Chapter 16: Infection Control

Contents

Introduction

Purpose

Use this section to understand and follow national and Wisconsin guidelines to do the following:

- Review the hierarchy of infection control measures and know where to go for further information
- Alert local public health staff to the basic differences between masks and respirators
- Estimate patients' infectiousness and determine when patients are noninfectious
- Determine when to isolate patients, when to discharge them from hospitals, and when to permit them to return to work, school, or other settings
- Review how to implement infection control measures in residential settings, patient care facilities, and transportation vehicles
- Consult with facilities that are implementing infection control measures, including two-step testing

In the 2005 guidelines, "Controlling Tuberculosis in the United States: Recommendations from the American Thoracic Society, Centers for Disease Control and Prevention, and the Infectious Diseases Society of America," one of the recommended strategies to achieve the goal of reducing tuberculosis (TB) morbidity and mortality is the identification of settings in which a high risk exists for transmission of *Mycobacterium tuberculosis* and application of effective infection control measures.[1]

As TB continues to decline in most areas of the United States, it is crucial that state and local public health agencies provide facilities with epidemiologic data on TB, as well as education and guidance in developing effective TB infection control programs.

Infection control measures are fundamental to reducing the spread of communicable diseases such as TB. Transmission of *M. tuberculosis* from person to person can occur in many locations, such as home, work, school, and health care facilities.[2] It is impossible to prevent all exposure; however, the goal is to reduce the amount of transmission.

Each agency's or facility's program should include a hierarchy of administrative controls, environmental controls, and personal respiratory protection. Because each patient care setting and patient's home is different, each program will incorporate a different combination of control activities. The extent to which each agency or facility implements its control activities is based on the results of its risk assessment. In areas where TB rates are lower, the TB risk is lower, and this should affect which elements of the TB infection control plan are utilized.

Policy

For infection control, state and local public health care agencies need to address TB control in these three areas:

- Health care facilities, where people with infectious TB disease would seek care[3,4]
- Congregate settings and residential facilities, whose residents are at increased risk for TB disease[5,6]
- The patient's home

To accomplish TB control activities, each local public health care agency should do the following:

- Familiarize staff with the current Centers for Disease Control and Prevention (CDC) infection control guidelines for health care providers and settings.
- Develop an infection control program for the county staff that addresses these issues:
    - Assignment of responsibility for the program
    - Risk assessment
    - People (if any) who need baseline testing, including TB screening and counseling
    - Education and training
    - Case management (if direct patient care is provided)
- Designate a staff person to guide facilities that may need to set up TB infection control programs.

For roles and responsibilities, refer to the "Roles, Responsibilities, and Contact Information" topic in the Introduction.

Hierarchy of infection control measures

There are three types of infection control measures. The first are administrative controls, which are primarily aimed at early identification, isolation, and appropriate treatment of infectious patients. The second are environmental controls, which focus on preventing the spread and reducing the concentration of infectious droplet nuclei in the air.[7] The third is personal respiratory protection, which may provide additional protection for health care workers in high-risk settings such as isolation rooms and cough-inducing or aerosol-generating suites.

The activities described below are more relevant to infection control in health care or residential facilities. Home settings are discussed separately in the “Residential Settings” topic in this section.

Administrative controls

Administrative control measures are the first of three levels of measures designed to reduce the risk of tuberculosis (TB) transmission. Administrative controls are the first level of infection control because they include a variety of activities to identify, isolate, and appropriately treat people suspected of having TB disease.

An effective TB infection control plan contains measures for reducing the spread of TB that are appropriate to the risk of a particular setting.[8] Every health care setting should have a TB infection control plan that is part of an overall infection control program.[9] A written TB infection control plan helps to ensure prompt detection, airborne precautions, and treatment of people who have suspected or confirmed TB disease.[10]

In TB infection control programs for settings in which patients with suspected or confirmed TB disease are expected to be encountered, develop a written TB infection control plan that outlines a protocol for the prompt recognition and initiation of airborne precautions for people with suspected or confirmed TB disease, and update it annually.[11]

In TB infection control program for settings in which patients with suspected or confirmed TB disease are NOT expected to be encountered, develop a written TB infection control plan that outlines a protocol for the prompt recognition and transfer of people who have suspected or confirmed TB disease to another health care setting. The plan should indicate procedures to follow to separate people with suspected or confirmed infectious TB disease from other people in the setting until the time of transfer. Evaluate the plan annually, if possible, to ensure that the setting remains one in which people who have suspected or confirmed TB disease are not encountered and that they are promptly transferred.[12]

Administrative activities[13]

Key activities to reduce the risk of transmission include the following:

- **Assign responsibility** to a specific person for designing, implementing, evaluating, and maintaining a TB infection control program for that facility.
- **Conduct a risk assessment.** The risk level of a particular facility is the basis for determining all other activities and will result in each facility having a plan designed specifically for that facility.
- **Develop, implement, and enforce policies and procedures** to ensure early identification, evaluation, and treatment of infectious cases of TB.
- **Provide prompt triage** and management in the outpatient setting of patients who may have infectious TB.

