Tuberculosis
Emergency Department Diagnosis, Treatment, and Infection Control

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Topics of Discussion

1. Suspicion of TB
2. Initial Management
3. Infection Control

Who Might Have Tuberculosis

Worldwide: Leading infectious cause of death
Affects over 1/3 of the world’s population
1,700,000 die every year from it

United States: Increased from 1980s-1993
2010 3.6 cases/100,000 people

Massachusetts


Why the ED We See It

<table>
<thead>
<tr>
<th>TB Risk Factor</th>
<th>Percentage in US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Racial/Ethnic Minorities</td>
<td>29%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>28%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>25%</td>
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<tr>
<td>Black/African American</td>
<td>25%</td>
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</tbody>
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<table>
<thead>
<tr>
<th>TB Risk Factor</th>
<th>Percentage in MA (Case Rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substances Abusers</td>
<td>9%</td>
</tr>
<tr>
<td>Homeless</td>
<td>3%</td>
</tr>
<tr>
<td>Correctional Facilities</td>
<td>2% (20/100,000)</td>
</tr>
<tr>
<td>Nursing Homes</td>
<td>2%</td>
</tr>
</tbody>
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*Information limited by incomplete HIV reporting.*
Why the ED We See It

1. Most likely to have tuberculosis:
   - Ethnic Minorities
   - Foreign Born
   - those with HIV
   - drug users
   - nursing home patients
   - homeless patients
   - prisoners
   - Chronic illnesses such as Diabetes and Renal Failure

2. Most likely to have
   - no “usual source of care”
   - acute illnesses requiring urgent medical attention

3. Most likely to show up to an ED near you

High Risk

Why the ED We Miss It

1. Nearly 50% of newly diagnosed TB cases had antecedent ED visit in previous 6 months
   - an average of 2.2 visits
   - as approached diagnosis, more likely to have an ED visit
   - ED visitors are the most sick of all TB patients

2. In a 30 month time period, 44 contagious TB patients made 66 ED visits prior to TB diagnosis

3. Not improving - at least in MA
   - between 2008 and 2010:
     - 1441530 documented TB cases sought care in an ED
     - only 10 had TB diagnosed (7%)
     - more than 33 of them had multiple ED visits

4. And it could be your ED
   - not just urban areas
   - not just urban areas


Sue Etkind, R.N., MS Director, Division of TB Prevention and Control
Why the ED  
We Miss It

1. In hospitalized patients, the median interval from admission to initiation of medications was 6 days.
2. 75% of patients had a delay of at least 24 hours.


Why the ED  
We Miss It

Clinical presentation of tuberculosis can be variable and non-specific:
1. Cough present in only 64%.
2. Cough was chief complaint in only 20%.
3. Only 36% had respiratory complaint at triage.

Sokolove PE et al. The Emergency Department Presentation of Patients with Active Pulmonary Tuberculosis. Academic Emergency Medicine Volume 7 Issue 9, September 2000.

Why the ED  
We Miss It

Clinical presentation of contagious TB patient may not even be related to TB.

Sokolove PE et al. The Emergency Department Presentation of Patients with Active Pulmonary Tuberculosis. Academic Emergency Medicine Volume 7 Issue 9, September 2000.

Why the ED  
We Miss It

Even worse for children:
1. 60 children seen in clinic had been seen in ED previously.
2. 27% had extra-thoracic disease.
3. Frequently accompanied by adult with undiagnosed pulmonary TB.


Why the ED  
We Miss It

Definitive diagnosis is frequently not possible in the ED:
1. Culturing the organism can take days to weeks.
2. Ziehl-Neelsen staining, which identifies Acid Fast Bacilli, is only 50-80% sensitive.

