



TB Infection Control in a Clinic Setting

Delvina “Mimi” Ford, BSN,
GCPH, RN, CIC, CCRN-K

Essentials of TB Nurse Case Management Online

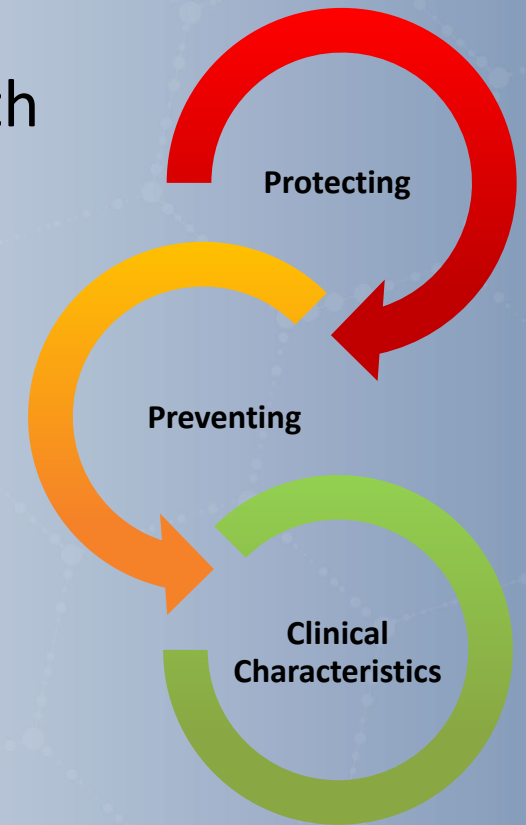
Delvina “Mimi” Ford, BSN, GCPH, RN, CIC, CCRN-K has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity



Objectives

- Infection Control Measures in a clinic setting:
 - Choosing the best option for the patient and health care personnel (surgical mask vs. N-95).
 - Preventing transmission with considerations of space, ventilation, and air cleaning methods.
- Describe factors associated with infectiousness:
 - Clinical characteristics.
 - Extrapulmonary vs. pulmonary tuberculosis.
 - Infectiousness of children vs. adults.



Best option for patient and health care personnel

- Per CDC, the minimum respiratory protection a health care worker should wear is a **filtering facepiece respirator (FFR)** to prevent the inhalation of airborne droplet nuclei.
- Patients with infectious TB should wear a **surgical mask** to prevent expelling droplet nuclei into the air.



The TB patient (left) is wearing a surgical mask. The health care worker (right) is wearing a filtering facepiece respirator (FFR).

- The FFR is better known as the N95 respirator.
- Patients should not be wearing the N95 respirator.

Understanding the Difference



Surgical Mask

N95 Respirator

For the patient.

For the HCW.

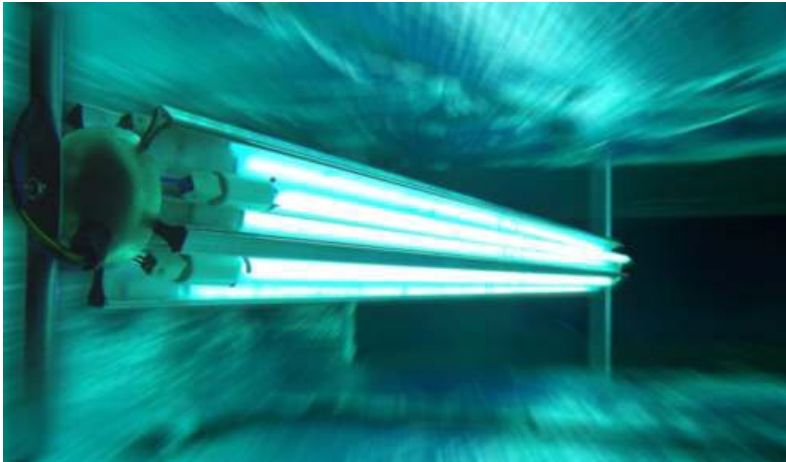
Warning: If a TB patient is wearing an N95 they can have increase respiratory distress.

Fit Testing should be done to ensure fit.

