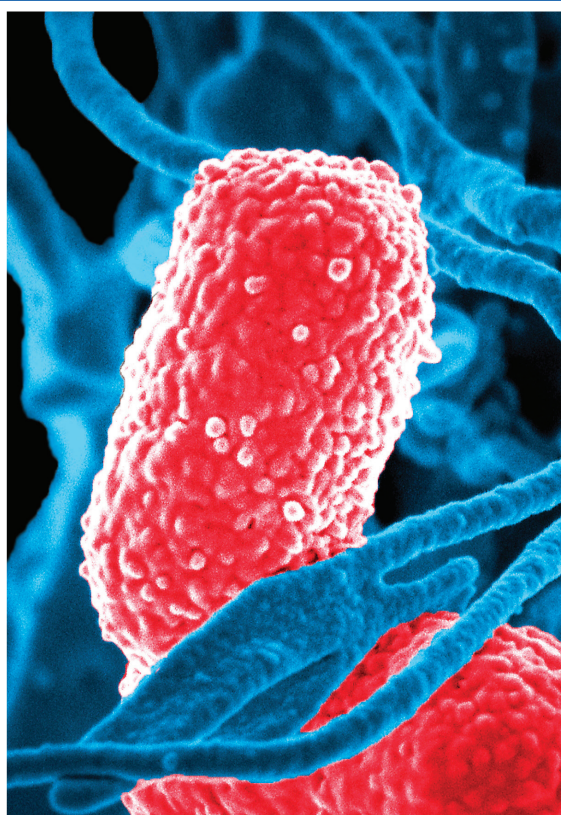


Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms (MDROs)



Centers for Disease
Control and Prevention
National Center for Emerging and
Zoonotic Infectious Diseases

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<https://www.cdc.gov/hai/containment/guidelines.html>

Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms (MDROs)

This document is intended for use by state and local health departments and healthcare facilities and serves as general guidance for the initial response for the containment of novel or targeted multidrug-resistant organisms (MDROs) 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 response described in this document.

Updates to the 2017 Interim Guidance:

- Added definitions for Healthcare Facility, Colonization Screening, and Response Tiers.
- Expanded the “Response Recommendations by Tier” to include additional detail, particularly for contact investigations and retrospective and prospective surveillance strategies.
- Added section, Containment strategies for healthcare facilities at high risk for transmission of MDROs
- Removed Figure 1 and added 2 tables:
 - o Table 1: Summary of Response Recommendations for MDRO Containment by Tier
 - o Table 2: Summary of CDC Recommendations to Assess Transmission of Novel or Targeted MDROs

Goals of initial containment response include:

1. Identifying affected patients.
2. Ensuring appropriate control measures are promptly implemented to contain further spread.
3. Determining if transmission and dissemination is occurring.
4. Characterizing the organism or mechanism in order to guide further response actions, patient management, and future responses.

In addition to this general guidance, further pathogen-specific guidance for some MDROs can be found here:

- [Vancomycin-resistant Staphylococcus aureus](#)
- [Carbapenem-resistant Enterobacteriaceae](#)

General Recommendations

Healthcare facilities and laboratories should contact state or local public health authorities promptly when targeted resistant organisms (e.g., pan-resistant organism) or mechanisms are identified (e.g., VIM-producing Enterobacteriaceae).

Health departments should utilize the expanded capacity for antimicrobial resistance-related laboratory testing through the [Antimicrobial Resistance Laboratory Network](#) (e.g. carbapenemase and *Candida auris* colonization screening, carbapenemase detection, *Candida species* identification and should contact the laboratory for their region to discuss the availability of specific testing and to coordinate specimen submission).

Health Departments conducting these investigations are encouraged to consult with CDC by contacting the healthcare outbreak duty officer at haioutbreak@cdc.gov.

