Public Health Role in Tuberculosis control

August 2, 2013

Harry K. Tweel, MD
Physician Director
Cabell-Huntington Health Department
True/ False Questions

1. Tuberculosis outbreaks occur about in WV about every 4 to 5 years.

2. Tuberculosis is highly contagious.

3. Prophylactic tuberculosis therapy is over 90% effective in preventing future progressive (active) tuberculosis in an individual whom has been recently infected.
True/ False Questions

4. Young children exposed to a parent with active tuberculosis often have a negative PPD skin test because they are more resistant to becoming infected.

5. In West Virginia close contacts of known active cases can not be forced to be evaluated even if they have a positive PPD.
HISTORY OF TUBERCULOSIS

- TB: Major Cause of Suffering and Death
- First human case 3400 BC
- Consumption, White Plague, scrofula, King’s Evil, pthisis
- England 1815: 1 in 4 deaths
- France 1918: 1 in 6 deaths
- During 20th C, TB killed ~100 million
Timothy Cratchit
aka Tiny Tim

- Tiny Tim known based on invalid son of Dicken’s friend
- 1997 Excavation at St. Andrew’s Church found 19C gravesite
- “In Memory. Timothy Cratchit. 1839–1884, Beloved Husband of Julia, Father of Robert, and Son of Robert and Martha.”
- Skeletal remains of 40yo man wearing metal frame and leather on legs and back
- PCR confirmed Tuberculosis*

*CW Callahan. JID 1997;176:1653–4
HISTORY OF TUBERCULOSIS

• At the height of the Romantic movement, tuberculosis was declared to be:
  • “The mark of spirituality or the wages paid by those seemingly touched by a burning creativity.”
HISTORY OF TUBERCULOSIS

- Mark of beauty - pale consumptive look
  - 1858 painting of Queen Guinevere by William Morris
- La Boheme - Mimi
- La Dame aux Camelias - Margerite
“I look pale . . . I should like to die of consumption – because the ladies would say ‘Look at poor Byron, how interesting he looks in dying’.”

Lord Byron (1788-1824)
HISTORY OF TUBERCULOSIS

- Robert Koch (1843-1910)
- Discovery of Tuberculosis bacillus
- April 10, 1882
  - Berlin Physiological Society
HISTORY OF TUBERCULOSIS

- Sanatorium Movement
  - National association for the study and prevention of tuberculosis 1904.
  - Rapid growth.
    - 11,953 beds in 1908
    - 30,000 beds in 1915
    - 97,726 beds in 1942 (peak)
HISTORY OF TUBERCULOSIS

- Tuberculosis Nursing
With no drug therapies, past TB sufferers like these in 1953 were isolated in sanatoriums.
Tuberculosis today
Still a Major Cause of Suffering and Death

- One third of the world’s population are infected with TB
- 9 million people worldwide become sick with TB each year
- 2 million will die each year of TB related disease
- TB is the leading killer of people who are HIV infected.
Fig. 1. Respiratory tuberculosis: mean annual death rate, England and Wales. (Reproduced with permission from McKeown T, Lowe CR. An Introduction to Social Medicine. Oxford: Blackwell, 1974.)
### TB Morbidity
United States, 2006–2011

<table>
<thead>
<tr>
<th>Year</th>
<th>No.</th>
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<td>2007</td>
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<tr>
<td>2010</td>
<td>11,171</td>
<td>3.6</td>
</tr>
<tr>
<td>2011</td>
<td>10,528</td>
<td>3.4</td>
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*Cases per 100,000. Updated as of June 20, 2012.*
## Tuberculosis in WV

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<thead>
<tr>
<th>Year</th>
<th>Active cases</th>
<th>New cases</th>
<th>Deaths</th>
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<tbody>
<tr>
<td>1950</td>
<td>6,107</td>
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<td>87</td>
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Tuberculosis 2013 contacts to MDR case
Cabell-Huntington Health Department

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</table>
Public Health Role in Tuberculosis control
Tuberculosis control

