



Nontuberculous mycobacteria (NTM) Recommended Practices for Healthcare Outbreak Response

A. Background

Nontuberculous mycobacteria (NTM) are mycobacteria other than *Mycobacterium tuberculosis* or *M. leprae*. NTM are also referred to as atypical mycobacteria, mycobacteria other than tuberculosis (MOTT), or environmental mycobacteria, because NTM are typically not transmitted from person to person but usually transmitted from an environmental source.¹⁻² NTM are opportunistic pathogens that can be difficult to diagnose and treat. Pulmonary disease, the most common clinical manifestation of NTM infection, often affects individuals with underlying lung disease. Extrapulmonary NTM infections are less common than pulmonary infections but are often associated with severe disease and poor outcomes, even among immunocompetent individuals.³

Multiple NTM infections within a healthcare facility often indicate a common source in which public health action could prevent additional cases.⁴⁻⁶ Outbreaks of NTM infections, primarily extrapulmonary NTM, have been increasingly linked with healthcare exposure. Healthcare-associated outbreaks have been associated with medical devices; cosmetic procedures, particularly those related to medical tourism⁷⁻⁸; dental procedures⁹; and contaminated parenteral medications, among others. Non-healthcare settings associated with extrapulmonary NTM outbreaks include tattoo parlors, nail salons, and spas.

The following information is intended as a general guide and is based on expert opinion, except as noted otherwise. State and local public health authorities may have their own outbreak definitions, requirements for reporting, and standards for investigation.

B. Detection and Reporting of Potential Outbreaks

1. Proposed Investigation/Reporting Thresholds and Outbreak Definition

	ALL HEALTHCARE SETTINGS*
Threshold for facility to start investigation	1 case of extrapulmonary NTM
Threshold for reporting to public health	1 case of extrapulmonary NTM [†]
Outbreak definition	≥ 2 cases of extrapulmonary NTM [†] within a 1-year period of time that are epidemiologically linked ^{‡§}



* Includes acute care hospitals, critical access hospitals, long-term acute care hospitals, long-term care facilities, and outpatient and emergency departments.

† Excludes advanced HIV with disseminated *Mycobacterium avium* complex (MAC).

‡ Epidemiologically linked = including but not limited to the following examples: shared water exposure (e.g., dental lines, therapy pools, or showers in the same healthcare facility), similar surgical or invasive medical procedures, common medical devices or equipment, or similar medications.

§ Application of the outbreak definition requires judgment and may include weighing evidence whether transmission took place in the facility, accounting for likely sources of exposure outside the facility and other factors.

2. Points for Consideration

- 2.1. These thresholds and definitions listed are specific to extrapulmonary NTM. If a healthcare facility or provider encounters a cluster of pulmonary NTM, they are advised to report this to public health to assist with further evaluation.
- 2.2. The Council of State and Territorial Epidemiologists (CSTE) standardized case definition of extrapulmonary NTM⁵ specifies the culture or molecular evidence of NTM from a normally sterile body site, such as blood, spinal fluid, bone marrow, abdominal fluid, pleural fluid, or skin/soft tissue, wound or urine. An overview of NTM diagnostic considerations is also available from CDC.¹⁰ See section C.4 for additional information.
- 2.3. While the CSTE case definition⁵ includes clinical evidence of NTM infection, the thresholds and definitions used in this document include laboratory identification only, since clinical evidence may not be known until an additional facility investigation is initiated. This approach also facilitates detection of potential pseudo-outbreaks.⁵
- 2.4. Pediatric lymph node infections with NTM are common and typically do not require further investigation unless related to a dental surgery or invasive procedure.⁹

C. Investigation and Control

The following sections outline important actions and considerations in conducting an investigation of a potential outbreak of NTM in a healthcare facility. These are written primarily from the perspective of the health department. Some of these actions can be conducted by the facility, while others may require assistance from the health department. Collaboration between the facility and public health authorities helps ensure a successful investigation. The public health department should support the facility by providing guidance and resources. The health department may be able to provide assistance with infection control assessment, medical record review, laboratory testing, data analysis, and other activities as appropriate for the investigation. This will depend on the circumstances of the potential outbreak as well as on the resources of the facility and the health department. The need for an on-site visit to the facility should be determined based on the number of the cases, patient population, severity of illness, and level of assistance required.

