


MAYO CLINIC

**Mayo Clinic Center
for Tuberculosis
Tuberculosis
Contact Investigation**



Shea Rabley, RN, MN
TB Nurse Educator
Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide 1

1

Disclosures

No relevant financial relationships

No off-label investigational uses

MAYO CLINIC

Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide 2

2

Objectives

At the conclusion of this presentation, the participant will be able to:

1. Identify one of the main objectives of conducting a contact investigation.
2. Name the agency who is mandated by law with the responsibility for the contact investigation.
3. Name the three (3) priority levels of contacts.



Mayo Clinic Center for Tuberculosis

©2014 MFMER | 019-03

3

Contact Investigation

An essential component of disease containment

and

the highest priority targeted testing activity
conducted in a TB Program



Mayo Clinic Center for Tuberculosis

©2014 MFMER | 019-04

4

American Thoracic Society

“Recently infected contacts of newly diagnosed cases are the most easily identified high-risk group.”

Controlling Tuberculosis in the United States: American Thoracic Society, June 2004; Centers for Disease Control and Prevention, November 2004; Infectious Disease Society of America, March 2005.



Mayo Clinic Center for Tuberculosis

©2014 MFMER | 0106-5

5

A goal of the
TB Nurse Case Management Process
is the evaluation of all persons who have
been identified as having had contact with
a person who has been diagnosed with or
is suspected to have TB disease.



Mayo Clinic Center for Tuberculosis

©2014 MFMER | 0106-6

6

Objectives of A Contact Investigation

- Identify, examine and evaluate persons most at risk of being infected
- Find new cases and begin treatment
- Detect and treat newly infected persons
- Prevent infection in certain individuals by using window-period prophylaxis



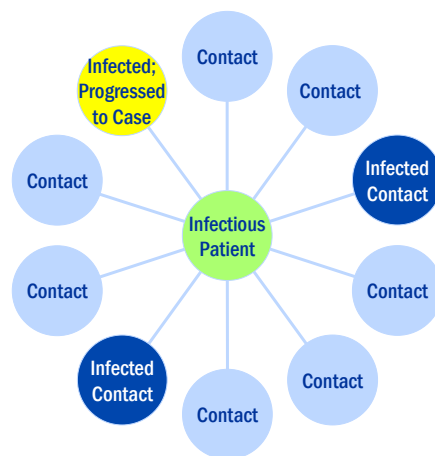
Mayo Clinic Center for Tuberculosis

©2014 MFMER | 695-7

7

Contact Investigation: A Critical TB Control Strategy

An average of **12.5** contacts identified for each TB case
15.3% of contacts are infected
1.1% of contacts have disease
10% of contacts will develop TB disease within their lifetime, with the highest risk for progression in the 1st 2 years after initial infection



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-8

8

Contact Investigation Responsibilities

- The responsibility for conducting contact investigations is mandated by law to public health departments in each state.
- These responsibilities are designed to “protect the public from communicable diseases”, such as tuberculosis.



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-9

9

Important Definitions

Index Case:

First person presenting with or suspected to have TB disease

Suspect:

A person for whom a diagnosis of TB disease is being considered, regardless of whether TB treatment has been started



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-10

10

Important Definitions

Source Case:

The person with diagnosed TB disease who was the original source of infection for secondary cases and contacts; can be but is not necessarily, the index case

TB Contacts:

Persons at high risk of acquiring TB infection because they have shared the same air space with the **Index Case** over an extended period of time.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-11

11

Contact Classifications

- **Previous** – Contacts were classified as “close” or “casual”
- **Current** – Assign priority status to individuals:
 - High
 - Medium
 - Low



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-12

12

Contact Prioritization

Contacts are prioritized based on:

- The infectiousness of the index case
- The amount of time the contact spent with the index case
- The environment in which the exposure occurred
- The contact's personal medical information and/or medical & population risk factors



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-13

13

Types of Investigations

There are 2 types :

- New or suspected case investigation
- Source case or Associate investigation



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-14

14

Initiating a Contact Investigation

Initiate an investigation if:

- Confirmed or suspected pulmonary, laryngeal, or pleural TB.
- Sputum has AFB on the smear
- Respiratory specimen is NAAT-positive
- Chest radiograph consistent with pulmonary TB and/or
- Chest Radiograph indicates presence of cavities in the lung



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-15

15

Source Case Investigations

Also known as Associate Investigations

- Conducted to identify the **source** of recent *infection* in a child
- Usually started before diagnosis of TB confirmed
- In the absence of cavitary disease, young children usually are not capable of transmitting TB to others.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-16

16

Steps in a Contact Investigation

1. Medical record review
2. Patient interview
3. Field investigation (home/work/social)
4. Assessment of risk for transmission
5. Prioritization of contacts
6. Evaluation of contacts
7. Treatment and follow-up
8. Decision concerning whether to expand the investigation



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-17

17

Medical Information Needed about the Index Case

- **TB skin test** (negative or positive for cutpoint) or **IGRA** (QFT-GIT or T-spot)
- History of prior TB disease, TB infection or exposure
- History of prior treatment for TB disease or TB infection
- Symptoms of tuberculosis: fever, weight loss, night sweats, cough > 3 weeks (most important), fatigue



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-18

18

Medical Information Needed about the Index Case - # 2

- Date of onset of symptoms; How long symptomatic?
- Chest x-ray: abnormal, infiltrates, cavities, WNL?
- Sputum bacteriology: smear positive? NAAT done? Culture ordered? Result may not be available for up to 8 weeks
- Other bacteriology tests
- Results from HIV and other testing



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-19

19

Ensure that

- Any person diagnosed with or suspected to have TB is started, at a minimum, on a 4 drug treatment regimen. (RPT/INH/PZA/MOXI or RIPE)
- Sputum specimens have been collected and sent to the Lab
- Appropriate isolation measures have been instituted
- Patient medical records have been reviewed
- Person is interviewed



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-20

20

The Index Case Interview Process

Interviews should be conducted in person, face to face, in the hospital, in the patient's home, in the TB Clinic (if an All room is available), or in a convenient location that accommodates the patient's privacy and affords appropriate respiratory protection. Outside is OK!



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-21

21

Index Case Interview

Assure patient's confidentiality

- Determine the patient's level of knowledge about the diagnosis of TB disease
- Discuss precautions to prevent transmission (masks, tissues, coughing into the crook of the arm, etc)
- Identify and record settings where transmission may have occurred
- Assess patient's willingness to share information with others about TB (at a minimum with the boss & family)



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-22

22

Eliciting Information

- Request permission to use the index case's name (some may agree; others will not)
- Request and compile a list of names and addresses for contacts identified in each setting
- Enlist the help of index case in notifying contacts of need for examination
- Review information with index case each visit
- Conduct follow-up interviews



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-23

23

Challenges

- Don't fully understand the diagnosis nor the difference between TB infection and TB disease
- Cultural differences
- Fears & stigmas
- Quarantine
- Long term hospitalization - sanatoria
- Loss of employment,



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-24

24

Establishing a Relationship

- You must work to establish a trusting and respectful relationship with the patient from the start - This is crucial!
- You will be working with this patient and their contacts for a long time – and they all know each other.
- Open communication is vital!



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-25

25

Where do we start the investigation?

- Home, work and social environments
- For potentially infectious persons, it is very important to visit all these environments to find contacts – No telephone contact investigations or interviews with the boss! Go see where the case works and what they do!
- If possible, carry skin testing/IGRA materials with you to begin investigations, especially in home setting.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-26

26

For Each of the Three Environments

- Determine the approximate amount of time that others spent breathing the same air as the index case during the infectious period.
- How intense was the exposure?
- What part might the ventilation have played in transmission?
- Observe the surrounding closely. Where was the patient in this environment?



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-27

27

Home Setting

- If the case/suspect is still hospitalized, arrangements should be made for a home visit prior to discharge as well as post discharge.
- Always, visit patient face-to-face, not by phone.
- Be sure others present (family, friends) have been informed about the diagnosis....you may need to have privacy during the interview
- Make sure that patient is not too ill to be interviewed; if so may have to interview family member in presence of the client.
- Observe the setting. Are there people in & out, pictures on the walls, toys in the corner, etc.?