- **Promptly initiate and maintain TB isolation** for people who may have infectious TB and are admitted to an inpatient setting.
- **Plan effectively for the discharge** of the patient, coordinating between the local public health agency and the health care provider.
- **Implement environmental controls.** Develop, install, maintain, and evaluate the effectiveness of engineering controls.
- **Implement a respiratory protection program.** Develop, initiate, install, maintain, and evaluate the effectiveness of the respiratory protection program.
- **Implement precautions for cough-inducing procedures.** Develop, implement, and enforce policies and procedures to ensure adequate precautions when performing cough-inducing procedures.
- **Educate and train health care workers** about TB.
- **Counsel and screen health care workers.** Develop and implement counseling and screening programs for health care workers in regard to TB disease and latent TB infection (LTBI).
- **Promptly evaluate possible episodes of TB transmission.**
- **Coordinate activities** between the state and local public health care agencies.

Environmental controls

TB is caused by an organism called *Mycobacterium tuberculosis.* When a person with infectious TB disease coughs or sneezes, tiny particles called droplet nuclei that contain *M. tuberculosis* are expelled into the air.[14] Environmental controls are used to prevent the spread and reduce the concentration of infectious droplet nuclei.[15] Each facility should use different combinations of environmental controls, based on the results of its risk assessment.

It is important to note, however, that without strong administrative controls, environmental controls are ineffective because cases would not be recognized or managed appropriately.

Table 16.1 describes the three main types of environmental controls.

Table 16.1: Three types of environmental controls

Most effective control	**Ventilation** Controls direction of air flow to prevent contamination of air in areas surrounding a person with infectious TB. Dilutes and removes contaminated air. Exhausts contaminated air to the outside.

Supplementary controls	**High-efficiency particulate air (HEPA) filtration** Cleans the air of infectious droplet nuclei. **Ultraviolet germicidal irradiation (UVGI)** Kills or inactivates TB bacilli in the air.

Personal respiratory protection

Although administrative controls and environmental controls are most effective in controlling the spread of TB, they do not eliminate the risk of transmission entirely. Personal respiratory protection, the third level of infection control, is also used in higher-risk settings.

The purpose of a respirator is to reduce exposure by filtering out TB bacilli from room air before the air is breathed into a person's lungs. Respirators used for TB control should be approved for TB use by the National Institute for Occupational Safety and Health (NIOSH).

It is recommended that health care provider staff and visitors use personal respiratory protective equipment in settings that may be at higher risk for TB transmission, such as:

- Rooms where infectious TB patients are being isolated.
- Areas where cough-inducing or aerosol-generating procedures are performed.
- Other areas, which should be identified in the facility's risk assessment, where administrative and environmental controls are not likely to protect people from inhaling infectious droplet nuclei.

It is important to note that the precise level of effectiveness (of respiratory protection) in protecting health care workers from *M. tuberculosis* transmission in health care settings has not been determined.[16]

Surgical-type masks are to be used by people who are infectious or are suspected cases of TB disease when they are out of TB respiratory isolation. The purpose of the mask is to reduce transmission by reducing the number of TB bacilli coughed out into the room air. The infectious patient should not wear a respirator. For more information, see Table 16.2: **Using Masks and Respirators.**

When TB respirators are used, a respiratory protection program should be developed and enforced.[17] For more information regarding respiratory protection programs, see the Centers for Disease Control and Prevention's (CDC's) "Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-care Settings, 2005.

CDC guidelines recommend that health care facilities conduct annual training regarding multiple topics for health care workers (HCWs), including the nature, extent, and hazards of TB disease in the health care setting. The training can be conducted in conjunction with other related

training regarding infectious disease associated with airborne transmission. In addition, training topics should include:

- Risk assessment process and its relation to the respirator program, including signs and symptoms used to indicate that respirators are required in certain areas and the reasons for using respirators.
- Environmental controls used to prevent the spread and reduce the concentration of infectious droplet nuclei.
- Selection of a particular respirator for a given hazard (See “Selection of Respirators” on page 78 of the CDC’s Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Settings.
- Operation, capabilities, and limitations of respirators.
- Cautions regarding facial hair and respirator use.
- Occupational Health and Safety Administration (OSHA) regulations regarding respirators, including assessment of employees' knowledge.

Trainees should be provided opportunities to handle and wear a respirator until they become proficient. Trainees should also be provided with copies or summaries of lecture materials for use as references and instructions to refer all respirator problems immediately to the respiratory program administrator.[18]

A fit test is used to determine which respirator fits the user adequately and to ensure that the user knows when the respirator fits properly. Fit testing provides a means to determine which respirator model and size fits the wearer best and to confirm that the wearer can don the respirator properly to achieve a good fit. Periodic fit testing for respirators used in TB environments can serve as an effective training tool in conjunction with the content included in employee training and retraining.[19]

The CDC recommends that, after a risk assessment to validate the need for respiratory protection, a health care facility should perform fit testing during the initial respiratory protection program training and periodically thereafter in accordance with federal, state, and local regulations.[20] Additional fit testing should be considered in the following situations: 1) risk of transmission of *M. tuberculosis,* 2) changes in facial features of the wearer, 3) development of a medical condition that would affect respiratory function, 4) change in the appropriate physical characteristics of the respirator (despite the same model number), or 5) change in the model or size of the assigned respirator.[21]

OSHA addresses general respiratory protection requirements and the need for the following:

- Respiratory protection program
- Amended medical evaluation
- Training and recordkeeping

- Annual fit testing
- Fit checking

For regulations in your area, refer to state and local regulations and contact your local OSHA office.[22]

Who should use a mask or respirator

Using masks and respirators properly can reduce transmission of *Mycobacterium tuberculosis* and exposure to TB. Refer to Table 16.2: **Using Masks and Respirators** to determine when to use masks and respirators.