All aspects of control

Detection

Prevention

Treatment programs
Tuberculosis control

Surveillance

Case containment

prevention
Tuberculosis control

- Source or suspected Case
  - Confirmed case
  - Suspected case
Contact investigation

concentric circle

Other-than close

close

Index case
Contact investigation
concentric circle / 3 months prior to Rx

Close contact
8 hr / week

Index case

Other-than close

Close
Contact investigation

concentric circle

- Household
- Leisure
- School
- Homeless
- Workplace

Index case

close

Other-than close
Contact investigation

Close contacts most likely to be infected:

1. Contacts to patients with high degree of infectiousness based on the following factors:
   - Laryngeal or pulmonary Tuberculosis
   - AFB smear positive
   - Cavitary disease on Chest X-ray
   - Cough
Contact investigation

Close contacts most likely to be infected:

2. Contacts exposed to patients in:
   - Congregate settings
   - Small or crowded rooms
   - Areas that are poorly ventilated
   - Areas without air-cleaning systems
Contact investigation

Close contacts most likely to be infected:

- Congregate settings
  - prison
  - shelters
  - nursing homes
  - single-room-occupancy hotels
  - health care facilities
Close contacts most likely to be infected:

Contacts who:

- Have prolonged exposure (longer than 8 hours per week during infectious period)
- Have been physically close to the patient
Contact investigation

Contacts at high risk of developing tuberculosis once infected

1. Contacts who are young children less than 5 years of age.

2. Contacts with any of these conditions:
   - HIV infection/AIDS or those at high risk for HIV infection who refuse HIV testing.
   - Injection of drugs
   - Diabetes mellitus
   - Silicosis
Contact investigation

Contacts at high risk of developing tuberculosis once infected

2. Contacts with any of these conditions:
   • Prolonged corticosteroid therapy
   • Immunosuppressive therapy
   • Chemotherapy
   • Certain types of Cancers (i.e. Carcinoma of the head, neck, or lungs) or hematological disorders (i.e. leukemia and lymphoma)
Contact investigation

Contacts at high risk of developing tuberculosis once infected

2. Contacts with any of these conditions:
   - Chronic renal failure
   - Gastrectomy or jejunoileal bypass
   - Low body weight (10% or greater below ideal)
   - Fibrotic lesions on CXR consistent with old Tuberculosis
Calculating the infectious period

- Usually starts 12 weeks prior to treatment and ends when contact with infected person is removed from interaction with contacts
  - This period is extended in the case of MDRTB
  - The period may be extended if history reveals an earlier start of symptoms.
  - If patient reverts from Negative cultures to Positive a new infectious period must be established. History is critical in this revision.
Disease investigation & Management

- Assessing Risk of Transmission
  - based on the characteristics of the source case
    - AFB smear Positive (higher the smear grade, higher risk)
    - Site (pulmonary or laryngeal tuberculosis)
    - Cavitary disease
    - Cough or hoarseness
Disease investigation & Management

- Assessing Risk of Transmission
  - Based on environmental factors
    - Small room size
    - Poor ventilation (lack of windows)
Disease investigation & Management

• Assessing Risk of Transmission
  • Based on the extent of exposure
    • Prolonged exposure greater than 8 hours of exposure
    • Frequent exposure
    • Close physical proximity (i.e. sleeping in the same room)
Evaluation & Management of Contacts

- All close contacts should be evaluated for symptoms

1. Highest priority for further testing are those who exhibit symptoms of TB.
   - Test with:
     - IPPD or IGRA (t-spot)
     - Chest X-ray
     - Sputum smears & cultures (with drug susceptibility testing)
     - Also look for extra pulmonary sites
Evaluation & Management of Contacts

- All close contacts should be evaluated for symptoms.

2. Contacts with definite symptoms of TB should be treated: (With or without a positive chest X-ray finding consistent with TB)

- Await TB culture results
Evaluation & Management of Contacts

- All close contacts should be evaluated for symptoms.

3. Patients with vague symptoms
   - Withhold treatment until evaluation is complete.
Evaluation & Management of Contacts

- All close contacts should be evaluated for symptoms.

3. Patients with vague symptoms
   - Withhold treatment until evaluation is complete.
   - This includes withholding LTBI treatment.
All close contacts should be evaluated for symptoms.

