.
  - A decision to discharge a patient/resident from one level of care to another (e.g., moving a patient from an intensive care unit to a medical ward) or to another healthcare facility should be based on clinical criteria and not colonization status.
- In general, screening individuals with a history of colonization or infection with a targeted MDRO with the aim of discontinuing transmission-based precautions is not recommended.

Tier 3 Organisms



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Initial Response Measures

- Upon identification of the organism or mechanism in a laboratory, the laboratory or healthcare facility should promptly notify the patient/resident's primary caregiver, patient/resident care personnel, and other healthcare staff per facility policies. Depending on local regulations, state or local health departments might need to be notified.
- Health departments and healthcare facilities should ensure implementation of appropriate infection control measures (e.g., Contact Precautions, Enhanced Barrier Precautions), which may vary depending on the healthcare setting.
- The patient/resident and family should be notified about the results and infection control measures.
- If the MDRO was present on admission, notification of the transferring facility should occur so appropriate review can occur at that facility.

Healthcare Investigation

- Review the patient/resident's healthcare exposures prior to and after the positive culture including overnight stays in healthcare settings. Investigations for Tier 3 organisms are 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, health departments should consider expanding the investigation to include this facility, especially if the patient/resident was admitted to a unit with high-acuity and/or long lengths of stay.
    - Note whether the facilities identified in the healthcare investigation are participating in ongoing prevention-driven infection prevention assessments and colonization screening for the identified organism (e.g., acute care hospitals performing admission screening and high acuity post-acute care facilities performing periodic point prevalence surveys). This information will help guide decisions about contact screening.

Contact Investigation

- Prioritize broader screening, such as a unit or facility-wide point prevalence survey, in the following situations:

- If the index patient/resident likely acquired the MDRO in the facility (e.g., index patient/resident is person without healthcare risk factors prior to their current admission or had a negative admission screening test).
- If there is other evidence or suspicion for transmission on the unit (e.g., isolates from multiple patient/residents representing an increase over baseline, clinical case on a unit that previously had low prevalence or had not been screened).
- If the case was on a unit or in a facility with long average length of stay (e.g., SNF, LTACH, some ACH units) and the facility is not participating in prevention-driven screening for the Tier 3 organism (e.g., recurring point prevalence surveys, recent ad hoc point prevalence survey, or admission screening), or if the facility is participating in prevention-driven point prevalence surveys and has not previously had cases or has maintained a very low prevalence.

- If new cases are identified on screening, follow-up screening may be indicated.
  - In general, follow-up screening should prioritize implementation of sustained, prevention-driven strategies over intermittent periods of intensive, recurring point prevalence surveys performed in response to a newly identified case.
  - After the initial response-driven PPS, additional screening may be indicated for a facility experiencing an acute outbreak or pronounced increase in prevalence of a Tier 3 organism. For example,
    - If an acute outbreak is suspected, periodic point prevalence surveys can serve as an infection control intervention and inform the epidemiologic investigation. These should generally have clear goals and a defined endpoint, such as reduced transmission with demonstrated IPC improvement.
      - Coupling this with admission screening can help to distinguish importation from ongoing transmission of Tier 3 organisms and complement ongoing infection control measures.

Healthcare personnel and household contact screening, and contact screening in other settings:

- In the absence of known or suspected transmission from HCP or other strong epidemiologic links, HCP screening is not recommended.
- Screening household contacts is generally not recommended for Tier 3 organisms; however, consider screening household contacts who have frequent inpatient/resident healthcare exposure and have had extensive contact with the index patient/resident to determine if Transmission-Based Precautions are necessary for subsequent admissions.
- In residential care settings, consider contact screening for residents if facility and situation meet the criteria for considering broader screening for healthcare contacts in Tier 3 investigations.
- Prioritize roommates and residents who share a bathroom with the index patient/resident and residents with frequent inpatient exposure. If transmission is identified, consider broader screening to inform infection control measures in the facility (e.g., dedicating certain bathrooms for use by positive or negative residents) and in the event the resident is transferred to a higher level of care.
- Prior to screening residents in congregate living settings, decide how colonized or infected individuals will be managed (e.g., changing rooms or bathrooms for residents and work restrictions and rescreening for staff). Congregate living settings should not deny housing based on MDRO colonization.
- Screening in other non-healthcare settings is generally not recommended unless an outbreak is suspected.

