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Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Facilities, 1994*

The following is a summary of recommendations published by the Centers for Disease Control and Prevention, 1994.

Executive Summary

This document updates and replaces all previously published guidelines for the prevention of Mycobacterium tuberculosis transmission in health-care facilities. The purpose of this revision is to emphasize the importance of

a) the hierarchy of control measures, including administrative and engineering controls and personal respiratory protection;

b) the use of risk assessments for developing a written tuberculosis (TB) control plan;

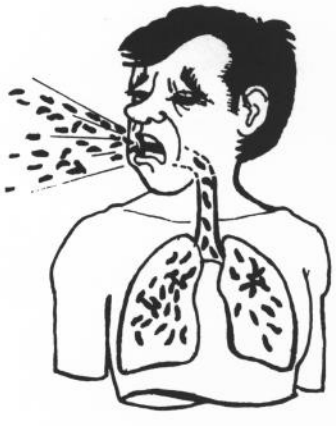
c) early identification and management of persons who have TB;

d) TB screening programs for health-care workers (HCWs);

e) HCW training and education; and

f) the evaluation of TB infection-control programs.

Transmission of M. tuberculosis is a recognized risk to patients and HCWs in health-care facilities. Transmission is most likely to occur from patients who have unrecognized pulmonary or laryngeal TB, are not on effective anti-TB therapy, and have not been placed in TB isolation. Several recent TB outbreaks in health-care facilities, including outbreaks of multidrug-resistant TB (MDR-TB), have heightened concern about nosocomial transmission. Patients who have multidrug-resistant TB can remain infectious for prolonged periods, which increases the risk for nosocomial and/or occupational transmission of M. tuberculosis. Increases in the incidence of TB have been observed in some geographic areas; these increases are related partially to the high risk for TB among immunosuppressed persons, particularly those infected with human immunodeficiency virus (HIV). Transmission of M. tuberculosis to HIV-infected persons is of particular concern because these persons are at high risk for developing active TB if they become infected with the bacteria. Thus, healthcare facilities should be particularly alert to the need for preventing transmission of M. tuberculosis in settings in which HIV-infected persons work or receive care.



Supervisory responsibility for the TB infection-control program should be assigned to a designated person or group of persons who should be given the authority to implement and enforce TB infection-control policies. An effective TB infection-control program requires early identification, isolation, and treatment of persons who have active TB. The primary emphasis of TB infection-control plans in health-care facilities should be achieving these three goals by the application of a hierarchy of control measures, including a) the use of administrative measures to reduce the risk for exposure to persons who have infectious TB, b) the use of engineering controls to prevent the spread and reduce the concentration of infectious droplet nuclei, and c) the use of personal respiratory protective equipment in areas where there is still a risk for exposure to M. tuberculosis (e.g., TB isolation rooms). Implementation of a TB infection-control program requires risk assessment and development of a TB infection-control plan; early identification, treatment, and isolation of infectious TB patients; effective engineering controls; an appropriate respiratory protection program; HCW TB training, education, counseling, and screening; and evaluation of the program's effectiveness.

Although completely eliminating the risk for transmission of M. tuberculosis in all health-care facilities may not be possible at the present time, adherence to these guidelines should reduce the risk to persons in these settings. Recently, nosocomial TB outbreaks have demonstrated the substantial morbidity and mortality among patients and HCWs that have been associated with incomplete implementation of CDC's Guidelines for Preventing the Transmission of Tuberculosis in Health-Care Facilities, with Special Focus on HIV-Related Issues published in 1990.† Follow-up investigations at some of these hospitals have documented that complete implementation of measures similar or identical to those in the 1990 TB Guidelines significantly reduced or eliminated nosocomial transmission of M. tuberculosis to patients and/or HCWs.

Introduction

The purpose of this document is to make recommendations for reducing the risk for transmitting *M. tuberculosis* to HCWs, pa-

Recommendations

I. Assignment of Responsibility

A. Assign supervisory responsibility for a TB infection control program to a designated, qualified person or persons with authority to implement and enforce policies.