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-28

28

Work Setting

- Are you employed? Where? What hours do you work? Do you rotate shifts?
- What kind of work do you do?
- If an office, are several people in a room? Do you meet or greet the public? Is it a large well-ventilated area or is it “stuffy” all the time?
- Do you work alone, outside in open air?
- How do you get back and forth to work?
- Does your supervisor or co-workers know that you may have TB? Others?



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-29

29

Social Settings

- What do you do in your spare time? Where do you hang out? (play bridge, drink beer, shoot baskets, etc) . Do you go to church?
- Age dependent – young children go to school or day care, older youth play sports, the elderly go to senior citizen centers, young adults party, teens hang out, etc.
- Identify cultural activities.
- Go visit all these places as well.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-30

30

Ventilation

- Site visits must be made to evaluate the ventilation in all the environments where the index has spent time. You don't have to be an expert in HVAC!
- Is air circulated from room to room or to outside? Are there exhaust fans? Other fans?
- Look at the patient's work site. Is it outside in the open air or a tiny cubicle in a small room with dropped ceilings?
- Are there large numbers of persons exposed in an enclosed space? (Bus, car etc.)
- Does the time of year make a difference?



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-31

31

Why Determine an Infectious Period?

- Focuses the investigation on those contacts most likely to be at risk for infection and sets the timeframe for testing contacts.
- To ensure the contacts identified are those who had exposure while the case was infectious.
- No exact scientific procedure to determine the period of infectiousness.
- Using the medical record review and the information gained in the patient interview, an **educated decision** is made to establish the infectious period.



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-32

32

Infectious Period

- The time frame during which the TB patient or suspect is capable of transmitting tubercle bacilli.
- Extrapulmonary cases/suspects do not have an infectious period and do not require a contact investigation, as long as pulmonary disease has been ruled out. Do not get burned!!
- Children do not have an infectious period unless there are extenuating circumstances.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-33

33

Beginning of Infectious Period

- Determined by going back in time approximately three months from the start of symptoms (probable onset of active TB disease). The following factors are considered:
 - Site of disease
 - Onset of signs and symptoms of disease
 - Smear results of sputum/respiratory specimens
 - Extent of infiltrates or cavitary lesions and/or
 - TB medical clinician decision



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-34

34

Identifying Specific Time Frames

In order to identify a framework for the infectious period and identify contacts, ask the following questions:

- When do you remember getting sick?
- Who visited you recently at Christmas, Easter, your birthday, etc? Were you feeling bad or coughing?
- Who lived with you in the last month, two months, six months, year?
- Who comes to your house frequently, such as children after school? Look around for ‘things’.
- Have you visited anyone in their home at any of these times?



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-35

35

End of Infectious Period

Occurs when the person with TB disease is most likely no longer capable of transmitting tubercle bacilli. The following factors are considered:

- Compliance with an effective treatment regimen (as demonstrated by susceptibility results)
- Mycobacteriologic response as manifested by *three (3) consecutive negative sputum smear results on three (3) separate days (at least 8 hours apart) or two (2) negative NAATs (at least 8 hours apart) or two (2) consecutive negative cultures.*
- Clinical improvement with diminished symptoms
- TB medical clinician decision



