Mayo Clinic Center for Tuberculosis

TB Infection Control
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Disclosure / Disclaimer

- No financial conflicts of interest
- No mention of off-label use of FDA-approved medications
OBJECTIVES:
• Describe the components of an effective infection control program (Tuberculosis)
• Explain administrative, engineering controls, and respiratory protection
• Describe ways healthcare workers can protect themselves and others from being infected with *M. tuberculosis*
Early disease prevention → Modern cough etiquette
Infectiousness

**Transmission** = conveyance of disease from one person to another (an event)

**Infectiousness** = the characteristic of the disease that concerns the ease with which it is transmitted (a capacity)
Update in 2005 and replaced the 1994 *Mycobacterium tuberculosis* infection control (IC) guidelines

Purpose:
- Further reduce threat to health-care workers (HCWs)
- Expand guidelines to nontraditional settings
- Simplify procedures for assessing risk
- Promote vigilance and expertise needed to avert another TB resurgence
Elderly patient with chronic cough and weight loss

HOPI

- 74 year-old, African American female
- Seen at OSU ER with complaints of shortness of breath and progressive weakness
- Increasing SOB over the last 4 days
- Associated with fevers, chills, cough, with purulent sputum
- Family noted history of cough and weight loss over last several months
CXR

Admission

8 months prior to admission
CT Scan: Extensive air-space disease left apical, post cavitary
**Hospital Course**

- Admitted to floor – Community Acquired Pneumonia
- Treated: ampicillin/sulbactam/azithromycin
- Respiratory failure ➔ Intubated 24 hours later
- Blood and routine sputum cultures negative.

5/5 respiratory specimens “Heavy AFB Positive”

**Family History**
- Patient’s mother died productive cough and weight loss
Case 1: Transmission Questions

• Where and how was she infected?

• Is she infectious?

• Who has she infected?
TB is an Airborne Contagion

Index Patient

Cough

Household / Residential

Work / School

Leisure / Recreation
Transmission of TB

- Transmission is **airborne** from patients with **active** pulmonary TB
- **Vehicle:** droplet nucleus (coughing, talking, sneezing); size (1-5 μm)
- **Quantity** of organisms; high with cavitary disease
- **Environment:** spread is enhanced by crowded, poorly ventilated conditions
- Bottom line: duration of exposure and concentration of organisms in the air
Really important levels of control

**Administrative**
Without, TB control fails

**Environmental**
Personal respiratory protection
NOT the 1st level of control, training is critical
What is the most important risk for transmission of *Mycobacterium tuberculosis* in health-care settings?

Unrecognized contagious TB patients
Collaboration with Public Health

- Reporting cases
- Coordinating discharge planning
- Facilitate continuity of care
- Review of policies and procedures
- Home evaluation
- Community investigations
What’s New in Guidelines?

• Broadens the scope of health-care settings
• Redefines TB risk assessment
• Changes TB testing frequency for HCWs
• Defines “airborne infection isolation” (AII)
• Summarizes respiratory fit testing
• Expands information on engineering controls
Case 2: In the Hospital

- 32 y/o male from China seen for “possible TB”
- Placed in airborne infection isolation room
- TB evaluation
  - Mild dry cough x 3 weeks
  - TST placed, at 48 hours = 0 mm
  - CXR done same day
Criteria for Initiating Airborne Infection Isolation (AII) Precautions

Patient has signs or symptoms of infectious TB disease

or

Whenever patient has documented culture-positive pulmonary TB disease and is still infectious

AII: Airborne Infection Isolation
Case 2

- Two negative AFB sputum smears
- The patient improved within 48 hours of starting levofloxacin for CAP...
- Patient released from isolation

- **After** release, a specimen grew *M. tuberculosis*

CAP: Community Acquired Pneumonia
*M.tb*: *Mycobacterium tuberculosis*
TST, smears and contagiousness

- 20% of patients with TB who have no immunosuppression will have a negative TST
- ~50% of patients with non-cavitary TB are sputum smear negative
- 5-10% of patients with cavitary TB are smear negative
- TB with positive smears is more contagious than is smear negative TB, but...BOTH are contagious

TST: tuberculin skin test
Clinical Pearl

• *M. tuberculosis* is a laboratory diagnosis

• TB treatment is a clinical decision
Case 3: Stepping Out

- 22 y/o student from Russia
- Seen by private MD for chest pain, fatigue
- History of prior treatment for TB
- Sputum smear is positive for AFB
- Started on TB treatment
- Culture positive for *M. tuberculosis*
Can she attend class with a N95 mask?