B. Identify and include persons with expertise in infection control, occupational health, and engineering.

II. Risk Assessment, Development of a TB Infection Control Plan, and Periodic Reassessment

A. Risk assessment

- Perform a thorough risk assessment for the entire facility using a qualified person(s).
- Obtain a profile of TB in the community served by the facility from the local health department.
- Evaluate data concerning the number of suspected and confirmed active TB cases in the facility. Review and evaluate drug susceptibility patterns.
- Analyze the results of PPD screening data from HCWs.
- Review TB patient medical records periodically to evaluate infection control parameters.
- Observe and assess adherence to TB infection-control practices on a regular basis and if an increase occurs in the number of TB patients or HCW PPD test conversions.
- Review results of engineering maintenance measures.

B. Develop an Infection-Control Plan

- Determine various risks present in different areas of the facility.
- Develop and implement a written TB infection-control plan for each area of the facility and occupational group, based on the determined risks.

C. Periodic Reassessment

- Perform follow-up risk assessment at appropriate intervals.
- After each risk assessment, have staff responsible for TB control, with other appropriate HCWs, review all TB control policies to ensure that they are effective and meet current needs. Problem evaluation may need to be conducted or the protocol may need to be modified to a higher- or lower-risk level.

III. Identifying, Evaluating, and Treating Patients With Active TB

The most important factors in preventing transmission of *M. tuberculosis* are the early identification of patients who may have infectious TB, prompt implementation of TB precautions for such patients, and prompt initiation of effective treatment for those likely to have TB.

A. Identify patients who may have active TB.

- Develop protocols for the early identification of patients in ambulatory-care and inpatient settings who may have infectious TB.
- Base protocols on the prevalence and characteristics of TB in the population served by the specific facility.

B. Perform the proper radiologic and bacteriologic evaluation of patients with signs and symptoms suggestive of TB.

C. Initiate treatment for suspected or confirmed TB promptly.

- In geographic areas or facilities with a high prevalence of MDR-TB, the initial regimen used may need to be enhanced while the results of drug-susceptibility tests are pending.
- Administer anti-TB drugs by directly observed therapy (DOT), the process by which an HCW observes the patient swallowing the medications, while the patient is in the health-care facility.

IV. Management of Patients With Active TB in Out-Patient Settings & ERs

A. Promptly identify patients with active TB. Train HCWs who are the first points of contact to ask questions that will facilitate identification of patients with signs and symptoms suggestive of TB.

B. Follow TB precautions while diagnostic evaluation is being conducted for any suspect patients.

C. Include the following TB precautions in the ambulatory-care setting:

- Place TB patients in a separate room or enclosure meeting TB isolation requirements.
- Give these patients surgical masks, tissues and instructions to cover their mouths and noses when coughing or sneezing.
- Schedule patients with active TB to avoid exposing HIV-infected or immunocompromised persons.
- Design and maintain ventilation in ambulatory-care areas where patients at high risk for TB are treated to reduce the risk for transmission.

V. Management of Hospitalized Patients With Confirmed or Suspected TB

A. Place any patient suspected of having or known to have infectious TB in a TB isolation room promptly.

B. Discontinue TB isolation if a diagnosis of TB is ruled out. If a diagnosis of

(continued from page 1.)

tients, volunteers, visitors, and other persons in these settings. The information also may serve as a useful resource for educating HCWs about TB.

The recommendations in this document are applicable primarily to inpatient facilities in which health care is provided (e.g., hospitals, medical wards in correctional facilities, nursing homes, and hospices). Recommendations applicable to ambulatory-care facilities, emergency departments, home-health-care settings, emergency medical services, medical offices, dental settings, and other facilities or residential settings that provide medical care are provided in separate sections, with cross-references to other sections of the guidelines if appropriate.

In this document, the term "HCWs" refers to all the paid and unpaid persons working in health-care settings who have the potential for exposure to *M. tuberculosis*.

Although the purpose of this document is to make recommendations for reducing the risk for transmission of *M. tuberculosis* in health-care facilities, the process of implementing these recommendations must safeguard, in accordance with applicable state and federal laws, the confidentiality and civil rights of persons who have TB.

For a copy of this complete document, including the following supplements:

Supplement 1: Determining the Infectiousness of a TB Patient

Supplement 2: Diagnosis and Treatment of Latent TB Infection and Active TB

Supplement 3: Engineering Controls

Supplement 4: Respiratory Protection

Supplement 5: Decontamination -- Cleaning, Disinfecting, and Sterilizing of Patient-Care Equipment

Contact the Division of Tuberculosis Control, (804) 786-6251.