Definitions

Healthcare Facility

For this guidance, the term 'healthcare facility' refers to all acute care hospitals and post-acute care facilities that care for patients or residents who remain overnight and require medical care, nursing care or rehabilitation services. This generally excludes assisted living facilities.

Colonization Screening

When an emerging MDRO is identified, colonization screening is recommended by CDC as an essential component of the public health response. Colonization screening identifies unrecognized carriers so that infection control measures can be targeted to prevent the spread of antimicrobial resistance.

The colonization screening recommendations in this guidance apply to all healthcare facility types. Additionally, depending on the scope of the investigation and type of organism identified, colonization screening might be recommended for community settings.

Recommendations for colonization screening are described in detail for each response tier (hyperlink to response recommendations by tier).

Response Tiers

The following describes criteria for three different categories of organisms and resistance mechanisms (Tiers 1–3) and the recommended approach to each. Although general definitions of each tier are accompanied by examples of organisms and resistance mechanisms, health departments should use local epidemiology to guide assignment of organisms to tiers 2 and 3.

Tier 1 organisms:

This category includes (1) organisms for which no current treatment options exist (pan-resistant) and that have the potential to spread more widely within a region and (2) organisms and resistance mechanisms that have never (or very rarely) been identified in the United States and for which experience is extremely limited and a more extensive evaluation is needed to define the risk for transmission.

Tier 2 organisms:

Organisms in this group include MDROs that are primarily associated with healthcare settings and are not commonly identified in the region. These organisms might be found more commonly 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 carbapenem-resistant Enterobacteriaceae with the less common carbapenemases (e.g., New Delhi Metallo- β -lactamase (NDM)) and carbapenemase-producing *Pseudomonas* spp. In many areas of the United States, carbapenem-resistant Enterobacteriaceae producing *Klebsiella pneumoniae* carbapenemase (KPC-CRE) meets the Tier 2 criteria.

Tier 3 organisms:

Organisms in this group include MDROs targeted by the facility or region that have been identified regularly but are not considered to be endemic. These organisms might be found more commonly 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, OXA-24/40, OXA-56) in certain regions of the United States where these organisms are more regularly identified but are not endemic.

Response Recommendations by Tier

The components of the initial response will vary depending on the organism involved; click to expand each window below for recommendations for the expected response, containment and control for each group.

- [TIER 1 Organisms](#)
- [TIER 2 Organisms](#)
- [TIER 3 Organisms](#)
- [Table 1: Summary: Response Recommendations for MDRO Containment by Tier](#)
- [Table 2: Summary of CDC Recommendations to Assess Transmission of Novel or Targeted Multidrug- Resistant Organisms \(MDROs\)](#)



Tier 1 organisms:

This category includes (1) organisms for which no current treatment options exist (pan-resistant) and that have the potential to spread more widely within a region and (2) organisms and resistance mechanisms that have never (or very rarely) been identified in the United States and for which experience in the United States is extremely limited and a more extensive evaluation is needed to define the risk for transmission.

Strategies:

(1) Initial response measures

- Upon identification of the organism or mechanism in a laboratory, the laboratory or healthcare facility should promptly notify the patient's primary caregiver, patient 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.
- 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.
- The patient 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 and/or others found to be colonized should be conducted in consultation with public health to inform prevention measures.
- In general, failure to identify the organism or mechanism of interest from at least two consecutive sets of screening cultures are the minimum criteria that should be met before an episode of colonization is considered resolved.
- 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.
- A decision to discontinue transmission-based precautions should be made in consultation with public health authorities.

(2) Conduct a healthcare investigation.

- Review the patient's healthcare exposures prior to and after the initial positive culture, including overnight stays in healthcare settings, outpatient visits, and home health visits to identify facilities where transmission could have occurred.
- In general, healthcare exposures over the preceding 30 days should be investigated. If information is available about the time that the organism was most likely acquired (e.g., patient was hospitalized outside of the United States in a country where the organism and mechanism is known or believed to be common), then this period could be considered the risk period for transmission.