Table 16.2: Using masks and respirators[23]

Mask (a regular "surgical" mask*)	Respirator (NIOSH-approved, N-95 or higher*)
Purpose To reduce transmission by capturing infectious droplet nuclei that an infectious patient releases before they get into the air.	**Purpose** To reduce exposure by filtering infectious droplet nuclei out of the air, before wearers breathe the air into their lungs.
Who should wear a mask? Patients with infectious TB or suspected infectious TB.	**Who should wear a respirator?** Staff Visitors to TB isolation rooms (keep these visitors to a minimum)
A patient should wear a mask in a hospital setting when: Suspected of having infectious TB and not yet placed in respiratory isolation. Leaving a respiratory isolation room for any reason. **Note:** Infectious patients should **not** wear masks when in their TB isolation rooms. **A patient should wear a mask in a health clinic setting when:** Not in a TB isolation room. Returning to the clinic for evaluation.	**A staff person or visitor should wear a respirator in a hospital or clinic setting when:** Entering a TB isolation room. Performing cough-inducing or aerosol-generating procedures. Unlikely to be protected by administrative or environmental controls.
A patient should wear a mask in a transportation setting when: Traveling in a vehicle with other people.	**A staff person or visitor should wear a respirator in some transportation settings when:** Riding in a vehicle with a patient with infectious TB.
In the patient's home:	**A staff person or visitor* should wear a**

Mask (a regular "surgical" mask*)	Respirator (NIOSH-approved, N-95 or higher*)
Note: Infectious patients do **not** need to wear a mask when they are in their homes.	**respirator in a patient's home when:** Visiting the infectious patient inside the home or residence. **Note:** There should **not** be any visitors (excluding protected health care workers) to the home until the patient is released from TB isolation.
Definition of abbreviations: NIOSH = National Institute for Occupational Safety and Health; TB = tuberculosis. * There are some devices, such as the 3M 1860, which are both N95 respirators and surgical masks.	

Source: CDC. Guidelines for preventing the transmission *of Mycobacterium tuberculosis* in health-care facilities, 2005. *MMWR* 2005;54(No. RR-17):38–40.

Two-step tuberculin skin testing

Two-step testing is used to improve the interpretation of tuberculin skin tests (TSTs), especially in people who are required to undergo periodic testing. Two-step testing should be used for the **initial** skin testing of adults who will be retested periodically, such as health care workers.[24]

In some people who are infected with *Mycobacterium tuberculosis,* delayed-type hypersensitivity to tuberculin may wane over the years. When these people are skin tested many years after their infection, they may have a negative reaction.

However, the skin test may have stimulated (boosted) their ability to react to tuberculin, causing a positive reaction to subsequent tests. This boosted reaction may be misinterpreted as a new infection. The booster phenomenon may occur at any age, but its frequency increases with age and is highest among older people. Boosted reactions may occur in people infected with nontuberculous mycobacteria or in people who have had a prior bacille Calmette-Guérin (BCG) vaccination.

Boosting can also happen when an IGRA test is performed too soon after a TST. The Wisconsin Tuberculosis Program (WTBP) recommends waiting at least 90 days after the administration of a TST to perform an IGRA test to limit the potential for boosting.

The second step of a two-step test can be placed up to a year after the first, although best practice is to place it one to three weeks after the first. A positive reaction to the second test should be interpreted as evidence for infection with *M. tuberculosis.* On the basis of this second test result, the person should be classified as previously infected and cared for accordingly. This would not be considered a skin test conversion.

If the first and second test results are negative, the person should be classified as uninfected. In these people, a positive reaction to any subsequent test is likely to represent new infection with *M. tuberculosis* (a skin test conversion).

Schedule apppointments for two-step testing as shown below.

Refer to the topics on administration, measurement, and interpretation of the tuberculin skin test in the Diagnosis of Latent Tuberculosis Infection section.

Table 16.3: Four appointment schedule for two-step testing

Appointments	Tasks
First appointment	Apply the first tuberculin skin test (TST).
Second appointment 48 to 72 hours after applying the first TST	Measure the reaction. If the reaction is negative, schedule a third appointment. If the reaction is positive, do not repeat the TST. Obtain a chest radiograph.
Third appointment 1 to 3 weeks after measurement of the first TST	Re-apply the TST. Use the same dose and strength of tuberculin. Inject the tuberculin on the other forearm, or at least 5 cm from the original test site. If the first reaction is negative and the patient returns over a week after the first TST was applied, apply the second TST.
Fourth appointment 48 to 72 hours after applying the second TST	Measure the reaction. If the reaction is negative, classify the individual as uninfected. If the reaction is positive, obtain a chest radiograph.

For more information on two-step testing, refer to the CDC's "Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-care Facilities, 2005.

Isolation

To reduce disease transmission, a patient with tuberculosis (TB) disease may need to be isolated or have activities restricted.

Isolation: Isolation is used when people are ill. Isolation of people who have a specific illness separates them from healthy people and restricts their movement to stop the spread of that illness. Isolation allows for the focused delivery of specialized health care to people who are ill,

and it protects healthy people from getting sick. People in isolation may be cared for in their homes, in hospitals, or at designated health care facilities. Isolation is a standard procedure used in hospitals today for patients with TB. In most cases, isolation is voluntary; however, many levels of government (federal, state, and local) have the basic legal authority to compel isolation of sick people to protect the public.[25]

Restricted activities: Until determined to be at low risk for transmitting the infection, the patient is not permitted to return to work, school, or any social setting where the patient could expose individuals to airborne bacteria.