Let's talk about Environmental Controls

Primary Controls

- Controlling the Source
- Local exhaust ventilation
- Diluting/removing contaminated air



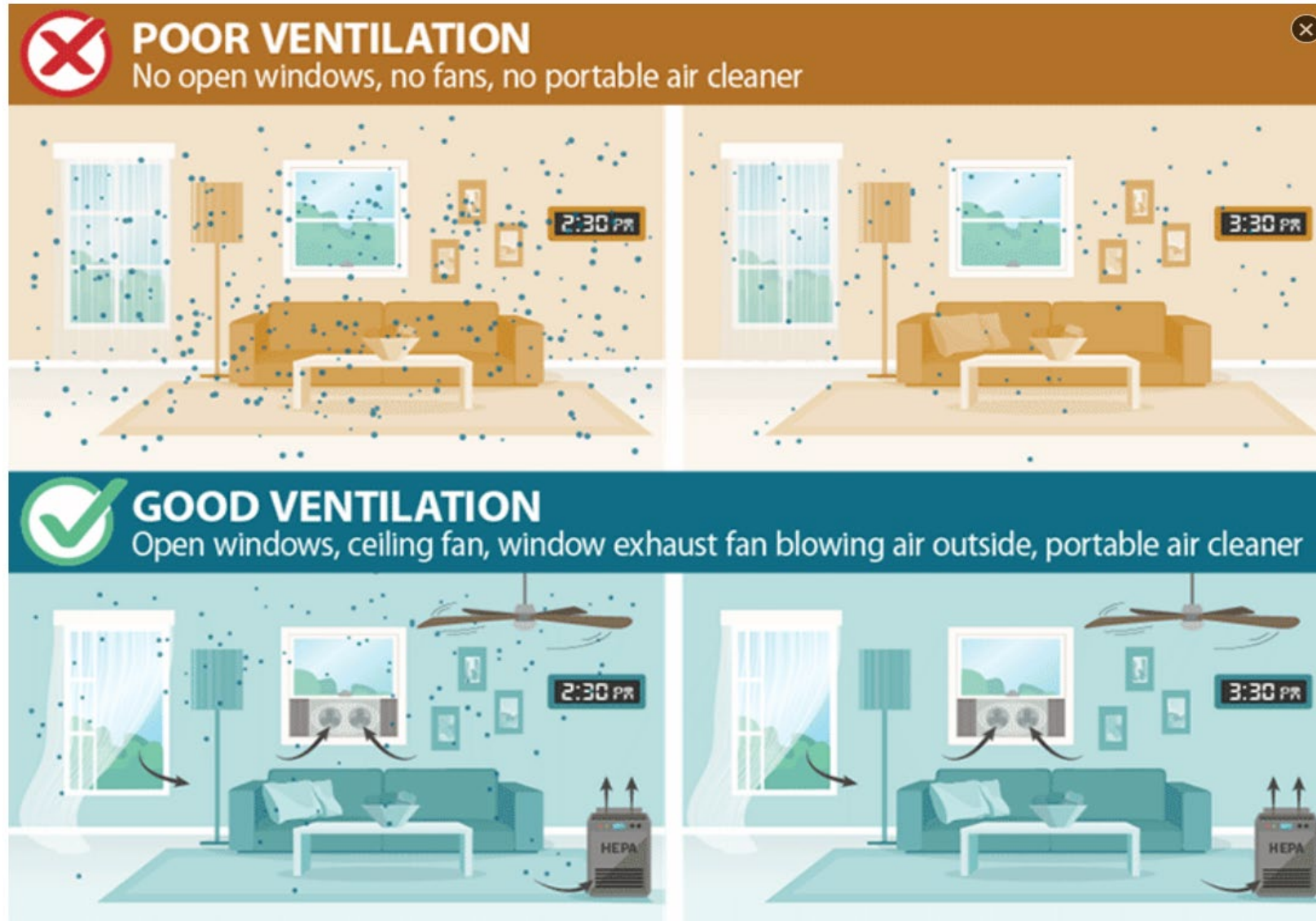
Secondary Controls

- All (airborne infection isolation room)
- Airflow
- Cleaning using HEPA/UV

Photo Credits: <http://www.flanders-csc.com/tb.htm>

<https://www.prlog.org/10226208-sanuvax-uv-air-sterilization-systems-ability-to-destroy-airborne-influenza-including-swine-flu.html>

For example, lets look at your home setting



What is your ventilation flow?

How many ACH?

Is it positive, negative, or neutral?



Air change per hour (ACH) is the number of times that the total air volume in a room or space is completely removed and replaced in an hour.