4. Contacts with symptoms are class 5 (High)
Evaluation & Management of Contacts

- All close contacts should be evaluated for symptoms

4. Contacts with symptoms are class 5 (High)

Regardless of initial lab findings:

- CXR
- IPPD or IGRA
Evaluation & Management of Contacts

• HIV testing
  • Who should be tested?
Evaluation & Management of Contacts

- HIV testing
  - All contacts
  - Those with HIV risk behavior should be closely monitored & referred when appropriate.
## Evaluation & Management of Contacts

### Table: Individuals Who Need Medical Evaluation and Chest Radiograph

<table>
<thead>
<tr>
<th>Status</th>
<th>New Positive Test for TB Infection</th>
<th>Prior Positive Test for TB Infection</th>
<th>Regardless of Test for TB Infection Result (+ or - TTBI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Contacts (close and other than close)</td>
<td>• Symptomatic</td>
<td>• Contacts with HIV infection or other medical risk factors</td>
</tr>
<tr>
<td></td>
<td>• Persons being evaluated in source case investigation</td>
<td>• Persons being evaluated in source case investigation</td>
<td>• Children younger than 5 years of age identified during window period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Additional persons with heavy exposure</td>
<td>• Anyone with symptoms suggestive of tuberculosis, regardless of TTBI result or age</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sexual contacts of HIV-infected index patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• All associates in a source case investigation</td>
</tr>
</tbody>
</table>
Contacts with a negative IPPD or IGRA (class I)
Why are they class I?
Evaluation & Management of Contacts

- Contacts with a negative IPPD or IGRA (class I)
  - Repeat testing in 8 to 12 weeks.
  - Of the negative test group who should have an X-ray & clinical evaluation during the 8 weeks period?
Evaluation & Management of Contacts

- Contacts with a negative IPPD or IGRA who need a chest X-ray & medical evaluation:
  - Contacts younger than 5 years of age
  - Contacts between 5 and 15 years of age at physicians request
  - Contacts who are HIV positive
  - Contacts who are Immunosuppressed
  - HIV risk patients who refuse HIV testing
Evaluation & Management of Contacts

- Contacts with a positive IPPD or IGRA
  - Chest X-ray and physical are normal (class 2)
  - Chest X-ray or Physical evidence suggest TB (class 5)
Evaluation & Management of Contacts

- Contacts with a positive IPPD or IGRA
  - Chest X-ray and physical are normal (class 2) **Start LTBI treatment**
  - Chest X-ray or Physical evidence suggest TB (class 5) **Evaluate for TB disease before starting treatment**
Evaluation & Management of Contacts

- Who needs evaluation & Chest X-ray
  - All contacts with a positive IPPD or IGRA
  - Any contact with a prior history of a positive IPPD/IGRA
  - Any contact with a prior history of TB
Evaluation & Management of Contacts

- **Who needs evaluation & Chest X-ray**
  - Contacts with HIV or other immunosuppressive conditions with or without a positive IPPD/IGRA
  - Children less than 5 years of age (regardless of IPPD results)
  - All persons with symptoms (regardless of IPPD/IGRA results)
  - Sexual partners of HIV infected contact individuals who refuse HIV testing
Evaluation & Management of Contacts

- 6 week follow-up testing:
  - 1. Negative test with no further contact to source case (Class 1)
    - May discontinue LTBI treatment
8 week follow-up testing:

1. Negative test with no further contact to source case (Class 1)
   - May discontinue LTBI treatment

2. Negative test with continues close contact with source case
   Continue LTBI if other risk factors
Evaluation & Management of Contacts

- 8 week follow-up testing:
  1. Negative test with no further contact to source case (Class 1)
  2. Negative test with continues close contact with source case

Reevaluate every 3 months with a chest X-ray & evaluation
Evaluation & Management of Contacts

- Those who have a positive culture during the interim period (Class 5)
  - *Is now a new source case requiring full treatment & new investigation*
Evaluation & Management of Contacts

- Expanding a contact investigation recommended when the index case fits one or more of these criteria:
  - Homeless living in a congregate setting, shelter or single-room-occupancy hotel
  - Works in or attends a school or day care facility
  - Works in a potentially sensitive worksite
  - Works in a setting where the coworkers are aware of the TB diagnosis
Evaluation & Management of Contacts