Quarantine: Although TB control programs have used the word "quarantine" interchangeably with "isolation" and "restricted activities," the word "quarantine" properly used is not a term applicable to TB control. Quarantine applies to people who have been exposed and may be infected but are not yet ill. Separating exposed people and restricting their movements is intended to stop the spread of illness. Quarantine is not an appropriate TB control measure for asymptomatic, exposed individuals. [26]

For information on diagnosis and laboratory tests, refer to the sections on diagnosis of TB disease and LTBI. For information on guidelines for infection control in the patient's residence, group settings, and during transportation of a patient, see the subtopics that follow.

Estimating infectiousness

In general, patients who have suspected or confirmed TB disease and who are not on antituberculosis treatment should be considered infectious if characteristics include the following:

- Presence of cough
- Cavitation on chest radiograph
- Positive acid-fast bacilli (AFB) sputum smear result
- Respiratory tract disease with involvement of the lung or airways, including larynx
- Failure to cover the mouth and nose when coughing
- Undergoing cough-inducing or aerosol-generating procedures (for example, sputum induction, bronchoscopy, airway suction) [27]

If a patient with one or more of these characteristics is on standard multidrug therapy with documented clinical improvement, usually in connection with smear conversion over several weeks, the risk of infectiousness is reduced.[28]

Determining non-infectiousness

Use the following criteria as general guidelines to determine when during therapy a patient with pulmonary TB disease has become noninfectious. Decisions about infectivity of a person on

treatment for TB should depend on the extent of illness and the specific nature and circumstances of the contact between the patient and exposed people. These guidelines can and should be modified on a case-by-case basis by a qualified public health officer. If you need assistance with determining when to initiate or discontinue isolation, please contact the WTBP at 608-261-6319.

For community non-congregate settings

The WTBP has adopted the recommendations in the National Tuberculosis Coalition of America (NTCA) Guidelines for Respiratory Isolation and Restrictions to Reduce Transmission of Pulmonary Tuberculosis in Community Settings, 2024 to guide decisions about respiratory isolation and restrictions for people with TB in the State of Wisconsin. See BCD Memo 2024-03 for the WTBP's statement on the guidelines.

Where previous guidance allowed only for people to be either in isolation or out of isolation, the updated guidance allows flexibility by utilizing a spectrum of respiratory isolation restrictions. The tiers include extensive restriction, midlevel or moderate restriction, and no restriction. Table 16.4 below details specific information for each tier. It is important to note that these levels are not absolute, but they provide a framework for making individual case judgements. The duration of restrictions should always consider both the individual's level of infectiousness as well as the potential risks and consequences of transmission to others. The goal is to utilize the least restrictive respiratory isolation possible to avoid unintentional harms to the person with TB.

Table 16.4: Definitions of levels of respiratory isolation and applicable time frames

Level of respiratory isolation	Definition	Time frame
Extensive	Movement strictly limited to an agreed-upon location, such as a home or other residence. Any exceptions to extensive RIR should be discussed and agreed with the LTHD. When an individual leaves the primary site of RIR (such as for a health care visit), additional measures to reduce TB transmission risk may be warranted, including, but not limited to: a. Personal protective equipment (for example, N95 masks) for close contacts, b. Face masks (that is, surgical masks, KN95, N95) for the PWTB c. Efforts to improve ventilation (for example, open windows during transportation in cars, negative-pressure rooms or HEPA filters). Visitors to the PWTB's residence should be avoided unless approved by the local health department; if	• For people with Pulmonary TB: prior to initiation of adequate TB therapy[1] • For people with extrapulmonary TB: when pulmonary involvement has not been ruled out

	approved, they should wear personal protective equipment (for example, N95).	
Midlevel or Moderate	Majority of time is spent at an agreed-upon location, such as a home or residence. Individual may engage in most activities in outdoor or well-ventilated environments. A mask (surgical mask, KN95, or N95) should be worn by the PWTB during indoor activities deemed essential by the LTHD, particularly if there is contact with previously unexposed individuals. If indoors, avoid prolonged (multiple hours) or repeated close contact with others, particularly individuals not previously exposed and medically vulnerable people. Indoor activities in settings of poor ventilation or crowding should be avoided. In settings at higher risk of transmission (for example, health care visits) or with the potential risk of transmission to vulnerable populations, additional risk reduction measures may be warranted, including: a. Personal protective equipment (for example, N95 masks) for close contacts, b. Face masks (that is, surgical masks, KN95, N95) for the PWTB c. efforts to improve ventilation (for example, open windows during transportation in cars, negative-pressure rooms or HEPA filters). Visitors should be avoided unless approved by the LTHD and should wear personal protective equipment (for example, N95 mask).	Day 0–Day 5 of adequate therapy[1]
No restrictions	Individuals have no restrictions and may engage in daily activities as usual, irrespective of setting or potential contacts.	After release from RIR while the PWTB remains on adequate TB therapy

All people newly diagnosed with respiratory tract TB (for example, pulmonary, laryngeal) should remain, at minimum, in midlevel or moderate restrictions until they have been on therapy for at least five days via DOT, are tolerating therapy, demonstrate clinical improvement (for example, resolution of fever or decreased cough frequency), are compliant with the treatment plan as outlined with the provider and local or Tribal health department (LTHD), and are presumed to have drug-susceptible TB.