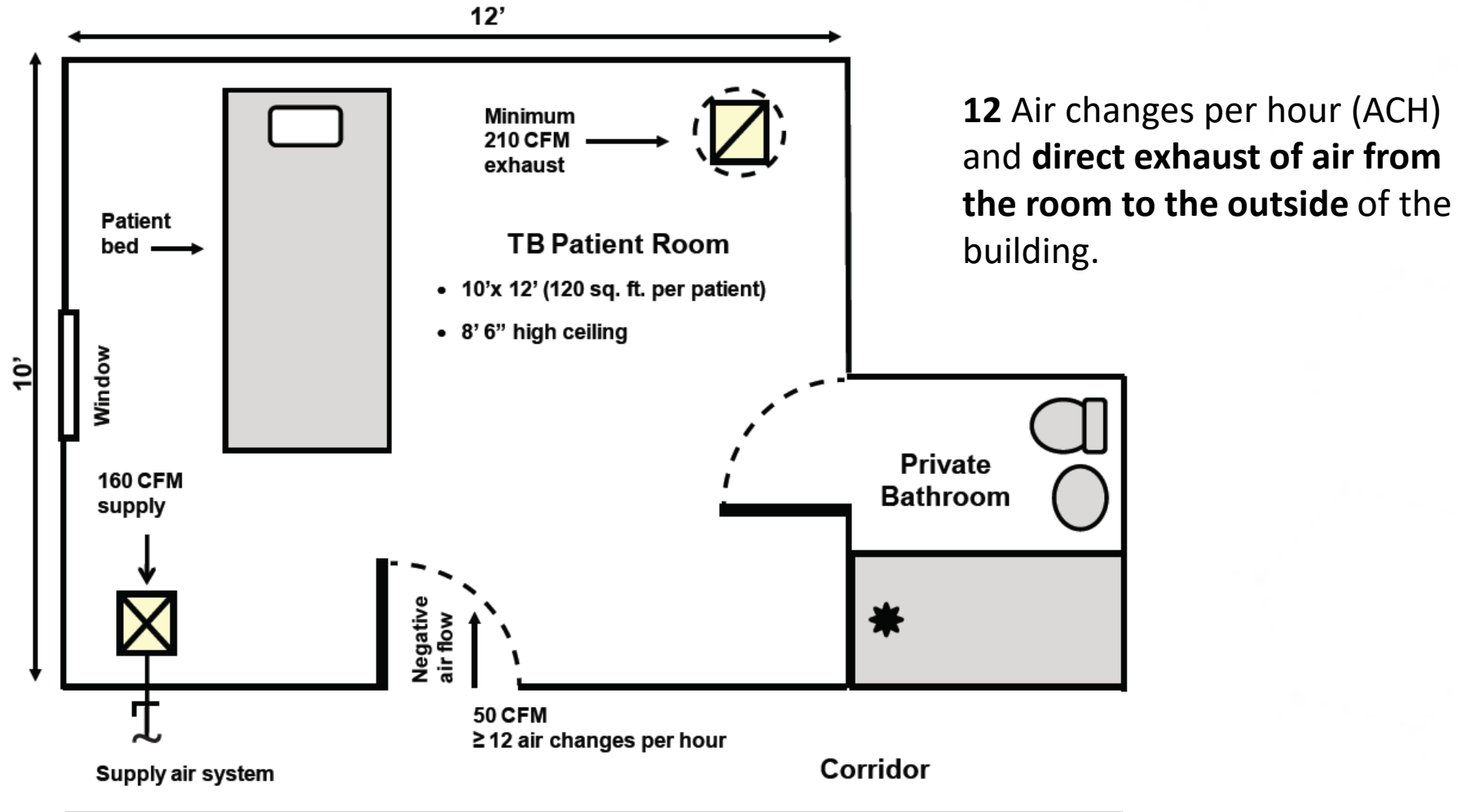
Positive pushes out of the room. You don't necessarily want this in a clinic setting for TB.

Negative sucks into the ventilation system. This is great for your airborne isolation rooms.

Neutral or light positive is the normal for most clinic type settings.

All Room

Figure 7.5
Airborne Infection Isolation (All) Room



Airborne Containment Removal

Table B.1. Air changes/hour (ACH) and time required for airborne-contaminant removal by efficiency *

ACH § ¶	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6+	46	69
8	35	52
10+	28	41
12+	23	35
15+	18	28
20	14	21
50	6	8

* This table is revised from Table S3-1 in reference 4 and has been adapted from the formula for the rate of purging airborne contaminants presented in reference 1435.