(3) Conduct a 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 received care but did not stay overnight (e.g. outpatient clinics) and community contacts.

- If the index patient had recent inpatient healthcare exposure, colonization screening of epidemiologically-linked patients should be performed.
- Body sites for specimen collection will depend on the organism. For example, Staphylococci most commonly require samples of nares and sometimes other sites such as axillae, groin, or pharynx. Gram-negative organisms most commonly require samples of stool and sometimes other sites such as wounds, groin, or sputum.
 - o At a minimum, screening should include roommates and patients that shared a bathroom with the index patient, regardless of whether or not the patient was on Contact Precautions. These contacts should be identified and screened even if they have been discharged to a private residence from the facility.
 - o For Tier 1 organisms for which the frequency and modes of transmission are well understood, if the index patient was on Contact Precautions during their entire stay and adherence is determined to be high by public health, then screening contacts beyond roommates is generally not recommended unless the index-patient is believed to be high-risk for transmission (e.g., bed bound, on antibiotics, incontinent of stool for enteric organisms). If adherence to Contact Precautions is not high or if a facility does not use Contact Precautions, then screening recommendations for index patients not on Contact Precautions should be followed (see below).
 - o If the MDRO is a novel organism for which data on the frequency and modes of transmission are not known, or if the index patient was not on Contact Precautions during their entire stay in a healthcare facility, then additional screening (beyond roommates) is recommended.
 - Broader screening, including patients on the same ward as the index patient and/or patients that shared healthcare personnel, might be particularly important for detecting transmission of novel MDROs when data on the frequency and modes of transmission are lacking.
 - For high-risk contacts (e.g., patients that overlapped with the index on same unit for 3 or more days) that have been discharged, healthcare facilities should consider flagging charts to facilitate admission screening if these individuals are readmitted to the facility in the following six months.
 - Healthcare settings with high-acuity patients and longer lengths of stay should be prioritized for broader screening.
 - o Wider surveys and ongoing point prevalence surveys extending beyond roommates and high risk patients are clearly indicated if there is evidence or suspicion of ongoing transmission (e.g., isolates from multiple patients) or if initial targeted screening of high-risk patients identifies new cases.
 - o If new cases are identified, periodic (e.g., every two weeks) point prevalence surveys are recommended until transmission is controlled (generally defined as two consecutive point prevalence surveys with no new MDRO cases identified).
 - o In some circumstances (e.g., organism or mechanism is believed to be present at other facilities in the region), admission screening can be helpful to distinguish importation from ongoing transmission within a healthcare facility.
 - o A public health investigation should also be initiated at healthcare facilities known to regularly share patients with healthcare facilities where transmission has occurred; this might be particularly important in high-acuity post-acute care facilities due to the risk of further amplification. 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.
- Colonization screening of outpatients who were seen in the same clinic as the index patient are generally not recommended unless contact was extensive or if patients were exposed to common devices (e.g., whirlpools, etc.) and cleaning of the devices may not have been adequate.

- Cultures of healthcare personnel (HCP) with extensive index patient contact should be performed if epidemiology suggests that the organism may have spread to patients from colonized or infected HCP or from colonized or infected patients to HCP. For novel MDROs for which the risk of HCP colonization following contact with a colonized or infected patient is not known, cultures of HCP should be considered.
 - Home health workers that cared for the patient for extended periods of time at home should also be considered among the potential HCP contacts.
 - Prior to performing cultures of HCP, decisions should be made about how colonized or infected HCP will be managed (e.g., work restrictions and rescreening).
- For organisms in which the risk of transmission outside of healthcare settings is unknown, close community contacts (e.g., contacts who help care for the index patient or share a bed or bathroom with the patient) should also be screened. Similarly, family and friends who do not reside with the index patient but were physically caring for the patient for extended periods of time could be screened.
 - Screening of additional household contacts should also be performed 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, screening results might influence the need for transmission-based precautions at admission.
 - If household contacts are HCP, decisions about screening should include consideration of the actions that will be taken if the contact is found to be colonized.
 - Some situations may warrant screening in other non-healthcare settings (e.g., resistant organism from a young child who attends daycare).