1. Initial Investigation (Surveillance and Case Finding)

- 1.1. Construct a line list of all potential cases.



- 1.1.1. Include exposures relevant to the body site(s) of infection, such as sites of surgical and diagnostic procedures or receipt of parenteral medications (injection or infusion), with a focus on water, ice, or aqueous products.
- 1.2. Review microbiology records to identify additional cases of NTM infections (or other waterborne pathogens) within the affected patient population.
- 1.3. Consider checking with your public health tuberculosis program to ask whether personnel have received reports of NTM.
- 1.4. Communicate with providers to facilitate case finding and reporting.
 - 1.4.1. Consider reminding providers that standard culture orders do not usually include acid-fast bacteria (see section 4 for more information).¹⁰
- 1.5. Notify at-risk patients to inform them of the potential for infection and the signs and symptoms of infection.
 - 1.5.1. Given that NTM infections often have an insidious onset and may present months or even years after the exposure, notification can lead to patients seeking care earlier and receiving treatment earlier, thus improving clinical outcomes associated with the infection.
 - 1.5.2. For guidance on making notifications in the context of a suspected healthcare-associated infection (HAI) outbreak, such as to potentially exposed patients, see CORHA's [Framework for Healthcare-Associated Infection Outbreak Notification](#).¹¹
- 1.6. Screening of asymptomatic patients for extrapulmonary NTM infection is usually not indicated.
- 1.7. Sequester products, such as medications or devices, if there is suspicion of intrinsic contamination.
- 1.8. Save clinical isolates in case a decision is made later in the investigation to perform a molecular comparison of isolates.
- 1.9. For clusters of NTM infections related to a common procedure, evaluate for common staff including product or device vendors present during the procedures of potential cases. If the epidemiological investigation indicates risk associated with exposure to a staff member, inquire about practices related to the procedure as well as practices that could lead to NTM skin colonization of the staff member (e.g., hot tub use).¹²
- 1.10. Notify appropriate authorities (e.g., CDC, FDA, or state pharmacy board) if initial findings implicate a common source (such as a contaminated product or medical tourism) that could affect patients beyond the facility that prompted the investigation.

2. Infection Control Measures

- 2.1. Consider performing an on-site assessment of infection control and procedural practices to identify potential pathways for NTM exposure.
- 2.2. Carefully assess relevant medical or surgical procedures to identify potential pathways that could introduce NTM into the anatomical locations where infections are occurring.
- 2.3. Identify concerning practices involving water or ice, such as the following:
 - 2.3.1. Preparing injections or infusions near sinks or other water sources
 - 2.3.2. Storage of materials used in invasive procedures (including injections) near a water source



- 2.3.3. Storage of respiratory equipment, such as nebulizers, while wet without allowing the equipment to dry (e.g., storage of nebulizer cups after rinsing in a plastic bag)
- 2.3.4. Use of aerosol-generating devices (e.g., humidifiers)
- 2.3.5. Use of ice to numb skin prior to an injection
- 2.3.6. Use of non-sterile water or ice resulting in contact with non-intact skin or an area of incision
- 2.3.7. Use of non-sterile water or ice during surgery in such a way that it could lead to contamination of the sterile field or sterile equipment
- 2.3.8. Dipping of bronchoscopes in ice prior to use
- 2.3.9. Use of endoscopes that were not completely dry post-reprocessing
- 2.3.10. Refer to the CDC's Water Infection Control Risk Assessment (WICRA) for Healthcare Settings¹³ for additional considerations.
- 2.4. Correct deficient practices; consider the need to stop procedures if there is risk of ongoing harm.
- 2.5. Consider notification of licensing or professional boards as appropriate.