+ Denotes frequently cited ACH for patient-care areas.



Identifying Factors Associated with Infectiousness

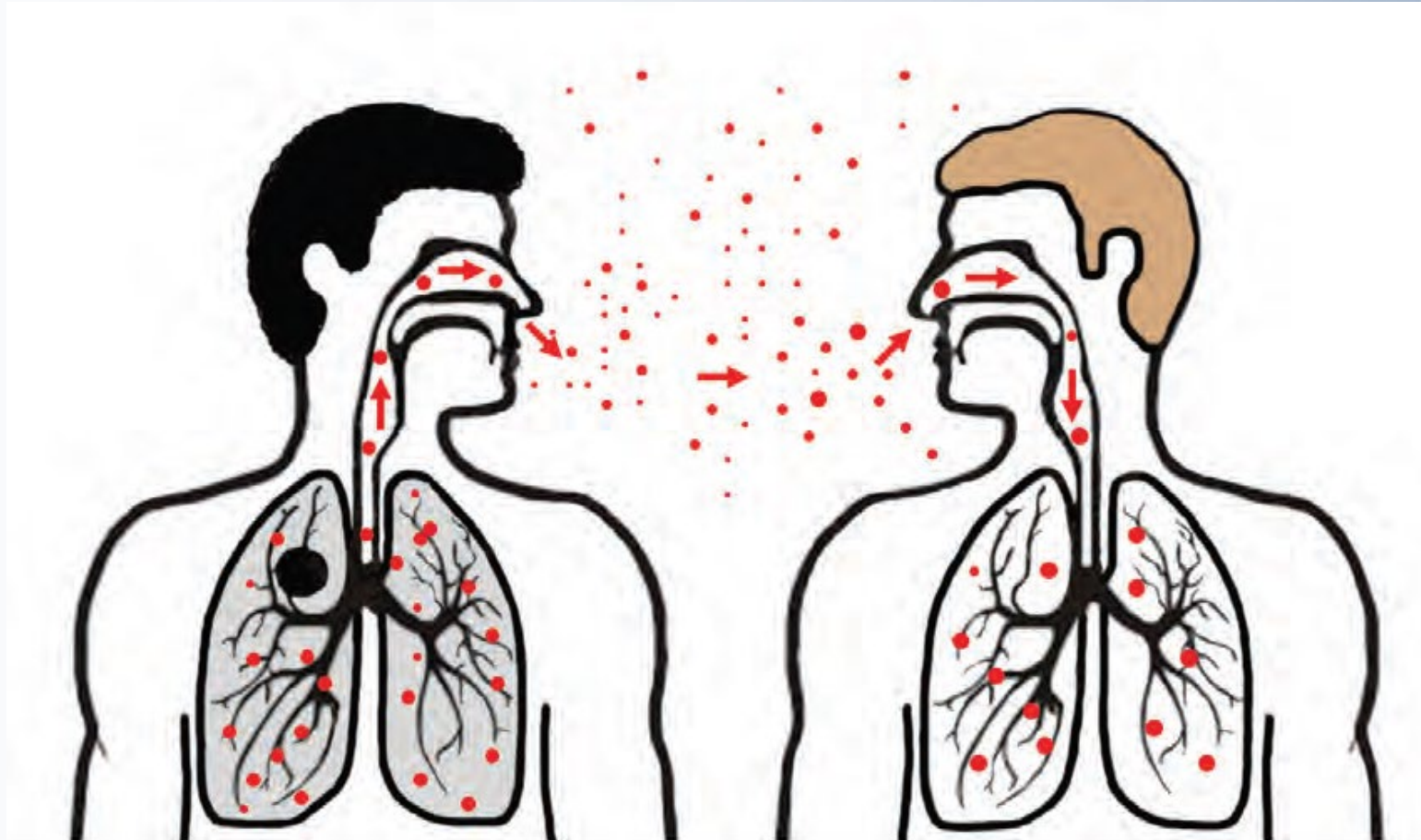


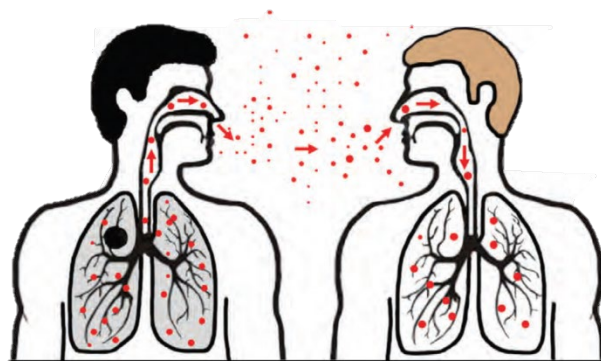
Photo Credit: <http://www.cdc.gov/tb/education/corecurr/pdf/chapter2.pdf>