(4) Clinical laboratory prospective and retrospective surveillance

- Clinical laboratories that perform cultures from healthcare facilities where the index patient 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.
- Prospective surveillance should be performed in consultation with public health and should occur for at least three months after identification of the index patient 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.
- Retrospective surveillance (laboratory lookbacks) of results from these clinical laboratories should be performed to identify organisms with similar resistance patterns, extending six months prior to identification of the index case. If available, these retrospective isolates should also be tested to see if they have the same mechanism of resistance as the organism of interest.

(5) Environmental cultures

- The threshold to do environmental cultures should generally be lower for these organisms; however, these 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 extent of environmental contamination of an organism or the effectiveness of cleaning and disinfection exist.

(6) Implement a system to ensure adherence to infection control measures.

- Educate and inform the HCP and visitors to the index patient about the organism and recommended interventions.
- Healthcare facilities should ensure that adequate supplies are available to implement precautions.

- Health departments or other experts should conduct on-site visits to facilities and use a standardized assessment tool to evaluate infection control practices at facilities that have cared for the index patient. Assessments should include 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.
- Healthcare facilities should conduct ongoing adherence monitoring of infection control practices and provide feedback to HCPs.
- Healthcare facilities and health departments should ensure the index patient's MDRO status and required infection control precautions are communicated at transfer to higher or lower levels of care.
 - o A decision to discharge a patient 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.
- Healthcare facilities that previously cared for the index patient or other contacts found to be colonized or infected with the organism of interest should be notified so that they can "flag" the patient's record and initiate appropriate infection control precautions upon re-admission.



Tier 2 organisms:

Organisms in this group include MDROs that are primarily associated with healthcare settings and are not commonly identified in the region. These organisms might be found more commonly 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 carbapenem-resistant Enterobacteriaceae with the less common carbapenemases (e.g., New Delhi Metallo- β -lactamase) and carbapenemase-producing *Pseudomonas* spp. In many areas of the United States, KPC-CRE meet the Tier 2 criteria.

Strategies:

(1) Initial response measures

- Upon identification of the organism or mechanism in a laboratory, the laboratory or healthcare facility should promptly notify the patient's primary caregiver, patient care personnel, and other healthcare staff per facility policies. Generally, local and state public health departments should also be notified.
- 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.
- The patient 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.

(2) Conduct a healthcare investigation.

- Review the patient's healthcare exposures prior to and after the initial positive culture, including overnight stays in healthcare settings, outpatient visits, and home health visits.
- In general, healthcare exposures over the preceding 30 days should be investigated. If information is available about the time that the organism was most likely acquired (e.g., patient was hospitalized outside of the United States in a country where the organism and mechanism is known or believed to be common), then this period could be considered the risk period for transmission.

(3) Conduct a 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 received care but did not stay overnight (e.g. outpatient clinics) and community contacts.

- If the index patient had recent inpatient healthcare exposure, colonization screening cultures of epidemiologically-linked patients should be performed.
 - o Body sites for specimen collection will depend on the organism. For example, Staphylococci most commonly require samples of nares and sometimes other sites such as axillae, groin, or pharynx. Gram-negative organisms most commonly require samples of stool and sometimes other sites such as wounds, groin, or sputum. These contacts should be identified and screened even if they have been discharged to a private residence from the facility.
 - o If the index patient was on Contact Precautions during their entire stay and adherence is determined to be high by public health, then targeted screening of contacts beyond roommates and other patients that shared a bathroom is generally not recommended, but could be considered

in specific instances when the index-patient is believed to be high-risk for transmission (e.g., bed bound, receiving antibiotics, incontinent of stool for enteric organisms). If adherence to Contact Precautions is not high or if a facility does not use Contact Precautions, then screening recommendations for index patients not on Contact Precautions should be followed (see below).

