Learning Objectives

Upon completion of this session, participants will be able to:

- Describe the criteria used and method for determining the infectious period (IP) for TB
- Describe the characteristics of the TB patient, contact, and exposure that should be assessed in order to prioritize contacts
- Name and apply the essential steps and timelines in a contact investigation (CI)
- List 3 criteria used to determine when to expand the scope of a CI
Background

CDC National Guidelines for the Investigation of Contacts of Persons with Infectious TB (2005)

- Provide a standard framework for assembling information related to exposure to TB
- Describe how to use findings to:
  - Assess for evidence of transmission
  - Inform decisions on whether to expand the investigation

TB Control Priority Strategies

1. Prompt detection, reporting and treatment of persons with active TB
2. Identification and evaluation of contacts of persons with contagious TB
3. Targeted testing and treatment of persons with latent TB infection
4. Strengthening infection control measures in settings at high risk for TB transmission
Why TB Contact Investigation?

Find active TB cases: treat and prevent ongoing transmission

Find persons with TB infection: treat and prevent future cases

Contact Investigation (CI) Performance Targets and Average 5-Year Outcomes
United States, 2009-2013

<table>
<thead>
<tr>
<th>National Performance Targets for 2020</th>
<th>Performance Outcomes (range 2009-2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td></td>
</tr>
<tr>
<td>Contacts are identified for <strong>100%</strong> of sputum AFB smear-positive TB patients</td>
<td><strong>94%</strong> (94-95%)</td>
</tr>
<tr>
<td><strong>93%</strong> of contacts are evaluated</td>
<td><strong>81%</strong> (78-83%)</td>
</tr>
<tr>
<td><strong>91%</strong> of contacts to sputum AFB smear(+) patients with newly diagnosed LTBI will <strong>start treatment</strong></td>
<td><strong>70%</strong> (68-72%)</td>
</tr>
<tr>
<td><strong>81%</strong> of contacts who start LTBI treatment will <strong>complete treatment</strong></td>
<td><strong>71%</strong> (66-71%)</td>
</tr>
</tbody>
</table>
Definitions

- **Case** - a particular instance of disease (e.g., TB). A case is detected, documented, and reported.
- **Index case** - the first case or patient that comes to attention as an indicator of a potential public health problem.
- **Source case** - the case or person who was the original source of infection for secondary cases or contacts.
- **Infectious** - refers either to TB disease of the lung or throat which has the potential to cause transmission to other persons, OR to the patient who has TB disease.

Definitions (2)

- **Contact** - someone who has been exposed to *M. tuberculosis* infection by sharing air space with a person with infectious TB.
- **Converter** - a change in the result of a test for *M. tuberculosis* infection that is interpreted to indicate a change from uninfected to infected.
Definitions (3)

- **Infectious period** - the time during which a person with TB disease might have transmitted *M. tb* organisms to others
- **Exposure period** - the coincident period when a contact shared the same air space as a person with TB during the infectious period
- **Window period** - the interval between infection and detectable reactivity to the tuberculin skin test (TST)

TB Contact Investigation Steps

1) Collect and Evaluate Index Case Information: Decide Whether to Initiate a CI
2) Interview the Index Case
3) Determine the Infectious Period
4) Examine Sites of Transmission
5) Prioritize Contacts
6) Locate and Evaluate Contacts
7) Treat and Follow up Contacts
8) Evaluate Contact Investigation Activities
Step 1

Collect and Evaluate Index Case Information: Decide Whether to Initiate a CI

What information is collected?

- Background information regarding the patient and circumstances of the illness
  - Demographics, identifiers, locating information
  - Site of disease, TB regimen, and start date(s)
  - History of previous TB exposure
  - History of previous TB disease and treatment
  - TB symptoms and the onset date(s)
  - Results of diagnostic tests
  - Concurrent medical conditions, diagnoses, or important social factors
## Assessing Transmission Risk

<table>
<thead>
<tr>
<th>TB CASE FACTORS</th>
<th>LIKELIHOOD OF DISEASE TRANSMISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MORE LIKELY</td>
</tr>
<tr>
<td>Site of TB Disease</td>
<td>Laryngeal / pulmonary or pleural</td>
</tr>
<tr>
<td>Smear status</td>
<td>Positive</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>Cavitation</td>
</tr>
<tr>
<td>Symptoms/behaviors</td>
<td>Coughing, singing, sneezing, sociability</td>
</tr>
<tr>
<td>Age</td>
<td>Adult or adolescent</td>
</tr>
<tr>
<td>Anti-TB drugs</td>
<td>No or ineffective Rx</td>
</tr>
</tbody>
</table>