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-36

36

Concentric Circle Method of Investigation

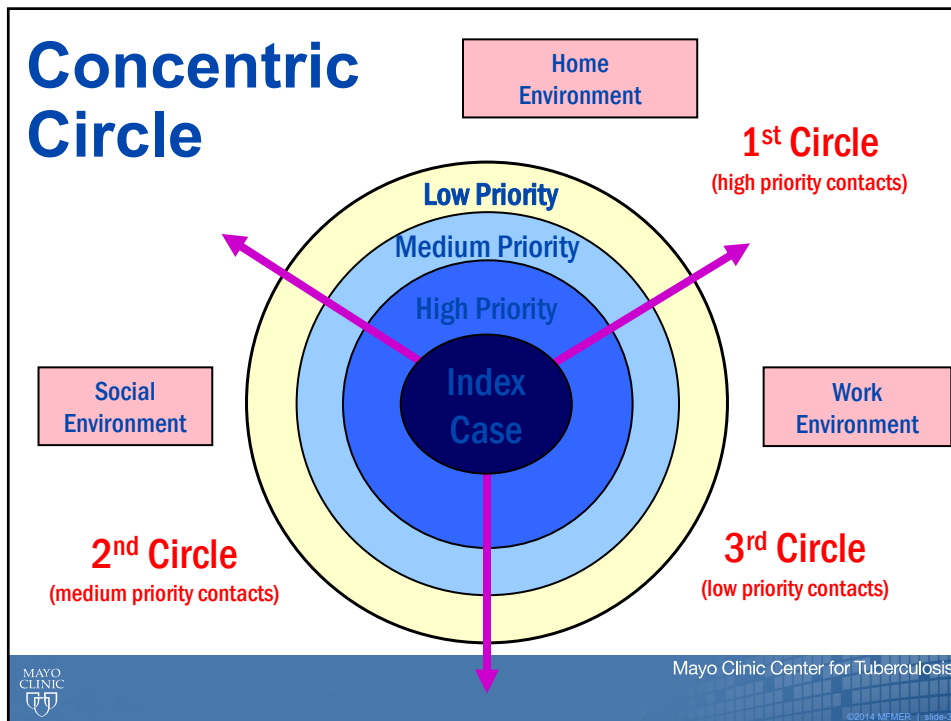
- Index case is at the center of the circles
- Contacts most at risk of being infected are examined first
- If the rate of infection in this group exceeds that of the community, then the investigation proceeds to the next circle of contacts who are presumed to be less at risk
- And so on to other circles, until the infection rate of the community is reached.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-37

37



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-38

38

What examinations are required for contacts?

Tuberculin skin test - (positive if ≥ 5 mm), or **IGRA**

Chest X-ray if:

Newly diagnosed with TB Infection
(+ TST for cutpoint; + IGRA)

Children < 5 years of age

Have an immunocompromising condition

Exhibiting symptoms

Assessment for signs/symptoms of TB disease:

Symptomatic contacts should have sputum collected

Repeat TST 8-10 weeks after date of last exposure
for those who are initially skin test negative



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-39

39

Source Case or Associate Investigations

EXAMINATIONS:

- Physicians may put children 14 yrs and younger on window prophylaxis even if skin test is negative.
- Repeat skin test in 8-10 weeks, if still negative, discontinue (window-period or primary prophylaxis).
- Source case of positive TSTs in children may never be found – look anyway!



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-40

40

Investigations in Congregate Settings

- Contact investigations can occur in all types of settings, particularly those where large numbers of people are together:
 - School, day care, jail/correctional facility, homeless shelter, hospital, nursing home, other group settings
- Consult with state health department TB staff for guidance and/or assistance



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-41

41

Communication

- Notify Supervisors of potentially difficult investigations or those where there may be panic and/or high exposure in the press.
- Not unusual when there are schools or large worksites involved
- Pressure may be exerted to examine large numbers of people unnecessarily (called P.R. Screening). Maintaining control will help avoid this extra work.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-42

42

Maintain Control of Investigation

- Examine “high” and “medium” priority contacts first
- Examine low contacts next, only if warranted
- If pressure dictates that non-priority screening be done (P.R.), then these persons can be recommended to see their PMD for testing and evaluation, at their own expense.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-43

43

PR Screenings

- Does not qualify as a contact with significant exposure, but is insistent on being tested due to minimal contact (or often imagined contact) with the potentially infectious index case (or contact to a contact).
- Be consistent and **firm**
- Not a priority for use of extremely limited public health resources
- In record keeping and counting purposes, this must be kept separate from the information on those who were prioritized contacts.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-44

44

Outbreak Investigation

- When the infection rate is larger than expected, the contact investigation must be expanded. Through this process, additional persons with TB infection and/or disease may be identified, evaluated and treated. Contact investigations will begin surrounding these new cases.
- A TB outbreak indicates potential extensive transmission



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-45

45

Outbreak Investigation, # 2

- An outbreak implies that:
A TB patient was contagious

Contacts were exposed for a substantial period

The interval since exposure has been sufficient for infection to progress to disease in the contacts



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-46

46

Definition of an Outbreak

- During (and because of) a contact investigation, 2 or more contacts are found to have active TB disease, regardless of their assigned priority;