- o If the index patient was not on Contact Precautions during their entire stay in a healthcare facility, then broader screening (beyond roommates) is recommended. Screening can initially be limited to the contacts at highest risk for acquisition, such as those still admitted who overlapped on the same ward as the index patient and who have a risk factor for MDRO acquisition (e.g., bedbound, high levels of care, receipt of antibiotics, or mechanical ventilation). Alternatively, facilities may choose to screen entire units using point prevalence surveys.
 - When deciding whether to perform a unit point prevalence survey versus targeted screening of high-risk contacts, the feasibility of rapidly identifying and screening high-risk contacts should be considered. For example, if identifying high-risk contacts is anticipated to take more than a few days or if most high-risk contacts have been discharged from a facility, performing unit point prevalence surveys may be preferred.
 - For high-risk contacts that have been discharged, healthcare facilities should consider flagging charts to facilitate admission screening if these individuals are readmitted to the facility in the next six months.
 - Healthcare settings with high-acuity patients and longer lengths of stay should be prioritized for broader screening.
 - Wider surveys extending beyond roommates and high-risk patients are clearly indicated if there is evidence or suspicion of ongoing transmission (e.g., isolates from multiple patients) or if initial targeted screening of high-risk patients identifies new cases. If new cases are identified, periodic (e.g., every two weeks) point prevalence surveys are recommended until transmission is controlled (generally defined as two consecutive point prevalence surveys with no new MDRO cases identified).
- o In some circumstances (e.g., organism or mechanism is believed to be present at other facilities in the region), admission screening can be helpful to distinguish importation from ongoing transmission within a healthcare facility.
- o A public health investigation should also be initiated at healthcare facilities known to regularly share patients with healthcare facilities where transmission has occurred; this might be particularly important in high-acuity post-acute care facilities due to the risk of further amplification. 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.
- Colonization screening of outpatients who were seen in the same clinic as the index patient is generally not recommended unless contact was extensive or if patients were exposed to common devices (e.g., whirlpools, etc.) and cleaning of the devices may not have been adequate.
- In the absence of known or suspected transmission from healthcare personnel (HCP) or other strong epidemiologic link, HCP should not be screened.
- In the absence of epidemiologic data suggesting household transmission, household contacts generally should not be screened. However, household contacts who have frequent inpatient healthcare exposure could be screened if they have had extensive contact with the index patient.

(4) Clinical laboratory prospective and retrospective surveillance

- Clinical laboratories that perform cultures from healthcare facilities where the index patient 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.
- Prospective surveillance should be performed in consultation with public health and should occur for at least three months after identification of the index patient 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.
- Retrospective surveillance (laboratory lookbacks) of results from these clinical laboratories should be performed to identify organisms with similar resistance patterns, extending six months prior to identification of the index case or until the time that the index patient likely acquired the organism (if known or suspected). If available, these retrospective isolates should also be tested to see if they have the same mechanism of resistance as the index case.

(5) Environmental cultures

- Environmental cultures in these situations are generally not recommended unless transmission is identified or suspected and there is epidemiologic evidence implicating an environmental reservoir in ongoing transmission. They could be considered if questions about the effectiveness of terminal cleaning exist.

(6) Implement a system to ensure adherence to infection control measures.

- Educate and inform the HCP and visitors for the index patient about the organism and precautions indicated.
- Healthcare facilities should ensure that adequate supplies are available to implement precautions.
- Health departments or other experts should conduct on-site visits to facilities and use a standardized assessment tool to evaluate infection control practices at facilities that have cared for the index patient. Assessments should include 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.
- Healthcare facilities should conduct ongoing adherence monitoring of infection control practices and provide feedback to HCP.
- Healthcare facilities and health departments should ensure the index patient'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 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.
- Healthcare facilities that previously cared for the index patient or other confirmed cases should be notified so that they can "flag" the patient's record and initiate appropriate infection control precautions upon re-admission.
- A decision to discontinue transmission-based precautions for an individual with a history of colonization or infection with a targeted MDRO should be made in consultation with public health. In general, failure to identify the organism or mechanism of interest from at least two sets of screening cultures are the minimum criteria that should be met before an episode of colonization is considered resolved. Additionally, 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.