## Decision to Initiate a TB Contact Investigation

[Diagram showing the decision process for initiating a TB contact investigation]

- **Site of disease**
  - Pulmonary/laryngeal disease
  - Pulmonary suspected: cavitation, e.g., nodules
  - Non-pulmonary (pulmonary and laryngeal involvement ruled out)

- **API® smear smear positive**
  - Contact investigation not indicated

- **API® smear smear negative or not performed**
  - **NAA** positive or not performed
    - Contact investigation should always be initiated
  - **NAA** negative
    - Cavitory disease
      - Contact investigation not initiated
    - Abnormal CXR non-cavitary consistent with TB
      - Contact investigation should be initiated if sufficient resources
    - Abnormal CXR not consistent with TB
      - Contact investigation should be initiated only in exceptional circumstances

- **Handout 1.1**

*Acid-fast bacilli  †Nucleic acid assay  §Approved indication for NAA  ¶Chest radiograph*
Exercise #1:
Deciding Whether to Initiate a CI

Step 2
Interview the Index Case
Index Case TB Interview Goals

1. ___________________________________
2. ___________________________________
3. ___________________________________
4. ___________________________________
5. ___________________________________
6. ___________________________________

Interview Timeframes

Conduct a minimum of 2 interviews

- 1st interview
  - ≤ 1 business day of reporting for infectious patients
  - ≤ 3 business days for others
- 2nd interview
  - 1-2 weeks later
- May need additional interviews

Use a trained interpreter when indicated
Step 3

Determine the Infectious Period

What is the Infectious Period?

Time during which a TB case is likely to transmit \( M. \text{ tuberculosis} \)
Importance of Estimating the Infectious Period (IP)

- Focuses the investigation on contacts most likely to be at risk of infection
- Sets the timeframe for testing contacts
  - (e.g., when repeat TST or IGRA is due)
- **NOTE:** current methods only estimate the IP. Certain circumstances might warrant extending the onset or end of the IP beyond the recommended guidelines

### Estimating Onset of Infectious Period

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>TB symptoms</th>
<th>AFB smear positive</th>
<th>Cavitary chest radiograph</th>
<th>Recommended minimum beginning of likely period of infectiousness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>3 months before symptom onset or 1st positive findings consistent with TB disease, whichever is longer</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3 months before symptom onset or 1st positive findings consistent with TB disease, whichever is longer</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>3 months before 1st positive finding consistent with TB disease</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>4 weeks before date of suspected diagnosis</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 2.** Guidelines for estimating the beginning of the period of infectiousness of persons with tuberculosis (TB), by index case characteristic. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis. Recommendations from the National Tuberculosis Controllers Association and CDC. 2005.
Closing the Infectious Period

- The infectious period (IP) is closed when further transmission of tuberculosis is unlikely

- General criteria for closing IP include:
  - Effective treatment for ≥ 2 weeks
  - Diminished symptoms
  - Mycobacteriologic response

Who is considered a “contact”?

- Must have shared same airspace as the index case during the infectious period

- Important to determine for each contact (or group of contacts):
  - ✓ When did exposure occur (in relation to index case diagnosis)?
  - ✓ How frequent and what duration was the exposure?
  - ✓ What was the date of last exposure?
Exercise #2:

Determining the Infectious Period

Determining Onset of Analyn’s Infectious Period

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>TB symptoms</th>
<th>AFB sputum smear positive</th>
<th>Cavitary chest radiograph</th>
<th>Recommended minimum beginning of likely period of infectiousness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td></td>
<td>3 months before symptom onset or 1st positive findings consistent with TB disease, whichever is longer</td>
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<tr>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td></td>
<td>3 months before 1st positive finding consistent with TB disease</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
<td>4 weeks before date of suspected diagnosis</td>
</tr>
</tbody>
</table>

- **Infectious period start** = __________________________
Determining End of Analyn’s Infectious Period

- Consider:
  1. ____________________________
  2. ____________________________
  3. ____________________________

Step 4

Examine Sites of Transmission
(Field Investigation)
Examine Sites of Transmission (Field Investigation)

- Visit the sites where the patient spent time during infectious period

- Components include:
  - Assess physical conditions of the setting
  - Interview, arrange for evaluation and provide TB information to contacts
  - Identify additional contacts

Assessing the Environment

<table>
<thead>
<tr>
<th>ENVIRONMENTAL FACTOR</th>
<th>LIKELIHOOD OF DISEASE TRANSMISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td>Volume of shared air space</td>
<td>Low (small)</td>
</tr>
<tr>
<td>Adequacy of ventilation</td>
<td>Poor</td>
</tr>
<tr>
<td>Re-circularized air</td>
<td>Yes</td>
</tr>
<tr>
<td>Upper room ultraviolet light</td>
<td>Not present</td>
</tr>
</tbody>
</table>
Step 5