- If a smear positive respiratory sample is available, TB NAAT testing should be performed. If a TB NAAT positive respiratory sample is available, molecular testing for the detection of drug resistance for rifampin (for example, GeneXpert) should be performed and results known before release from isolation. If the performing lab does not have this capability, specimens must be sent to WSLH promptly for this testing.
- People under midlevel or moderate restriction isolation should be highly encouraged to wear a surgical mask for essential indoor activity outside their home or residence.
- Essential activity is defined as any activity critical for the health of the person, such as picking up food or medications. Prolonged activities, such as returning to employment, should be avoided until the person is released from midlevel or moderate restrictions. Any activities that are not urgent (for example, dental cleaning visits) should be delayed or rescheduled.
- Most outdoor activities in uncrowded areas away from vulnerable individuals are permissible for patients under midlevel or moderate restrictions.

People with extrapulmonary TB should remain in extensive restrictions until they have been evaluated for respiratory tract TB via symptom evaluation, chest imaging, and sputum collection for AFB smear, TB NAAT, and AFB culture evaluation. People unable to spontaneously expectorate a sputum sample should receive sputum induction, if available; alternately, individuals unable to produce a sputum sample spontaneously or after induction who have lung imaging abnormalities should undergo bronchoscopy. Rapid assessment (ideally, within five days of suspecting extrapulmonary TB diagnosis) for pulmonary TB should be encouraged in such patients, so that unnecessary restrictions can be reduced.

For inpatient or congregate settings

Hospitals and congregate settings (for example, long term care facilities or correctional facilities) necessitate slightly different criteria for release from respiratory isolation. The patient may be released from isolation with the following criteria are met:

- The patient has negligible likelihood of multidrug-resistant TB (no known exposure to multidrug-resistant tuberculosis and no history of prior episodes of TB with poor compliance during treatment).
- The patient has received adequate, multidrug antituberculosis therapy for two weeks.
- The patient has demonstrated complete adherence to treatment (for example, is receiving directly observed therapy).
- The patient has demonstrated evidence of clinical improvement (for example, reduction in the frequency of cough or reduction of the grade of the AFB sputum smear result).
- All close contacts of the patient have been identified, evaluated, advised, and, if indicated, started on treatment for LTBI. This criterion is critical, especially for children

younger than 5 years of age and people of any age with immunocompromising health conditions such as human immunodeficiency virus (HIV) infection.

- Three consecutive AFB-negative smear results from sputum specimens collected eight to 24 hours apart, with at least one being an early morning specimen.

While in the hospital for any reason, patients with pulmonary TB should remain in airborne infection isolation until the above criteria are met. Hospitalized patients returning to a congregate setting (for example, a homeless shelter or detention facility) should have three consecutive AFB-negative smear results of sputum specimens collected more than eight hours apart before being considered noninfectious.[29] At least one of these specimens should be collected early in the morning.

Airborne infection isolation in a health care facility

In airborne infection isolation (AII), the patient is placed in an AII room, usually within a hospital or health care facility. The main characteristics of an AII room (for new or renovated buildings) are that it has negative air pressure relative to the hall and 12 or more air exchanges per hour, of which at least two exchanges are outside air. For existing structures, six or more air exchanges per hour are acceptable.[30]

When to initiate airborne infection isolation

Suspected cases of laryngeal or pulmonary TB should be isolated immediately, before AFB sputum smear results are available.

Initiate all TB precautions for any patient who meets the criteria in Table 16.5.

Table 16.5: Initiation of airborne infection isolation[31]

Criteria for initiation of airborne infection isolation		
The patient has signs or symptoms of pulmonary, laryngeal, or multidrug-resistant tuberculosis (MDR-TB) disease.	**Or**	The patient has documented infectious pulmonary, laryngeal tuberculosis (TB) disease or MDR-TB disease. **and** The patient has not completed treatment.

Source: CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):16, 44.

Patients with suspected or confirmed MDR-TB should remain in an AII room throughout their hospitalization or until culture conversion is documented, regardless of sputum smear results.

When to discontinue airborne infection isolation

Prior to discontinuing isolation, call the WTBP at 608-261-6319. High-risk patients should be carefully evaluated before discontinuing isolation. Hospitalized patients with suspected or confirmed MDR-TB should remain in an AII room throughout their hospitalization.

Suspected tuberculosis disease

For patients placed in AII due to suspected infectious TB disease of the lungs, airway, or larynx, AII can be discontinued when the criteria in Table 16.6 are met.