Tier 3 organisms:

Organisms in this group include MDROs targeted by the facility or region that have been identified numerous times in a region but are not considered to be endemic. These organisms might be found more commonly 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, OXA-24/40, OXA-58) in regions of the United States where these organisms are more regularly identified but are not endemic

Strategies:

(1) Initial response measures

- Upon identification of the organism or mechanism in a laboratory, the laboratory or healthcare facility should promptly notify the patient's primary caregiver, patient 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), which may vary depending on the healthcare setting.
- The patient 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.

(2) Conduct a healthcare investigation.

- Review the patient'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 and (in some cases) the admission immediately prior to the current admission.

(3) Conduct a contact investigation.

- Screening of roommates or patients that share a bathroom with the index patient should be performed. Roommates or patients that share a bathroom with the index patient should be screened if they are still admitted.
- If the index patient was on Contact Precautions during their entire stay in a healthcare facility and adherence was determined to be high, then screening contacts beyond roommates is not recommended but could be considered in certain situations (e.g., index case believed to be high-risk for transmission).
 - If the index-patient was not on Contact Precautions during their entire stay in a healthcare facility, then additional screening of high-risk contacts could be considered if the index-patient is high-risk for serving as a source of transmission (e.g., bed bound, on antibiotics). Surveys could initially be limited to the contacts at highest risk for acquisition including those who overlapped with the patient and who have a risk factor for MDRO acquisition (e.g., being bedbound or requiring higher levels of care, being on antibiotics, or being on mechanical ventilation).
 - For roommates and other high-risk contacts that have been discharged, healthcare facilities should consider flagging charts to facilitate admission screening if these individuals are readmitted to the facility in the next six months.
 - Wider screening (e.g., point prevalence survey) should be performed if there is evidence or suspicion of transmission (e.g., isolates from multiple patients, new cases identified through targeted screening).

- o Periodic (e.g., every two weeks) point prevalence surveys are recommended until transmission is controlled (generally defined as two consecutive point prevalence surveys with no new MDRO cases identified).
- o In some circumstances, admission screening can help to distinguish importation from ongoing transmission within a healthcare facility.
- A public health investigation should also be initiated at healthcare facilities known to regularly share patients with healthcare facilities where transmission has occurred; this might be particularly important in high-acuity 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.
- In the absence of known or suspected transmission from healthcare personnel (HCP) or other strong epidemiologic link, HCP should not be screened.
- Screening household contacts is generally not recommended for Tier 3 organisms; however, household contacts who have frequent inpatient healthcare exposure could be screened if they have had extensive contact with the index patient to determine the level of precautions required at admission.

(4) Clinical laboratory prospective

- Clinical laboratories that perform cultures from healthcare facilities where the index patient received care in the previous 30 days should be targeted for prospective surveillance in order to identify organisms with similar resistance profiles from clinical cultures.
- Prospective surveillance should be performed in consultation with public health and should occur for at least three months after identification of the index patient or, if transmission is identified through surveillance or screening, three months after the last case is identified.
 - o All isolates identified during prospective surveillance should be promptly tested to investigate whether they match the organism of interest; isolates should be saved as additional testing at the state, regional or CDC laboratory might be indicated.
- 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).

(5) 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.

(6) Implement a system to ensure adherence to infection control measures.