1. Yes
2. No
3. After proper fit testing
Protect the innocent

- Young children
- Immunocompromised
- Uninfected
- Non-exposed
Case 4: Long-term care

- 82 year old female with some dementia
  - cough x 2 weeks
  - 10 lb. weight loss
- No insurance
- Sputum AFB smear positive
- *M. tb* PCR positive
Criteria for Discontinuing AII

When infectious TB is unlikely and either

1) Another diagnosis is made that explains the clinical syndrome
   or
2) Patient has three consecutive negative AFB sputum smear results*

* Exception: MDR-TB
When can this patient be discharged and return to her facility?

1. Minimal TB symptoms
2. Three (3) negative smears
3. Tolerating TB medications
4. All of the above
Case 5  Non-adherence with therapy

- 41 y/o with HIV infection presents with fever, chills and productive cough
- Hospitalized 2 weeks for smear-positive pulmonary TB
- Not cooperative with DOT in hospital
- Lives with HIV-infected partner
How would you proceed with this patient?

1. Send home
2. Admit to a hospice
3. Keep in the hospital
Discharge

• What do you need to know?
  • About the patient
  • About the home setting
  • About visitors
# AIRBORNE PRECAUTIONS
## PRIVATE ROOM, NEGATIVE AIRFLOW

<table>
<thead>
<tr>
<th>Section</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HANDS</strong></td>
<td>Clean thoroughly with alcohol handrub or with soap and water upon entering and leaving the room.</td>
</tr>
<tr>
<td><strong>MASK</strong></td>
<td>An N95 (particulate filter) respirator must be worn when entering the room and must fit snugly around the nose and face.</td>
</tr>
<tr>
<td><strong>ROOM</strong></td>
<td>Private room with negative air flow. Door must remain closed.</td>
</tr>
<tr>
<td><strong>PATIENT TRANSPORT</strong></td>
<td>Place procedure mask on patient.</td>
</tr>
<tr>
<td><strong>VISITORS</strong></td>
<td>Please report to Nurse's Station before entering the room.</td>
</tr>
</tbody>
</table>

**Questions?**
Call Department of Clinical Epidemiology: University Hospital/James 293-8556; University Hospital East: 257-2037 (6/06)
## TB precautions in the home

<table>
<thead>
<tr>
<th>Setting</th>
<th>Administrative controls</th>
<th>Environmental controls</th>
<th>Respiratory protection</th>
</tr>
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<tbody>
<tr>
<td><strong>Home health care</strong></td>
<td>• Train patients about meds, cough etiquette</td>
<td>• Ventilate the home</td>
<td>• When transporting patients in an enclosed vehicle</td>
</tr>
<tr>
<td></td>
<td>• Screen visitors</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Postpone travel until noninfectious</td>
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Home Infection Control

• Discharge from the hospital should not take place until a plan that includes DOT has been approved.

• Patients can be at home while infectious if there is no risk of exposing uninfected persons who are at high risk for progressing to TB disease (e.g., young children, HIV-infected persons).

• Until the patient is deemed noninfectious, he or she should not have uninfected visitors.

Connecticut Advisory Committee for the Elimination of Tuberculosis, 2008
What’s New in Guidelines?

• Broadens the scope of health-care settings
• Redefines TB risk assessment
• Changes TB testing frequency for HCWs
• Defines “airborne infection isolation” (All)
• Summarizes respiratory fit testing
• Expands information on engineering controls
Fundamentals of Infection Control

- **Administrative controls**: reduce risk of exposure via effective Infection Control program
- **Environmental controls**: prevent spread and reduce concentration of droplet nuclei
- **Respiratory protection**: further reduce risk of exposure

• Hierarchy of Infection Control
Collaboration with Public Health

- Reporting cases
- Coordinating discharge planning
- Facilitate continuity of care
- Review of policies and procedures
- Home evaluation
- Community investigations
Risk is Variable

- Prevalence of TB in the community
- Patient population served
- Type of health-care facility
- HCW occupational group
- Area in the hospital
- Effectiveness of TB infection control interventions
Conduct a Baseline Risk Assessment

- Develop/Revise
- TB Infection Control Plan
- Evaluate
- Implement
Changes in Risk Classifications and Frequency of TB Screening
Current Risk Classifications