Table 16.6: Discontinuation of airborne infection isolation of patients with suspected tuberculosis[32]

Criteria for discontinuing airborne infection isolation: suspected case of tuberculosis of the lungs, airway, or larynx		
Infectious TB disease is considered unlikely.	**and**	**Either** Another diagnosis is made that explains the clinical syndrome. **Or** The patient has 3 negative acid-fast bacilli (AFB) sputum smear results, * has been on treatment delivered as directly observed therapy, and has demonstrated clinical improvement.
* Each of the 3 sputum specimens should be collected 8 to 24 hours apart, and at least 1 should be an early morning specimen (because respiratory secretions pool overnight). Generally, this will allow patients with negative AFB sputum smear results to be released from AII in 2 days.[33]		
While in the hospital for any reason, patients with pulmonary TB should remain in airborne infection isolation until they (1) are receiving standard multidrug antituberculosis therapy; (2) have demonstrated clinical improvement; and (3) have had 3 consecutive AFB-negative smear results of sputum specimens collected 8 to 24 hours apart, with at least 1 being an early morning specimen.[34]		
Because patients with TB disease who have negative AFB sputum smear results can still be infectious, patients with suspected disease who meet the above criteria for release from AII should not be released to an area where other patients with immunocompromising		

conditions or children less than 5 years old are housed.[35]

Sources: CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):16, 43; ATS, CDC. Controlling tuberculosis in the United States: recommendations from the American Thoracic Society, CDC, and the Infectious Diseases Society of America. *MMWR* 2005;54(No. RR-12):9.

Confirmed tuberculosis disease

A patient with drug-susceptible TB of the lung, airway, or larynx who is on standard multidrug antituberculosis treatment and who has had a significant clinical and bacteriologic response to therapy (for example, reduction in cough, resolution of fever, and progressively decreasing quantities of AFB on smear results) is probably no longer infectious. However, because culture and drug susceptibility results are not usually known when the decision to discontinue AII is made, all patients with confirmed TB disease should remain in AII while hospitalized until all the criteria in Table 16.7 are met.[36]

Table 16.7: Discontinuation of airborne infection isolation of patients with confirmed tuberculosis[37]

Criteria for discontinuing airborne infection isolation: Hospitalized patients with confirmed, drug-susceptible tuberculosis of the lungs, airway, or larynx
• The patient has had 3 consecutive negative acid-fast bacilli (AFB) sputum smear results collected 8 to 24 hours apart, with at least 1 being an early morning specimen. **and** • The patient has received adequate antituberculosis treatment by directly observed therapy (DOT). **and** • The patient has demonstrated clinical improvement.

Source: CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):43.

Hospital discharge

The decisions to discharge an acid-fast bacilli (AFB) sputum smear-positive patient or a multidrug-resistant tuberculosis (MDR-TB) patient should be made in consultation with the local health department and the WTBP.

Drug-susceptible tuberculosis disease

If a hospitalized patient who has suspected or confirmed drug-susceptible TB disease is deemed medically stable (including patients with positive AFB sputum smear results indicating

pulmonary TB disease), the patient may be discharged from the hospital before converting AFB sputum smear results to negative if all the criteria in Table 16.8 are met.[38]

Table 16.8: Hospital discharge of patients with drug-susceptible tuberculosis[39]

Criteria for hospital discharge to home: patients with suspected or confirmed drug-susceptible tuberculosis
• A specific plan exists for follow-up care with the local TB control program. **and** • The patient has been started on an adequate antituberculosis treatment regimen and directly observed therapy (DOT) has been arranged. **and** • No children aged under 5 years or people with immunocompromising conditions are present in the household, or those individuals are started on and tolerating window prophylaxis. **and** • All immunocompetent household members have been previously exposed to the patient. **and** • The patient is willing to remain inside the home except for activities discussed and explicitly agreed upon by the local health department.

Source: CDC. Guidelines for preventing the transmission *of Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):43–44.

Multidrug-resistant tuberculosis disease

Patients with suspected or confirmed MDR-TB disease should remain in the hospital in AII until they meet all three of the criteria in Table 16.9.

Table 16.9: Hospital discharge of patients with multidrug-resistant tuberculosis

Criteria for hospital discharge to home: patients with suspected or confirmed multidrug-resistant tuberculosis
• An appropriate treatment regimen has been devised and initiated. **and** • Suitable arrangements have been made so that the regimen can be continued and properly monitored on an outpatient basis, specifically by directly observed therapy (DOT).

Release settings

Patients with suspected or confirmed infectious TB disease should not be released to health care settings or homes where the patient can expose others who are at high risk for progressing to TB disease if infected, such as HIV-infected people or young children.[40] Hospitalized patients

returning to a congregate setting (for example, a homeless shelter or detention facility) should have three consecutive AFB-negative smear results of sputum specimens collected more than eight hours apart, with at least one being an early morning specimen, before being considered noninfectious.[41]

The updated NTCA RIR guidance, 2024 does not apply to congregate settings. Patients who have positive AFB sputum smear results should **not** be directly discharged from the hospital to **any** of the following living environments:

- Congregate living site (for example, shelter, nursing home, jail, prison, group home, another hospital).
- Living situation where infants and young children also reside.
- Living situation where immunosuppressed people (for example, people living with HIV or taking cancer chemotherapy) also reside.
- Living situation where home health aides or other social service providers will be present in the home for several hours a day to care for the person or family member.

Local and Tribal health care departments (LTHDs) are highly encouraged to know what resources are available locally for individuals needing isolation and live in high-risk settings. They are also encouraged to identify and potentially access facilities that have the capability to care for or house someone with infectious TB until it is safe for them to return to their usual residence.

Residential settings

Patients suspected of having infectious TB either are diagnosed during an outpatient workup, or, if admitted to a hospital, are often sent home after starting treatment, even though they may still be infectious. Because patients are most likely to transmit TB to household members **before** TB has been diagnosed and treatment has rendered the patient noninfectious, it is important that TB patients and members of their households know what steps to take to prevent the spread of TB in the home until the patient becomes noninfectious.[42,43]

Administrative controls in the patient's home

Establish a policy and procedure for managing infectious patients at home. To standardize care, the following information should be included:

- **Definition of key terms:** Infectious case and noninfectious case
- **Treatment of cases at home whenever possible:** Treat patients at home if their condition does not otherwise require hospitalization.