- Educate and inform the HCP and visitors for the index patient about the organism and precautions indicated.
- Healthcare facilities should ensure that adequate supplies are available to implement precautions.
- If transmission is identified, health departments or other experts should consider conducting on-site visits to facilities and use a standardized assessment tool to evaluate infection control practices at facilities that have cared for the index patient. Assessments should include 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.
- Healthcare facilities should conduct ongoing adherence monitoring of infection control practices and provide feedback to HCP.
- Healthcare facilities and health departments should ensure the index patient's MDRO status and required infection control precautions are communicated at transfer to higher or lower levels of care.

- o A decision to discharge a patient 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.
- Healthcare facilities that previously cared for the index patient or other confirmed cases should be notified so that they can “flag” the patient’s record and initiate appropriate infection control precautions upon re-admission.

Containment Strategies for Healthcare Facilities at High Risk for Transmission of MDROs

Certain healthcare facilities, such as long-term acute care hospitals or ventilator units of skilled nursing facilities, have characteristics that are associated with increased risk of importation and transmission of MDRO (e.g., high-acuity patients, long length of stay). These types of facilities should be considered high risk for the presence of targeted MDROs, even when colonized or infected patients and/or residents have not been clearly documented to have been admitted to the facility.

Public Health and healthcare facilities should work together to identify healthcare facilities with characteristics associated with increased risk of MDRO transmission; identifying and intervening to decrease transmission of resistant organisms at these healthcare facilities should be part of a regional MDRO control strategy.

Strategies to identify targeted MDROs at these facilities could include one or both of the following:

- Retrospective and prospective surveillance of clinical cultures. For retrospective surveillance, laboratory lookbacks (at least 6 months) should be performed to identify organisms with concerning resistance patterns, and saved isolates with the targeted resistance phenotype should be sent for additional testing to identify whether mechanisms of interest are present. Prospective surveillance is performed through submission of isolates with certain phenotypes for resistance mechanism testing when indicated.
- Periodic point prevalence surveys on high-risk units.

If targeted MDROs are identified from retrospective or prospective laboratory surveillance or through point prevalence screening, additional interventions to control transmission (as described in Response Recommendations by Tier-hyperlink) should be implemented.

Acute care hospitals that regularly receive patients and/or residents transferred from high-risk facilities, especially those found to have high prevalence of MDROs through colonization screening or laboratory lookback, should consider performing screening cultures when admitting these patients.

Table 1: Summary of Response Recommendations for MDRO Containment by Tier

Description	Tier 1 Resistance mechanisms never or very rarely identified in the United States; pan-resistant organisms with the potential for wider spread in a region	Tier 2 Mechanisms and organisms not regularly found in a region	Tier 3 Mechanisms and organisms regularly found in a region but not endemic
Healthcare Investigation¹			
Review the patient’s healthcare exposures prior to and after the positive culture	Always	Always	Always
Contact Investigation¹			
Screening of healthcare roommates	Always	Always	Always
Broader screening of healthcare contacts ²	Always ³	Sometimes ⁴	Sometimes
Prospective lab surveillance ⁵	Always	Always	Always
Retrospective lab surveillance ⁶	Always	Always	Sometimes
Household contact screening	Sometimes	Rarely	Rarely
Environmental sampling	Sometimes	Rarely	Rarely
Healthcare personnel screening	Sometimes	Rarely	Rarely
Evaluate potential spread to healthcare facilities that regularly share patients with the index healthcare facility ⁷	Sometimes	Sometimes	Rarely
Infection Control Measures			
Prompt notification of healthcare providers and patient and implementation of appropriate transmission-based precautions	Always	Always	Always
Clear communication of patient status with transferring facilities	Always	Always	Always
On-site infection control assessment with observations of practice, such as Epidemiology and Laboratory Capacity (ELC) Infection Control Assessment and Response (ICAR)	Always	Always	Sometimes

¹ For Tier 1 and 2 organisms/mechanisms, healthcare exposures and healthcare contacts over the preceding 30 days 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 and sometimes prior admission.