TB cannot be ruled out, maintain isolation until a determination has been made that the patient is noninfectious. Patients can be discharged from the healthcare facility while still potentially infectious if appropriate postdischarge arrangements can be ensured.

C. Discontinue isolation of patients with active TB only when the patient is on effective therapy, is improving clinically, and has had three consecutive negative sputum AFB smears collected on different days.

D. Monitor hospitalized patients who have active TB for relapse by having sputum AFB smears examined regularly (e.g., every 2 weeks).

E. Strongly consider continued isolation throughout the hospitalization for patients who have MDR-TB because of the tendency for treatment failure or relapse.

F. Ensure continuation of therapy by collaborating with public health authorities prior to discharge of a TB patient.

VI. Engineering Control Recommendations

A. Have persons with expertise in ventilation engineering work closely with infection-control staff to assist in controlling airborne infections.

B. Design TB isolation rooms with an ample supply of "clean" air that is not recirculated, but exhausted directly to the outside at a rate of >6 air changes per hour (ACH) for existing rooms and >12 ACH for new or renovated rooms. Exhaust the air from these rooms at a safe distance from the facility's intake for the general ventilation system or outside areas where people tend to congregate. Designate isolation rooms clearly and ensure that proper precautions are taken by HCWs or visitors when they enter the room. Limit entry into these rooms to the degree possible. An anteroom is preferable to minimize the escape of droplet nuclei when the door is opened. Additional precautions (see section VI., paragraph D.) can be used to supplement local exhaust ventilation.

C. Adjust the air supply and exhaust for TB isolation rooms to ensure the room remains continuously under negative pressure to adjacent areas. Monitor these isolation rooms daily to ensure negative pressure is maintained. Design and maintain the direction of airflow throughout the facility so that air flows from "clean" to "less clean" areas.

D. The ventilation system in general-use areas of health care facilities where TB patients are likely to go (e.g., waiting rooms, emergency departments and radiology suites), especially in health care facilities serving populations with a high prevalence of TB, may need to be supplemented. The use of additional engineering approaches such as a single-pass, nonrecirculating system that exhausts directly to the outside, a recirculation system that passes air through HEPA filters before recirculation or upper air ultraviolet G irradiation (UVGI) are recommended in these areas.

VII. Respiratory Protection

A. Have the following persons use personal respiratory protection:

- Persons entering rooms in which patients with known or suspected infectious TB are being isolated.
- Persons present during cough-inducing or aerosol-generating procedures performed on such patients.
- Persons in other settings where administrative and engineering controls are not likely to protect them from inhaling infectious airborne droplet nuclei (such as in emergency transport vehicles or surgical or dental care settings).

B. Respiratory protective devices:

- Should filter particles 1 μm in size with 95% efficiency.
- Should be fitted to obtain a face-seal leakage of ≤ 10%.
- A respiratory protection program is required at most facilities and should be designed in accordance with the estimated risk for transmission in various areas.

VIII. Cough-Inducing and Aerosol-Generating Procedures

A. Do not perform cough-inducing procedures on patients who may have infectious TB unless the procedures are absolutely necessary and can be performed with appropriate precautions.

B. Perform all cough-inducing procedures using local exhaust ventilation devices (e.g., booths or special enclosures) or in a room that meets the ventilation requirements for TB isolation.

C. Have HCWs wear respiratory protection when present in rooms or enclosures in which cough-inducing procedures are being performed.

D. Keep patients who may have infectious TB in their isolation rooms or enclosures, after completion of cough-inducing procedures, until coughing subsides and have them cover their mouths and noses with tissues when coughing.

E. Allow enough time to pass for at least 99% of airborne contaminants to be removed before the booth, enclosure, or room is used for another patient.

IX. Education and Training of HCWs

A. Have all HCWs receive education regarding TB that is relevant to persons in their particular occupational group.

B. Include in the training the basic concepts of *M. tuberculosis* transmission, pathogenesis, and diagnosis, including information concerning the difference between latent TB infection and active TB disease, the signs and symptoms of TB, and the possibility of reinfection.