Clinical Laboratory Prospective and Retrospective Surveillance

- Clinical laboratories that perform cultures from healthcare facilities identified in the healthcare investigation should report any organisms with similar resistance profiles from clinical cultures to public health and follow public health guidance regarding forwarding isolates for appropriate testing at a public health laboratory to investigate whether they match the organism of interest.
- Retrospective surveillance is generally not performed for Tier 3 organisms, but could be considered in certain situations (e.g., first recognized case of an organism and/or mechanism in a facility, suspect acute or point source outbreak).

Environmental Cultures

- Environmental cultures are generally not recommended unless transmission is identified or suspected and there is epidemiologic evidence implicating an environmental reservoir in ongoing transmission.

Adherence to Infection Control Measures

- Healthcare facilities should:
    - Educate and inform the HCP and visitors for the index patient/resident about the organism and precautions indicated.
    - Ensure that adequate supplies are available to implement precautions.
    - Conduct ongoing adherence monitoring of infection control practices and provide feedback to HCP.
    - Flag affected patient/residents' medical records to initiate appropriate infection control precautions upon readmission.
    - Make plans for how receiving facilities will be notified of affected patient/residents' MDRO status if the patient/resident is transferred.
- Healthcare facilities, particularly long-term care facilities, should ideally receive regular (e.g., at least yearly) infection control assessments using a standardized assessment tool and with observations of infection control practices and recommendations to address observed gaps. Repeat on-site assessments might be needed to ensure that infection control gaps are fully addressed.
- If facilities identified during the healthcare investigation have not had a recent infection control assessment, consider performing an onsite or remote video assessment.
    - Prioritize assessments for facilities that are at highest risk of MDRO importation and transmission (influential facilities) that regularly share patient/residents with these facilities, or that are known or suspected to have fewer infection control resources than most other facilities in the region.
    - If a facility has recently participated in a recent infection control assessment, assess the facility's progress in mitigating previously identified infection control gaps, either through a remote video assessment or in-person.

- If transmission is identified in a healthcare facility that has not had a recent infection control assessment, health departments or other experts should prioritize an on-site visit using a standardized assessment tool.
- Healthcare facilities and health departments should ensure the index patient/resident's MDRO status and required infection control precautions are communicated at transfer to higher or lower levels of care.
    - A decision to discharge a patient/resident from one level of care to another (e.g., moving a patient from an intensive care unit to a medical ward) or to another healthcare facility should be based on clinical criteria and not colonization status.

Table 1. Response Recommendations for MDRO Containment by Tier

Epidemic Stages	No cases identified Limited spread	Limited to moderate spread	Moderate to advanced spread	Epidemic
Containment Tier	**Tier 1**	**Tier 2**	**Tier 3**	**Tier 4**
Tier definition	Organisms or resistance mechanisms never or very rarely identified in the United States	Mechanisms and organisms not regularly found in a region. Pan-not susceptible organisms with the potential for wider spread in a region	Mechanisms and organisms regularly (i.e., frequently) found in a region but not endemic.	**Mechanisms and organisms that are endemic.**
Response Elements				**Prioritize prevention; containment principles generally do not apply.**
Healthcare Investigation[1]				
Review the patient's healthcare exposures prior to and after the positive culture[1]	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	
Contact Investigation[1]				
Screening of healthcare contacts (i.e., residents and patients) [2]	ALWAYS	ALWAYS	USUALLY	
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	
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	
Prospective lab surveillance[5]	ALWAYS	ALWAYS	ALWAYS	
Environmental Cultures				
Environmental Sampling	SOMETIMES	RARELY	RARELY	
Infection Control Measures				
Notify healthcare providers; promptly implement appropriate transmission-based precautions	ALWAYS	ALWAYS	ALWAYS	
Infection Control Assessment with observations of practice	ALWAYS	ALWAYS	SOMETIMES	
Clear communication of patient status with transferring facilities	ALWAYS	ALWAYS	ALWAYS	
Link to Prevention Activities: All Novel and Targeted MDROs				

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.