Table 2.1
Factors that Determine the
Probability of Transmission of *M. tuberculosis*

Factor	Description
Susceptibility	Susceptibility (immune status) of the exposed individual
Infectiousness	Infectiousness of the person with TB disease is directly related to the number of tubercle bacilli that he or she expels into the air. Persons who expel many tubercle bacilli are more infectious than patients who expel few or no bacilli (Table 2.2) (see Chapter 7, TB Infection Control)
Environment	Environmental factors that affect the concentration of <i>M. tuberculosis</i> organisms (Table 2.3)
Exposure	Proximity, frequency, and duration of exposure (Table 2.4)

Table 2.2
Characteristics of a Patient with TB Disease that
Are Associated with Infectiousness

Factor	Description
Clinical	<ul style="list-style-type: none"> • Presence of cough, especially lasting 3 weeks or longer • Respiratory tract disease, especially with involvement of the larynx (highly infectious) • Failure to cover the mouth and nose when coughing • Inappropriate or inadequate treatment (drugs, duration)
Procedure	<ul style="list-style-type: none"> • Undergoing cough-inducing or aerosol-generating procedures (e.g., bronchoscopy, sputum induction, administration of aerosolized medications)
Radiographic and laboratory	<ul style="list-style-type: none"> • Cavitation on chest radiograph • Positive culture for <i>M. tuberculosis</i> • Positive AFB sputum smear result



CDC Guidelines 2005 - Suspected TB Rule Out

Another diagnosis is made that explains the clinical syndrome

Three consecutive, negative AFB sputum smears,
Each of the three sputum specimens collected 8 – 24
hour intervals

At least one specimen from early morning
(respiratory secretions pool overnight)



CDC Guidelines 2005 - Confirmed TB Release from Airborne Infectious Isolation

Three consecutive negative AFB sputum smear results, each collected in 8–24-hour intervals



At least one being an early morning specimen



Standard multidrug anti-tuberculosis treatment (minimum of 2 weeks)



Demonstrated clinical improvement



Extrapulmonary TB

larynx,
lymph nodes,
pleura,
brain,
kidneys,
or the
bones
and joints

Other than the lungs:

Main sites of Extrapulmonary tuberculosis

Central nervous system

- Meningitis

Lymphatics

- Scrofula (of the neck)