- Expanding a contact investigation recommended when the index case fits one or more of these criteria:
  - Works, studies, or lives in a setting with 15 or more individuals
  - Is a health care worker
  - Has traveled during the infectious period for 8 or more hours on an airplane, train, or bus.
  - Attends a place of worship regularly during the infectious period
Evaluation & Management of Contacts

- Expanding a contact investigation recommended when the index case fits one or more of these criteria:
  - Attended an after school program or other extracurricular programs during the infectious period
  - Frequently in a health care setting during the infectious period
    - Especially if not appropriately isolated during a hospitalization or frequent clinic visits
Evaluation & Management of Contacts

- Latent Tuberculosis infection
  - Short course therapy (12 weeks) DOT
  - Standard 6 or 9 months therapy
    - Source case finding
    - Regular follow-up
    - Observe for drug toxic effects
Tuberculosis contact investigation at the Cabell-Huntington Health Department 2013
## Tuberculosis in WV

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<td>15</td>
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</tr>
<tr>
<td>2012</td>
<td>----</td>
<td>8</td>
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</tr>
<tr>
<td>2013</td>
<td>----</td>
<td>7</td>
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<tr>
<td>Number of new cases</td>
<td>Number of contacts identified</td>
<td>Number of contacts test or Evaluated</td>
<td>Number with LTBI</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------</td>
<td>------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>7</td>
<td>4022</td>
<td>3760</td>
<td>65</td>
</tr>
<tr>
<td>Number of LTBI</td>
<td>Number who were candidates for LTBI treatment</td>
<td>Number started on treatment</td>
<td>Number who have completed treatment</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------</td>
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</tr>
<tr>
<td>58</td>
<td>53</td>
<td>45</td>
<td>33</td>
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## Reasons for not completing LTBI

<table>
<thead>
<tr>
<th>Adverse Medication reaction</th>
<th>Patient chose to stop</th>
<th>Patient lost to follow-up</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
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# Tuberculosis 2013

**Cabell-Huntington Health Department**

<table>
<thead>
<tr>
<th>Case</th>
<th>Contacts</th>
<th>Positive PPD</th>
<th>Positive T-spot</th>
<th>On treatment</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
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<td></td>
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</table>
Tuberculosis is a social disease with medical implications.
True/False Questions

1. Tuberculosis outbreaks occur about in WV about every 4 to 5 years.
2. Tuberculosis is highly contagious.
3. Prophylactic tuberculosis therapy is over 90% effective in preventing future progressive (active) tuberculosis in an individual whom has been recently infected.
4. Young children exposed to a parent with active tuberculosis often have a negative PPD skin test because they are more resistant to becoming infected.

5. In West Virginia close contacts of known active cases cannot be forced to be evaluated even if they have a positive PPD.
Role of Nursing today in Direct observed Therapy

- Tuberculosis Nursing
TBC nursing 2012
TBC nursing 2012
TBC nursing 2012
<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Date</th>
<th>Time Collected</th>
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<tr>
<td>CABE01</td>
<td></td>
<td>3:14</td>
</tr>
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</table>
TBC evaluation & Therapy
TBC evaluation & Therapy
TBC nursing 2012
Summary

- WV has a high standard for the care of tuberculosis patients.
- The Cabell-Huntington Health Department embraces the challenge & the complexity of proper treatment in order to eliminate tuberculosis. (DOT & contact investigation)
- We treat these patients with respect and compassion for our best chance of success.
Eliminate tuberculosis in the US

- Good contact investigation with proper follow-up & therapy. (HIPAA)
- Close monitoring of therapy of active cases with DOT & labs
- Testing all active cases for HIV & MDR & XMD.
- Testing of high risk individuals
- Knowledge of co-morbidities
summary

- Great need exists for new drugs/regimens to address the unmet medical needs in TB therapy
- Ultimate success will require still stronger and more robust global TB drug pipeline
- New approach underway for the development of novel anti-TB drug regimens (CPTRR initiative)
Questions

Thank you
Public Health Role in Tuberculosis control

August 2, 2013

Harry K. Tweel, MD
Physician Director
Cabell-Huntington Health Department