- **Window period treatment policy:** Ensure that candidates for window period treatment in the home have completed their evaluation and are on medication before they are discharged home (or as soon as possible if they were not hospitalized).
- **Education:** Educate infectious patients, family, care providers, and close contacts regarding the purpose of isolation, their responsibility to adhere to the isolation requirements, and the consequences of not voluntarily complying with isolation.
- **Home isolation agreements:** Have infectious patients in isolation sign a home isolation agreement. This document should include any legal consequences should they fail to voluntarily comply.

Environmental controls in the patient's home

Generally, there are no special engineering recommendations. However, patients and their families can be advised to do the following:

- Have tissues available for patients to cover their mouths and noses when coughing or sneezing.
- Keep windows and doors open (weather permitting) to increase the ventilation and dilution of infectious droplet nuclei in the house.
- If a sputum sample needs to be collected at home, do so in a well-ventilated area away from other residents (for example, bathroom with an exhaust fan). If possible, collect the sputum in an outdoor area away from open windows or doors.

Respiratory protection in the patient's home

Patient: Mask

Patients do not need to wear masks at home.

Give patients regular surgical-type masks and advise them to wear them at medical appointments until they are no longer infectious.

For more information on the criteria for non-infectiousness, see the "Determining Non-infectiousness" topic in this section.

Do not give patients respirators (N-95 or higher).

Health care worker: Respirator

Health care workers should wear respirators when entering the home or a closed area to visit with infectious patients.

The respirators should be National Institute for Occupational Safety and Health (NIOSH)-approved (N-95 or higher).

Health care workers should be provided with respirators after appropriate education and testing.

Other residential settings

Motels

Unhoused people with infectious TB may be housed in a motel that has outside access to rooms (not via hallways) or hotel if hallway and common areas can be avoided. The individual rooms should not have shared ventilation to and from other rooms if used for housing a person with infectious TB. Heating, ventilation, and air conditioning (HVAC) staff may need to be consulted to ensure air is not directly shared between occupancy units. Please submit Treatment Assistance Program preapprovals for any requests exceeding the spending limit. Special housing may be an acceptable reimbursement request.

The motel manager must be advised of the following:

- The patient is in respiratory isolation.
- The manager should report to local public health agency staff if the manager becomes aware that the patient does not stay in the room or if the patient has guests.
- The manager should advise motel staff that they are not to enter the room while the patient resides at the motel. (Arrangements should be made for weekly linen replacement in which the patient sets out linens that need to be replaced, and the staff knock on the door and leave the linens for the patient to make his or her own bed.)
- Upon release from isolation, the room should be aired out for one day before staff enter to clean. Afterwards, routine cleaning done between guests is sufficient. There are no additional special cleaning requirements.
- Local public health agency staff will be delivering medication to the patient (specify the frequency).
- Arrangements have been made for food delivery to the patient.

Health care facilities or residential settings

- Patients with infectious TB should be in appropriate respiratory isolation (airborne infection isolation rooms) when housed in health care facilities or residential settings.
- If a facility does not have the capability to provide appropriate respiratory isolation, the patient should be transferred to a facility that can accommodate respiratory isolation until the patient is noninfectious. Once noninfectious, the person may return to the original facility.

Return to work, school, or other social settings

The decision of when to allow a patient to return to work, school, or other social settings should be made in consultation with the WTBP.

The decision to permit a patient to return to work, school, or other social settings is based on:

- The characteristics of the patient with TB disease (for example, whether the patient is likely to adhere to the regimen and follow treatment instructions).
- The characteristics of the TB disease itself (for example, multidrug-resistant versus drug-susceptible TB, AFB sputum smear-positive versus smear-negative, cavitary versus noncavitary).
- The duration of current treatment.
- The environment(s) to which the patient will be returning.

If you need assistance with determining when a patient is able to return to work or school, call the WTBP at 608-261-6319.

Drug-susceptible tuberculosis disease

Patients with drug-susceptible TB are no longer considered infectious if they meet all the criteria in Table 16.10.

Table 16.10: Return to work, school, and other settings of patients with drug-susceptible tuberculosis[44]

Criteria for return to work, school, or other social settings: patients with suspected or confirmed drug-susceptible tuberculosis
The patient is on adequate therapy. **and** The patient has had a significant clinical response to therapy. **and** The patient has completed at least 5 days of appropriate treatment (meaning there is no suspicion of drug resistance and any eligible specimens have had GeneXpert testing performed).
*__NOTE__: This guidance does not apply to congregate settings such as health care facilities or jails. If an individual works in a congregate setting, they should not return to work after 5 days of treatment. Please refer to the “For inpatient or congregate settings” section of this chapter for more information.

Multidrug-resistant tuberculosis disease

Regardless of their occupation, patients known or likely to have pulmonary MDR-TB may be considered for return to work or school only if they meet all four of the criteria in Table 16.11.

Table 16.11: Return to work, school, and other settings of patients with multidrug-resistant tuberculosis

Criteria for return to work, school, or other social settings: patients with suspected or confirmed multidrug-resistant tuberculosis
Please consult with the WTBP regarding return to work, school, or other social settings for patients with suspected or confirmed multidrug-resistant tuberculosis.