Pleura

- Tuberculosis
pleurisy

Disseminated

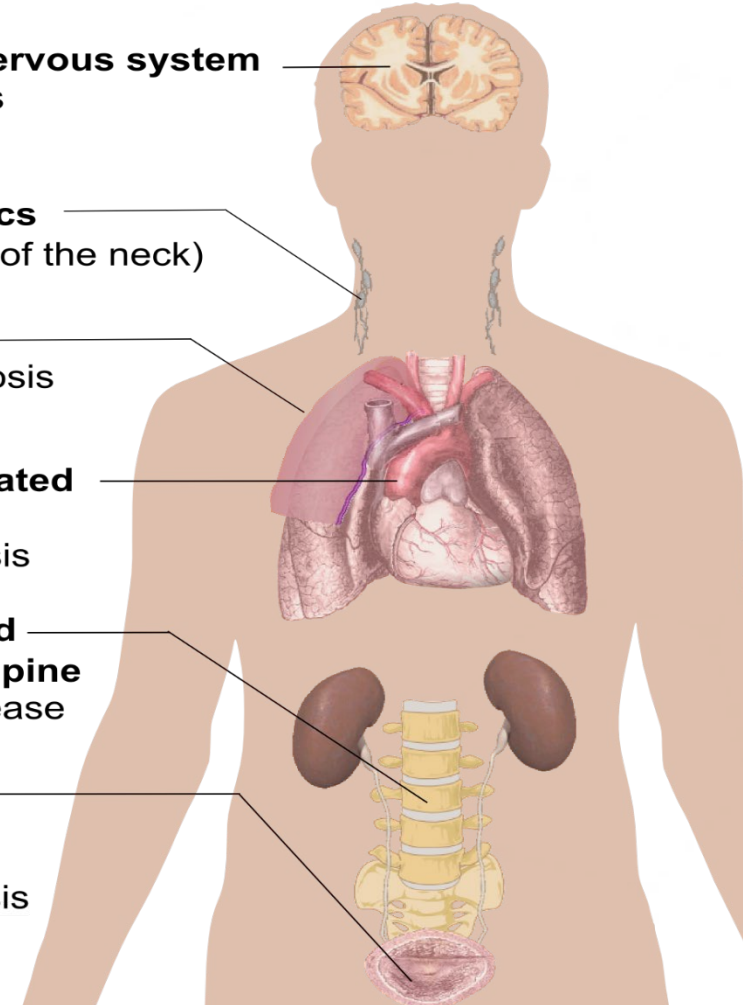
- Miliary
tuberculosis

Bones and joints of spine

- Pott's disease

Genito- urinary

- Urogenital
tuberculosis



Extrapulmonary TB – Draining Lesion

Usually not Infectious unless:

1. Pulmonary disease in addition to
2. it is located in the oral cavity or the larynx
3. includes an open abscess or lesion in which the concentration of organism is high or if drainage fluid is aerosolized.

Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are three consecutive negative cultures of continued drainage. *CDC Appendix A 2007 Guideline for Isolation Precautions.*



Pediatric TB



TB disease in a person < 15 years of age



Children with tuberculosis are rarely contagious, but their caregivers may be.



Isolate children of any age with adult type disease for example extensive infiltrates, sputum production, or cavity on chest x-ray should be isolated when in health care facilities until it can be determined that they are not infectious.

CDC TB guidelines 2005



Review

TB measures in a clinic setting.

- HCW wear N95 respirators.
- Preventing transmission with placing an active TB patient in a room.
- Ensuring appropriate ventilation and if active TB allowing the room turn over time.

Factors associated with infectiousness:

- We reviews clinical characteristics: Susceptibility, Infectiousness, Environment, Exposure
- Extrapulmonary vs Pulmonary TB
- Children vs Adults with infectiousness



Questions?



My daughter Alison
and her Aunt Joanne
(LTBI survivor).
Machu Picchu, Peru
June 2017



References

- Bartley, J. (2014). APIC text of infection control and epidemiology: Heating, ventilation, and air conditioning (4th ed.). Washington, D.C.: Association for Professionals in Infection Control and Epidemiology.
- Cadena, J. A. (2014). APIC text of infection control and epidemiology: Tuberculosis and other mycobacteria (4th ed.). Washington, D.C.: Association for Professionals in Infection Control and Epidemiology.
- CDC. Core curriculum on tuberculosis: What the clinician should know (6th ed.). (2013). Atlanta, GA: U.S. Dept. of Health & Human Services, Centers for Disease Control and Prevention, National Center for HIV, STD, and TB Prevention, Division of Tuberculosis Elimination.
<http://www.cdc.gov/tb/education/corecurr/pdf/chapter2.pdf>
- CDC. Guidelines for preventing the transmission of Mycobacterium tuberculosis in health-care settings, 2005. MMWR 2005; 54 (No. RR-17).
www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e
- Cruz, A. T., Medina, D., Whaley, E. M., Ware, K. M., Koy, T. H., & Starke, J. R. (2011). Tuberculosis among families of children with suspected tuberculosis and employees at a children's hospital. Infection Control & Hospital Epidemiology, 32(2), 188-190 3p. doi:10.1086/657940
- Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, Appendix A. Retrieved on July 6th 2016 from
<http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf>
- Starke, J.R. (2004). Tuberculosis in children. Seminars in Respiratory and Critical Care Medicine, 2004;25 (3). Retrieved on July 1, 2016 from http://www.medscape.com/viewarticle/484123_2



References

OSHA Appendix A to 1920.134 Fit Testing Procedures Mandatory protocols. Retrieved on July 8, 2016 from
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9780

CDC (2022). TB 101 for Health Care Workers. Retrieved from
<https://www.cdc.gov/tb/webcourses/TB101/page1796.html>