Why the ED We Spread It

- Between Patients
- From Patients to Health Care Workers
- From Patients to Family Members

Why the ED We Spread It Between Patients

- Emergency Department Infrastructure
- Overcrowding in the Waiting Room
- Boarding in ED Hallway or Room without sufficient Ventilation Precautions

Why the ED We Spread It

- Acuity in the ED
  - Intubation
  - Induced Sputum
  - Nebulized Medications
  - Atypical Presentations

Why the ED We Spread It

- In Peru
  - High prevalence of TB
  - Virtually no infection control measures
  - 56% of staff baseline Quantiferon positive
  - 30% of staff that had tested negative converted in one year period

Why the ED We Spread It

- Patients go upstairs
- Patients go home

Topics of Discussion

- Suspicion of TB
- Initial Management
- Infection Control

Case #1

- **CC:** Cough, fever
- **HPI:** 35 y/o male with 4 days of cough productive of yellow sputum
- **PMH:** None
- **Meds:** None
- **Exam:** Febrile, well appearing, coughing, rales at right lung base

Community-Acquired Pneumonia

- **Organisms:**
  - S. pneumoniae
  - H. flu
  - Atypicals

Community-Acquired Pneumonia

- **High Level Drug Resistant strep Pneumoniae**

Case #2
Community-Acquired Pneumonia

Don’t we use Respiratory Fluoroquinolones to treat resistant TB??
Can this be a problem??

Community-Acquired Pneumonia
Partially treated Tuberculosis
Delay in Diagnosis
Development of Resistant Tuberculosis
Appears to be more theoretical

Of 428 pts diagnosed with Pulmonary Tuberculosis:
17% of patients had been prescribed a Fluoroquinolone in previous 6 months
Most within 90 days of diagnosis
Only 3/74 who had been treated had resistant TB
All had received more than one course of Fluoroquinolones

Among Fluoroquinolone Resistant Tuberculosis, Majority appear to be in MDR-TB
Likely secondary to Multi-Drug Regimen
Not due to Isolated Fluoroquinolone use in the Community

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COMMUNITY-ACQUIRED PNEUMONIA

Fluoroquinolone Risk

- Might be a bigger problem if prevalence of TB increases
- Use of fluoroquinolones increases
- Consider trying alternative regimens

Case #3

- 46 year old homeless male, born in Peru, complains of cough, fever, night sweats, and weakness for 1 month

Clinical Suspicion

- We learned:
  - Cough > 2 weeks duration
  - Dyspnea
  - Night sweats
  - Hemoptysis

- We see:
  - Variable clinical presentation

High Suspicion of TB

- Decision to initiate treatment
  - Epidemiologic information
  - Clinical, pathologic, and radiologic findings
  - Microscopic findings of acid-fast bacilli
  - Cultures for mycobacteria

High Suspicion of TB

- In the emergency department
  - Chest X-ray
    - Looking primarily for active pulmonary tuberculosis
High Suspicion of TB

Sputum Sample
- Looking for AFB on Smear (Ziehl-Neelson Stain)
- Sensitivity of 60% in Culture Positive pts
- Depends on skill of lab tech
- Depends on Bacillary Load
- Rapid

Sputum Sample
- Looking for AFB on Smear (Ziehl-Neelson Stain)
- Rapid
- Sensitivity of 60% in Culture Positive pts
- Depends on skill of lab tech
- Depends on Disease Burden
- Culture
- Slower Results
- Gold Standard

Other Methods
- PPD
- QUANTIFERON® Gold

Disposition?
- Can be treated as outpatient
- Not so easy!!
- Not ill appearing
- Appropriate social situation
- Contact with local TB program
- Most will be admitted

Case #4
46 year old female, noncompliant with HIV meds, complains of cough for 1 month
**Tuberculosis AND HIV**

1. Occurs at **ANY** CD4 Count (only 11.4% of TB patients have HIV)
2. Degree of immunosuppression influences clinical, radiographic, and histopathologic presentation of TB
   - CD4>350: Appears as typical TB (RUL, +/- cavitations)
   - CD4<200: Extrapulmonary manifestations, sepsis syndrome with (−) X-ray, no granulomas or cavitations, miliary TB
3. 1/3 of AIDS patients have primary TB
4. 2/3 have reactivation TB
5. 7-10% annual risk in HIV-infected patients with positive tuberculin skin test (TST)
6. In HIV uninfected, 5-10% lifetime risk
7. Faster progression of HIV
8. More severe TB in HIV

**Sputum Smear AND culture**

Need 3 (Decreased sensitivity when immunocompromised)

**Tuberculosis AND HIV**

**Case #5**

- **CC:** Back Pain
- **HPI:** 19 y/o male from Vietnam with gradually increasing back pain
- **PMH:** None
- **MedS:** None
- **Exam:** Uncomfortable, significant tenderness over back