3. Environmental Assessment, Cleaning and Disinfection

- 3.1. Tailor the environmental assessment as appropriate to the locations and patient populations that are affected by the outbreak.
- 3.2. Consider reviewing water management practices with the facility environmental management and infection prevention staff.
 - 3.2.1. Inquire whether the facility has a water management plan in place.
 - 3.2.2. Review monitoring of water quality, such as heterophilic platelet counts, pH, nitrogen, and residual chlorine.
 - 3.2.3. Discuss the potential for bacterial growth and biofilm formation resulting from plumbing system dead legs, capped pipes, or rarely used plumbing fixtures (see CDC's [Reduce Risk from Water: From Plumbing to Patients](#)¹⁴).
 - 3.2.4. Examine ice machines that could potentially be involved in the outbreak, and review maintenance and cleaning procedures for the machine as well as accessories such as buckets or scoops.
 - 3.2.5. Refer to the CDC's [Tap Water Quality and Infrastructure Discussion Guide for Investigation of Potential Water-Associated Infections in Healthcare Facilities](#)¹⁵ for additional considerations.
- 3.3. Review instructions for use (IFU) for cleaning and disinfection of devices potentially associated with the outbreak.
- 3.4. Proceed cautiously when considering collection and testing of environmental samples, recognizing potential limitations regarding timeliness, relevance and accuracy (see section 4.4).
 - 3.4.1. Findings from the epidemiological investigation as well as the infection control and environmental assessments should be used to guide sampling and interpret test results.



4. Laboratory

- 4.1. As noted in section B, extrapulmonary NTM involves a normally sterile body site, such as blood, spinal fluid, bone marrow, abdominal fluid, pleural fluid, or skin/soft tissue, wound or urine; an overview of NTM diagnostics is available from CDC.¹⁰
- 4.2. Culturing NTM requires acid-fast bacteria cultures; however, these are not usually included in standard culture orders.
- 4.3. NTM can be divided into two groups based on how long the bacteria take to grow in culture¹⁰:
 - 4.3.1. Rapid-growing species: Usually within 7–10 days
 - 4.3.2. Slow-growing species: May require >14 days
- 4.4. Most clinical and many public health laboratories can only identify NTM to the complex level; requiring that suspected NTM isolates be sent to a specialty laboratory for speciation.
- 4.5. Testing environmental samples (e.g., water) or medical products requires considerable expertise; the CDC can assist with guidance in collecting these samples and directing samples to laboratories with the proper expertise.
 - 4.5.1. Healthcare facility water systems will often contain multiple species (and strains) of NTM. Thus, multiple NTM species or multiple strains of the same species can be part of the same outbreak.
 - 4.5.2. Medical product testing to evaluate for intrinsic contamination (commencing at the point of production or during storage/transport to a healthcare facility) requires the involvement of regulatory authorities.
- 4.6. Molecular testing, such as pulsed-field gel electrophoresis or next generation sequencing, can provide a comparison of patient isolates to each other or to isolates obtained from environmental or product cultures.
 - 4.6.1. These data must be interpreted in the context of the epidemiological information.

5. Monitoring and Follow Up

- 5.1. Continue prospective surveillance to determine if the control measures were successful in preventing further infections.
 - 5.1.1. Infections may develop in patients exposed prior to the mitigation measures, so it is critical that these infections are quickly diagnosed and directed to medical management.
 - 5.1.2. Since NTM infections can have long incubation periods, it may take months to years for an outbreak to be fully resolved.
 - 5.1.3. Consider notification of relevant physicians to increase awareness of the outbreak so that new infections are promptly diagnosed and treated.

D. References

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E. Supplemental Resources

1. Surveillance

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<https://www.tn.gov/health/cedep/reportable-diseases/non-tuberculous-mycobacteria-infection-extra-pulmonary.html>

2. Water Management

1. Centers for Disease Control and Prevention. Reduce Risks from Water: From Plumbing to Patients. <https://www.cdc.gov/hai/prevent/environment/water.html>
2. Centers for Disease Control and Prevention. Legionella. Toolkit: Developing a water management program to reduce *Legionella* growth and spread in buildings. <https://www.cdc.gov/legionella/wmp/toolkit/index.html>
3. Centers for Medicare & Medicaid Services. Requirement to Reduce Legionella Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease (LD). <https://www.hhs.gov/guidance/sites/default/files/hhs-guidance-documents/QSO17-30.Requirement%20to%20Reduce%20Legionella%20Risk%20REV.07.06.18.pdf>

Web Site

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