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

³ If the MDRO is a novel organism for which data on the frequency and modes of transmission are not known, or if the index patient was not on Contact Precautions during their entire stay in a healthcare facility, then additional screening (beyond roommates) is recommended. Broader screening, including patients on the same ward as the index patient and/or patients that shared healthcare personnel, might be particularly important for detecting novel MDROs when data on the frequency and modes of transmission are lacking.

⁴ If the index patient was not on Contact Precautions during their entire stay in a healthcare facility, then broader screening (beyond roommates) is recommended. Screening can initially be limited to the contacts at highest risk for acquisition, such as those still admitted who overlapped on the same ward as the index patient and who have a risk factor for MDRO acquisition (e.g., bedbound, high levels of care, receipt of antibiotics, or mechanical ventilation). Alternatively, facilities may choose to screen entire units using point prevalence surveys.

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

⁶ Conduct a laboratory lookback covering at least 6 months prior to identification of index case.

⁷ 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.

Table 2: Summary of CDC Recommendations to Assess Transmission of Novel or Targeted Multidrug-Resistant Organisms (MDROs)

Healthcare Facility Description	Recommendations to Assess Transmission
Healthcare facilities¹ where a patient with an MDRO was treated	
<ul style="list-style-type: none"> • Individual with targeted multidrug-resistant organism is currently present at the healthcare facility • Individual with targeted multidrug-resistant organism is not currently present in the healthcare facility, but has been treated at the healthcare facility within prior 30 days 	<ol style="list-style-type: none"> 1. Perform a laboratory lookback encompassing at least 6 months prior to the index case to identify any potential missed cases.² 2. Screen roommates³ and conduct broader screening as recommended for relevant response tier. 3. If transmission is suspected or confirmed: <ol style="list-style-type: none"> A. Perform consecutive point prevalence surveys until transmission is controlled. B. Consider implementing admission screening.⁴ 4. Conduct prospective laboratory surveillance for 3 months (a) following identification of the index case (if no transmission identified) or (b) after transmission controlled to monitor for additional cases.
Healthcare facilities¹ that have not directly cared for a patient with a confirmed MDRO	
<ul style="list-style-type: none"> • Healthcare facility commonly shares patients with another healthcare facility where there is suspected or confirmed transmission of targeted MDROs 	<ol style="list-style-type: none"> 1. Institute one of the options below: <ol style="list-style-type: none"> A. Retrospective and prospective surveillance of clinical cultures for phenotype of interest. Conduct point prevalence survey if resistance phenotype identified. B. Perform baseline point prevalence survey of high risk units. 2. Consider admission screening⁴ of patients admitted to the facility; especially transfers from the index healthcare facility.
<ul style="list-style-type: none"> • Healthcare facility is determined to be high risk for transmission based on facility characteristics (e.g., high-acuity post-acute care setting such as long-term acute care hospitals or ventilator units of nursing homes) 	<ol style="list-style-type: none"> 1. Institute one or both options below: <ol style="list-style-type: none"> A. Retrospective and prospective surveillance of clinical cultures for phenotype of interest. Conduct point prevalence survey if resistance phenotype identified. B. Perform a point prevalence survey of high risk units and/or admission screening⁴ as recommended by public health and other experts. 2. If cases are identified through initial point prevalence survey, perform consecutive point prevalence surveys to assess for transmission. If transmission is identified, repeat point prevalence surveys until transmission is controlled.

¹ The term 'healthcare facility' refers to all acute care hospitals and post-acute care facilities that have patients or residents who remain overnight and require medical or nursing care. This generally excludes assisted-living facilities.

² Laboratory lookback may vary depending on the Tier.

³ Roommates should be screened even (1) if the index case was on Contact Precautions for the duration of the hospitalization or (2) roommates have been discharged from the healthcare facility.

⁴ Admission screening can help distinguish importation of MDROs into a healthcare facility from transmission within a healthcare facility.