**Liver failure (check LFTs!)**

**IRIS**
**More Tuberculosis**

- Can be anywhere
- Does NOT require isolation unless it is pulmonary or laryngeal, or in a wound that will be I&D'd

**Topics of Discussion**

- Suspicion of TB
- Initial Management
- Infection Control

**Why Bother**

- 6 Fold Decrease in Development of LTBI After Beginning Infection control program with Administrative, Engineering, and Respiratory Protection elements

**Back to Basics**

- Spread by droplet nuclei (airborne particles)
- From Patients with Pulmonary or Laryngeal TB
- Cough, Sneeze, Shout
- Aerosolized from TB wounds
- Abscesses I&D'd
- 1-5 µm
- Normal air currents keep particles airborne for prolonged periods

**High Risk Transmission**

- Exposure to TB in small, enclosed spaces
- Inadequate local or general ventilation that results in insufficient dilution or removal of infectious droplet nuclei.
- Recirculation of air containing infectious droplet nuclei.
- Inadequate cleaning and disinfection of medical equipment.
- Improper procedures for handling specimens.

**Hierarchy of Infection Control**

- Administrative Controls
- Environmental Controls
- Respiratory Protection

Sources:


Infection Control

1. Administrative controls
   - Reduce risk of exposure via effective IC program
2. Environmental controls:
   - Prevent spread and reduce concentration of droplet nuclei
3. Respiratory protection controls:
   - Further reduce risk of exposure in special areas and circumstances

Administrative Controls

1. Test and evaluate HCWs at risk for TB or for exposure to M. tuberculosis
2. Train HCWs about TB infection control
3. Ensure proper cleaning of equipment
4. Use appropriate signage advising cough etiquette and respiratory hygiene

Respiratory Protection (RP) Controls

1. Implement RP program
   - Protocols
   - Training
   - Mask Fitting
2. Minimum respiratory protection is a filtering facepiece respirator
   - Nonpowered, air-purifying, half-facepiece, N95 disposable

Environmental Controls

1. Control source of infection
2. Dilute and remove contaminated air
3. Prevent spread of infectious droplet nuclei
4. Reduce concentration of infectious droplet nuclei
5. Control airflow (clean air to less-clean air)

Environmental Controls

1. High air flow (at least 6 air changes/hour)
2. Air cleaning methods
   - High energy particulate air filtration (HEPA)
   - Ultraviolet germicidal irradiation (UVGI)
3. Negative pressure
   - Air exhausted to the outside

Environmental Controls

1. Airborne infection isolation rooms ("TB room")
**Environmental Controls**

- 1995 Most ED’s did not have adequate environmental measures
- 1.7% of Triage/Waiting Areas
- 19.6% of EDs
- Have things changed since then??

**Resource utilization**

- If the ED has isolation rooms
- The trick is getting the appropriate patients into these rooms
- Protocols for identifying, evaluating, and managing infectious TB patients

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**Triage**

- Important and vulnerable point of entry into the ED and the hospital
- Effective strategy here will minimize nosocomial infections throughout ED and entire hospital

**Triage**

- Initial patient encounter
- Consider infection control measures on arrival
  - Masking
  - ED isolation room
  - Notification of staff members

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**Difficulties**

- Triage procedures have met with limited success
  - In sensitivity
  - In specificity
  - Problem is that talking to the patient is just not sufficient

**Plan?**

- Mask everybody with a cough
  - Droplet precautions sufficient for most bacteria/viruses
  - Large droplets
  - Don’t remain suspended in the air
- “TB rooms” for those with high-risk epidemiologic factors
- High-risk procedures done only in rooms with non-recirculated air

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Admission to Hospital

1. If ED does not have isolation room:
   - Rapid identification of possible cases and rapid admission to hospital bed.

2. If ED does have isolation room:
   - Screen high-risk patients in ED to determine who needs an isolation bed.

**Decision Instrument**

- History of tuberculosis
- Immigrant
- Homeless
- History of incarceration
- Recent weight loss
- Chest radiograph with apical infiltrate
- Chest radiograph with cavitary lesion

**Sensitivity:** 96.4%
**Specificity:** 48.7%

**Effectiveness (Post-test Probability) will always depend on your prevalence**

1. Peru
   - High prevalence area, not found to be sufficient
2. Urgent care area that has never had a case of TB
3. You will be isolating a large number of ultimately negative pts.

**What Have We Learned**