Prioritize Contacts

Assign Priority Level to each Contact

- High Priority
  - 3-5 business days (from listing to initial encounter)

- Medium Priority
  - 14 business days

- Low Priority

- Non-contact
**How to Prioritize Contacts**

- **Consider both:**
  - Factors associated with transmission
  - Factors associated with increased risk for progression to TB disease (vulnerability)

**High Priority Contacts**

**High Priority Contacts** are:

1. Most likely to be infected (exposure)
2. Most likely to progress to disease if infected
3. Most likely to suffer increased morbidity or mortality from TB disease
When assigning priority, consider:

- Infectiousness of the TB case
- Circumstances of the exposure
  - Environment where transmission likely occurred
  - Frequency & duration of exposure
- Susceptibility/vulnerability factors of the contact
  - Age, immune suppressed, other medical risk factors
- Any contact with TB symptoms = High priority

Assessing Exposure Circumstances

- Determine when exposure occurred in relation to TB case’s infectious period including date of last contact (contact break date)
  - Close to date of diagnosis?
  - Toward beginning of infectious period?
- Evaluate how often (frequency) the TB case and contact shared air space and how long (duration) each exposure lasted (e.g., number of hours)
Susceptibility/Vulnerability Factors–Contact Risk Assessment

Is the contact at high risk for rapid progression to active TB?
- Under five years of age?
- HIV infected?
- Other immune suppressed?

Susceptibility/Vulnerability Factors - Contact Risk Assessment (2)

Children
- TB disease is more likely to occur once infected
- Incubation or latency period is briefer
- If <5 years of age, assign “high priority”
Susceptibility/Vulnerability Factors – Contact Risk Assessment (3)

Immune Status - HIV Infection

“...results in the progression of *M. tuberculosis* infection to TB disease more frequently and more rapidly than any other known factor”

Source: CDC Guidelines for the investigation of contacts of persons with infectious tuberculosis. Recommendations from the NTCA and CDC. 12/2005

Susceptibility/Vulnerability Factors – Contact Risk Assessment (4)

Immune Status - Other

Immunosuppressive treatment that increases the likelihood of progression to TB disease after infection:

- Corticosteroids - >15 mg daily for >4 weeks
- Multiple cancer chemotherapy agents
- Anti-rejection drugs for organ transplants
- Tumor necrosis factor alpha antagonists
Susceptibility/Vulnerability Factors – Contact Risk Assessment (5)

Medical conditions that increase the likelihood of progression to TB disease after infection:

- Silicosis
- Diabetes mellitus
- Status post gastrectomy or jejunoileal bypass surgery

Prioritizing Contacts

- **Medium Priority**
  - Shorter exposure time
  - Less close contact
  - Lower risk
  - **Examples:** students in same classroom, co-worker in same suite, extended family that visit weekly

- **Low Priority**
  - Brief exposure
  - No real face-to-face contact
  - No vulnerability risk factors
Prioritizing Contacts - Guidelines

- CDC CI guidelines propose various algorithms to guide the priority classification process (handout 1.3)

Wyoming Risk Assessment Form

- Patient Tuberculosis Risk Assessment form (handout 1.4)
- Complete for all high and medium priority contacts
- In general, WDH recommends IGRA for most contacts
  - IGRA may be covered by CD Unit for contacts without insurance (must be pre-authorized)
Exercise #3:
Examine Site(s) of Transmission and Prioritize Contacts

Step 6
Locate and Evaluate Contacts
Locating Contacts

Consider:
- Social networks
- Re-interviews
- Jails
- Shelters
- DMV
- Postal service?

Evaluation of Contacts

1. Medical and TB history
2. TB symptom evaluation
3. TST or IGRA; if initial test is negative, then repeat 8 - 10 weeks post contact

If symptomatic or positive TB test:
- Obtain chest X-ray and medical evaluation
- Consider sputum for AFB smear and culture if indicated
Important information for Evaluating the TB Contact

- Prior TB test history:
  - Employment or immigration health record
  - Primary care provider medical record
  - School / immunization health record
  - Cure-TB, TBNet, other program record (e.g., foster care)

- Country of birth, year of arrival in US, and travel history

- Other medical conditions
Evaluation: Special Contact Groups

- **Child < 5 y/o or immunocompromised:**
  - Medical history
  - Physical exam
  - Chest X-ray (PA & lateral views)
  - Tuberculin skin test

- **Documented prior positive TST or IGRA:**
  - Obtain medical and exposure history
  - Obtain prior treatment history
  - If treatment for LTBI is indicated, obtain CXR prior to treatment initiation