C. Include the epidemiology of TB within that facility and community.

D. Include the principles and practices of infection control that reduce the risk for transmission of *M. tuberculosis*, including the written policies and procedures of the facility.

E. Include an explanation as to the purpose of PPD testing, the significance of a positive PPD test result, and the importance of participating in the skin-test program.

F. Include a description of work practices in place to reduce the likelihood of transmitting TB and policies regarding HCWs who become infected.

X. HCW Counseling, Screening, and Evaluation

A. Counsel all HCWs regarding TB.

B. Counsel all HCWs regarding the increased risk for developing active TB in HIV-infected or otherwise severely immunocompromised persons.

C. Screen symptomatic HCWs for active TB.

D. Determine which HCWs should participate in a skin-testing program and the frequency of testing.

E. Determine how best to evaluate and manage HCWs with positive PPD test results or active TB.

XI. Epidemiologic Investigations May Be Indicated For:

A. The occurrence of PPD test conversions or active TB in HCWs.

B. The occurrence of possible person-to-person transmission of *M. tuberculosis*.

C. Situations in which patients or HCWs with active TB are not promptly identified and isolated.

XII. Coordinate Any Investigations with the Public Health Department

†CDC. Guidelines for Preventing the Transmission of Tuberculosis in Health-Care Facilities, with Special Focus on HIV-Related Issues. MMWR 1990;39(No.RR-17).

* Adapted from MMWR 43(RR13);1-132, 1994.

Cases of Selected Notifiable Diseases, Virginia, February 1 through February 28, 1995.*

Disease	Total Cases Reported This Month						Total Cases Reported to Date in Virginia		
		Regions							
	State	NW	N	SW	C	E	This Yr	Last Yr	5 Yr Avg
AIDS	105	7	28	11	21	38	156	217	142
Campylobacteriosis	45	12	6	9	13	5	60	47	55
Gonorrhea	996	58	111	92	358	377	1886	2165	2327
Hepatitis A	16	1	2	10	3	0	34	18	22
Hepatitis B	4	0	2	0	1	1	12	15	29
Hepatitis NANB	0	0	0	0	0	0	0	6	5
Influenza	89	5	1	72	1	10	215	733	496
Kawasaki Syndrome	0	0	0	0	0	0	0	1	3
Legionellosis	0	0	0	0	0	0	0	2	2
Lyme Disease	1	0	0	0	0	1	1	8	5
Measles	0	0	0	0	0	0	0	1	2
Meningitis, Aseptic	8	2	2	0	0	4	20	14	30
Meningitis, Bacterial†	11	2	3	2	1	3	20	8	18
Meningococcal Infections	9	2	6	0	0	1	10	11	10
Mumps	2	0	0	1	1	0	4	4	9
Pertussis	0	0	0	0	0	0	0	9	4
Rabies in Animals	25	7	5	5	4	4	44	51	36
Reye Syndrome	0	0	0	0	0	0	0	0	0
Rocky Mountain Spotted Fever	0	0	0	0	0	0	0	0	0
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	52	4	12	7	12	17	121	109	128
Shigellosis	17	2	3	0	10	2	26	83	39
Syphilis, Early‡	96	2	1	4	17	72	187	189	204
Tuberculosis	6	0	0	0	1	5	6	36	42

Localities Reporting Animal Rabies: Accomack 3 raccoons; Albemarle 2 skunks; Arlington 1 raccoon; Campbell 1 fox, 1 skunk; Caroline 1 raccoon; Fairfax 2 raccoons; Loudoun 1 fox, 1 raccoon; Lunenburg 1 raccoon; Madison 1 raccoon; Prince Edward 1 raccoon, 1 skunk; Richmond City 1 raccoon; Roanoke County 1 skunk; Rockbridge 2 raccoons; Rockingham 1 raccoon; Suffolk 1 raccoon; Washington 1 skunk; Wythe 1 cow.

Occupational Illnesses: Asbestosis 28; Carpal Tunnel Syndrome 60; Coal Workers' Pneumoconiosis 22; Lead Poisoning 3 ; Loss of Hearing 22; Silicosis 1.

*Data for 1995 are provisional.

†Other than meningococcal.

‡ Includes primary, secondary, and early latent.

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