OR

- Any 2 or more cases occurring within a year of each other, discovered to be linked, and the linkage is established outside of a contact investigation



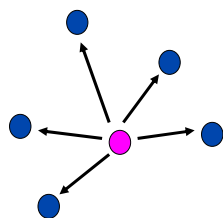
Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-47

47

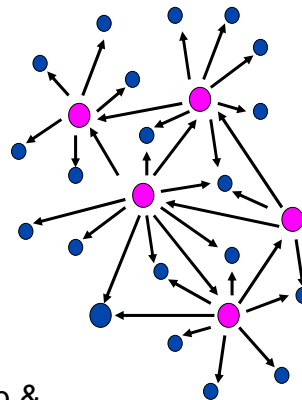
Contact Investigation

vs. Outbreak Investigation



● Case

● Contact



There will be persons that overlap & can be both a case & a contact.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-48

48

Genotyping

The first culture on a TB case is subcultured and submitted to the CDC contracted lab for genotyping.

Even though the cases may deny ever knowing each other, these tests can tell you if the cases are “genetically” linked to each other through recent transmission or whether the TB disease is the result of TB infection acquired in the past.

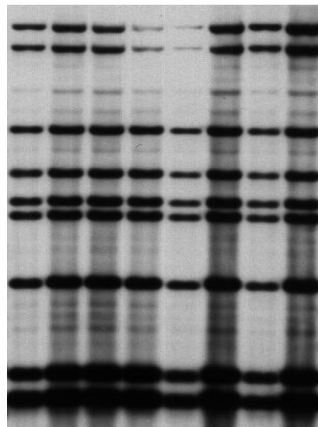


Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-49

49

Genotyping Results



IS6110-RFLP
Refraction Fragment
Length Polymorphism

Matching band
sequences



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-50

50

Genotyping Results (Conventional)

- The results:

Spoligotype

Spacer oligonucleotide typing

777777760771

Mycobacterial Interspersed Repetitive Unit

MIRU 1

MIRU 2

223325173533 133634423336

MIRU-VNTR (24 locus)

223325173533 133634423336



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-51

51

Genotyping Reports:

Genotyping Reports prior to 4/2009 provided

PCR type (PCR 115280) & Cluster name (XX_095)

Since then, Reports provide a GENType:

G00012 (Spoligotype plus 24 locus MIRU-VNTR)

- When specimens match on all parameters, they are assigned to a GENType.
- The database started in 2004 and matches are assigned from any specimens in the database.



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-52

52

Whole Genome Sequencing

- Started in 2012 for specific clusters
- Now performed prospectively on all new isolates
- Provides DNA sequence data for the entire *M. tuberculosis* genome



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-53

53

Always Remember...

**Every person who is diagnosed with
TB disease (TB case) was once
a contact.**

Thank You!



Mayo Clinic Center for Tuberculosis

©2014 MEMER | slide-54

54

References

CDC. *Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC*. MMWR 2005; 54, RR-15.

CDC. *Guide to the Application of Genotyping to Tuberculosis Prevention and Control*, June 2004.

CDC. *GENType: New Genotyping Terminology to Integrate 24-locus MIRU-VNTR*, August 16, 2012.

CDC. *Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-care settings*. MMWR 2005; 54, RR-17.

CDC. *Interim Guidance: 4-Month Rifapentine-Moxifloxacin Regimen for the Treatment of Drug-Susceptible Pulmonary Tuberculosis*. MMWR 2022;71 (8).

CDC. *Update of Recommendations for Use of Once-Weekly Isoniazid-Rifapentine Regimen to Treat Latent Mycobacterium tuberculosis Infection*. MMWR 2018;67(25).

National TB Controllers Association/CDC Advisory Group on Tuberculosis Genotyping. *Guide to the Application of Genotyping to Tuberculosis Prevention & Control*. Atlanta, GA, USDHHD, CDC; June 2004.

NTCA and CDC. *Guidelines for the Treatment of Latent Tuberculosis Treatment Infection*. MMWR 2020; 69(1); 1-11.



Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-55

55

Questions?

Mayo Clinic Center for Tuberculosis

©2014 MFMER | slide-56

56