- Low
- Medium
- Potential ongoing transmission
### Risk Classifications for Hospitals

<table>
<thead>
<tr>
<th>Inpatient settings</th>
<th>Low</th>
<th>Medium</th>
<th>Potential Ongoing Transmission</th>
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<tr>
<td>&lt;200 beds</td>
<td>&lt;3 TB patients/yr</td>
<td>≥3 TB patients/yr</td>
<td>Evidence of ongoing transmission, regardless of setting</td>
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<tr>
<td>≥200 beds</td>
<td>&lt;6 TB patients/yr</td>
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</table>

- **Low Risk:**
  - <3 TB patients/yr in <200 beds
  - <6 TB patients/yr in ≥200 beds

- **Medium Risk:**
  - ≥3 TB patients/yr in <200 beds
  - ≥6 TB patients/yr in ≥200 beds

- **Potential Ongoing Transmission:**
  - Evidence of ongoing transmission, regardless of setting
## Risk Classifications for Outpatient Settings

<table>
<thead>
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<th>Outpatient settings</th>
<th>Low</th>
<th>Medium</th>
<th>Potential Ongoing Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>medical offices, ambulatory care settings, TB treatment facilities</td>
<td>≤3 TB patients/yr</td>
<td>≥3 TB patients/yr</td>
<td>Evidence of ongoing transmission, regardless of setting</td>
</tr>
</tbody>
</table>
# Risk Classifications for Other Health-Care Settings

<table>
<thead>
<tr>
<th>Nontraditional facility-based settings</th>
<th>Low</th>
<th>Medium</th>
<th>Potential Ongoing Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS, LTCFs, medical settings in correctional facilities, outreach care</td>
<td>Only LTBI; system for detection of persons with TB symptoms</td>
<td>Settings where persons with TB disease are treated</td>
<td>Evidence of ongoing transmission, regardless of setting</td>
</tr>
</tbody>
</table>
Example of Risk Classification (1)

- A 100 bed hospital in a small city
- Two TB patients admitted in the previous year – one directly to AII, one after 2 days on a medical ward
- Contact investigation in exposed employees found no evidence of transmission

*Risk Classification:*

Low
Example of Risk Classification (2)

- Big city hospital admits 30 TB patients/year
- TB test conversion rate of 1.0%; 3/20 (15%) respiratory therapists (RTs) converted
- Problem evaluation:
  - The three who converted spent time where induced sputum specimens collected
  - Ventilation in this area inadequate

**Risk Classification:**

1. Potential ongoing transmission for RTs
2. Rest of facility: medium
Example of Risk Classification (3)

- A home healthcare agency that serves a clientele w/TB rates higher than community
- No patients with TB in past year
- 125 workers; 1/3 are foreign-born
  - provide nursing, PT, basic home care
  - at baseline two-step testing, 4 TST+; 2 TST+ on second-step; no cases

Risk Classification:

Low
### TB Screening Frequency

<table>
<thead>
<tr>
<th>RISK CLASSIFICATION</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Baseline; then further screening not necessary unless exposure occurs</td>
</tr>
<tr>
<td>Medium</td>
<td>Baseline; then annually</td>
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<tr>
<td>Potential Ongoing Transmission</td>
<td>Baseline; then every 8–10 weeks until transmission interrupted</td>
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Summary
Keys to good infection control

• Think TB!
• Isolate
• Start 4 drugs
• Patient education
• Directly Observed Therapy
• Discharge planning
• Respiratory protection
• Contact Investigation
Thank you!

Acknowledgements:
Mark Lobato, MD
Paul Jensen, MD
Sundari Mase, MD
25 year old patient admitted to the hospital with cough x 1 month. CXR with right upper lobe cavitary lesion. Sputum AFB smear positive, *Mycobacterium tuberculosis* PCR positive.

When can you discontinue isolation in this patient?

A. Clinical improvement  
B. Three negative AFB sputum smears  
C. Tolerating TB medications  
D. All of the above
Please determine risk classification for TB for the following healthcare setting:
A 100 bed hospital in a small city. In the previous year, the hospital admitted two (2) TB patients. No tuberculin skin test conversions in healthcare workers. The facility is classified as which of the following?

A. Low risk – baseline TB screening for healthcare workers, then as needed
B. Medium risk – baseline TB screening, then annually.
C. Potential ongoing transmission—baseline; then every 8 to 10 weeks until transmission is interrupted.