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Step 7

**Treat and Follow Up Contacts**
Treatment and Follow-up

- Prioritize efforts with contacts who are most in need of treatment
- Monitor throughout treatment (monthly face-to-face)
- “Window-period” prophylaxis
  - TST-negative high-risk contacts
  - during the period following last contact until the follow-up TST (8-10 weeks after last contact)
- MDR-TB exposure- seek expert consultation; follow-up 2 years post exposure

Exercise #4:

Locate, Evaluate, Treat, and Follow Up Contacts

Contact Investigation
27
Q8: House #1 Contact Evaluation

<table>
<thead>
<tr>
<th>Contacts: evaluation completed</th>
<th>Additional evaluation required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aunt Riza:</strong> Prior + TST; asymptomatic</td>
<td></td>
</tr>
<tr>
<td><strong>Husband:</strong> Prior + TST; asymptomatic</td>
<td></td>
</tr>
<tr>
<td><strong>16 y/o son:</strong> TST +; asymptomatic</td>
<td></td>
</tr>
<tr>
<td><strong>9 y/o daughter:</strong> TB5, symptom +, abnormal CXR</td>
<td></td>
</tr>
<tr>
<td><strong>6 y/o daughter:</strong> TST -, asymptomatic</td>
<td></td>
</tr>
<tr>
<td><strong>Aunt’s brother:</strong> TST +, asymptomatic</td>
<td></td>
</tr>
</tbody>
</table>

Q10: Treatment Regimen for the Contacts in House #4

<table>
<thead>
<tr>
<th>Contacts</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neighbor</strong></td>
<td>No treatment</td>
</tr>
<tr>
<td><strong>Husband</strong></td>
<td>INH x 9 months INH + rifapentine x 12 weeks RIF x 4 months</td>
</tr>
<tr>
<td><strong>4 year old daughter</strong></td>
<td>INH window prophylaxis</td>
</tr>
<tr>
<td><strong>3 year old son</strong></td>
<td>INH x 9 months OR RIF x 4 months</td>
</tr>
</tbody>
</table>
Step 8

Evaluate Contact Investigation Activities

When to Evaluate?

- When should you evaluate the contact investigation?

Answer:

- The evaluation should begin when the CI is initiated and continue throughout until the investigation is closed
Why Evaluate?

- Will help in the management, care, and follow-up of the TB case and contacts
- Analysis of the investigation in progress will allow prioritization of program activities and resources
- Will allow you to report on how well your objectives are being met for program monitoring and planning
- Will help you determine whether or not the investigation should be expanded

Deciding Whether to Expand Testing

Evidence of Recent Transmission:
- High infection rate in high-priority contacts
- Infection in a child (< 5 y/o)
- TST converters
- Secondary case
- TB disease in any contact assigned a low priority
Exercise #5:

Decide Whether to Expand the Contact Investigation

Would you expand the contact investigation at this point?

1. Yes
2. No
3. Not sure
Q11: Would you expand the contact investigation at this point? (2)

- **If yes**, explain which group/setting you will include in the investigation or what additional steps you would take to inform you on whom to test
- **If not**, explain what your rationale is for not expanding the testing at this point and what information would lead you to reconsider your decision

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When to Call It Quits

**Before closing a contact to follow-up:**

- Try different methods of contacting
- Visit or call at different times of the day
- Explore obstacles, offer incentives/enablers
- Consult your supervisor and other health team members
When to Call It Quits (2)

- Inform the contact of the risks of not completing their evaluation or treatment
- Document your efforts and strategies used and the contact’s response to each
- For certain high-risk contacts, more effort may be required

Special Settings...

- TB contact investigation steps also apply to CIs in special settings (schools, correctional facilities, healthcare facilities, etc.)
  - School CI toolkit - [http://www.cdph.ca.gov/programs/tb/Pages/ResourcesLHDsTBCB.aspx](http://www.cdph.ca.gov/programs/tb/Pages/ResourcesLHDsTBCB.aspx)
  - Corrections toolkit - [http://sntc.medicine.ufl.edu/CorrectionsToolkit.aspx#.WA__JC0rLIU](http://sntc.medicine.ufl.edu/CorrectionsToolkit.aspx#.WA__JC0rLIU)
- Identify stakeholders early and keep them informed
- Be prepared for possible media attention
Summary

- Contact investigations are an essential component to TB control and prevention
- Determining the infectious period helps to maintain focus on those most likely to have been infected
- Evaluating CI activities in real time will help maintain a focus on priorities
- Seek consultation for special situations (drug resistance, outbreak, large CI, etc.)