Tuberculosis infection control in patient care facilities

Patients with suspected TB may present for care in many different settings. The Centers for Disease Control and Prevention (CDC) has written a comprehensive set of guidelines for TB infection control in acute care hospitals and other medical settings.[45] In addition to the CDC guidelines, various professional organizations or state regulations may have guidelines for managing TB patients.

The main focus in establishing a TB infection control program at a patient care facility is to do the following:

- Assign responsibility for managing the program to a designated staff position.
- Perform and establish a TB risk assessment for the facility.
- Develop the TB infection control plan based on the level of TB risk identified in the assessment.

The main purpose for having an effective TB infection control plan in a facility is to assure that the activities necessary for TB control are addressed and that policies and procedures are developed to protect the health care workers, other patients, and visitors in the facility.

Table 16.12: **Guidelines for Tuberculosis Infection Control** lists references that provide the information needed to conduct a TB risk assessment and write a TB infection control plan to establish policies and procedures for TB control activities for inpatient care facilities.

Call the WTBP at 608-261-6319 if you have any questions when consulting with institutions on infection control measures.

Table 16.12: Guidelines for tuberculosis infection control

Guidelines for tuberculosis infection control	
The following settings are addressed in the "Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-care Facilities, 2005" Some settings have additional guidelines as noted below.	
Inpatient settings	• Emergency departments and urgent care settings • Intensive care units • Surgical suites • Laboratories • Bronchoscopy suites • Sputum induction and inhalation therapy rooms • Autopsy suites and embalming rooms
Outpatient settings	• TB treatment facilities • Medical settings in correctional facilities: Prevention and Control of Tuberculosis in Correctional Facilities. (ACET) (*MMWR* 1996;45[No. RR-8]). • Medical offices and ambulatory care settings • Dialysis units
Nontraditional facility-based settings	• Homeless shelter clinics: Prevention and Control of Tuberculosis Among Homeless People (ACET) (*MMWR* 1992;41[No. RR-5]). • Emergency medical services • Home-based health care and outreach settings • Long-term care facilities (that is, hospices, skilled nursing facilities): Prevention and Control of Tuberculosis in Facilities Providing Long-Term Care to the Elderly (*MMWR* 1990;39[No. RR-10]).

Transportation vehicles

To prevent the transmission of *Mycobacterium tuberculosis* while transporting patients, follow the respiratory precautions identified below.

Patient self-transport

- The car windows should be opened, and any recirculating air controls should be turned off if any other already exposed household members are also present in the car.
- If possible, only household members should accompany the patient. Members of the patient's household who accompany the patient do not need to wear surgical masks.
- If the only source for transport is a friend or relative who is not a member of the patient's household:
    - The person accompanying the patient should be given a respirator (N-95) to wear during transport (due to the confined space and risk of ongoing exposure).
    - The patient should sit in the back seat and wear a surgical mask.
    - The car windows should be opened, and any recirculating air controls should be turned off.
- The patient should wear a surgical mask after leaving the vehicle.[46]

Transport by health care workers

- Health care workers should wear respiratory protection (N-95) while in the vehicle.
- The patient should wear a surgical mask and sit in the back seat.
- The car windows should be opened, and any recirculating air controls should be turned off. [47]

Transport by emergency medical services

Emergency medical services staff may have specialized vehicles that have the ability to separate the driver's compartment from the transport compartment or may be equipped with rear exhaust fans. Recommendations for these vehicles and staff are addressed in the Centers for Disease Control and Prevention (CDC) "Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-care Settings, 2005."

Resources and references

Resources

CDC. "Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-care Settings, 2005" (*MMWR* 2005;54[No. RR-17]).

CDC. "Guidelines for Environmental Infection Control in Health-care Facilities" (*MMWR* 2003;52[No. RR-10]).

CDC. "Infection Control". Available at: Infection Control | CDC

CDC. *Interactive Core Curriculum on Tuberculosis*. Available at: Core Curriculum on Tuberculosis: What the Clinician Should Know | Tuberculosis (TB) | CDC

CDC. "Respiratory Protection in Health-Care Settings" (*TB Elimination Fact Sheet* April 2006).

CDC. Module 4: "Treatment of TB Infection and Disease" (*Self-Study Modules on Tuberculosis 1999*). Available at: Self-Study Modules on Tuberculosis | Tuberculosis (TB) | CDC

CDC. Module 5: "Infectiousness and Infection Control" (*Self-Study Modules on Tuberculosis 1999*). Available at: Self-Study Modules on Tuberculosis | Tuberculosis (TB) | CDC

NIOSH. "Respiratory Protection" [Web page]. Available at: Respiratory Protection Information Trusted Source | NPPTL | NIOSH | CDC .

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[3] CDC. Guidelines for preventing the transmission *of Mycobacterium tuberculosis* in health-care facilities, 2005. *MMWR* 2005;54(No. RR-17):1–2.
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[13] CDC. Guidelines for preventing the transmission *of Mycobacterium tuberculosis* in health-care facilities, 2005. *MMWR* 2005;54(No. RR-17):8.
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[16] CDC. Guidelines for preventing the transmission *of Mycobacterium tuberculosis* in health-care facilities, 2005. *MMWR* 2005;54(No. RR-17):75.

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