Assigning Priority to Persons Exposed to M. Tuberculosis

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TB Contact Investigation 101
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Jan Dougan, RN, TBCM has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity
Define the information needed to PRIORITIZE contacts for TB investigation:
- Characteristics of the index patient
- Characteristics of contacts

Identify factors that increase the likelihood of TB transmission and progression of TB infection (LTBI) to active disease.
Why prioritize contacts?

- Distinguish all recently infected contacts from those who are not infected, and
- Prevent TB disease by treating those with infection (both active or latent)

Reactivation TB: The development of TB disease one or more years after initial infection, usually appearing as nodular and linear areas of increased opacity in the upper lobes, often with cavitation.

Contacts

- Contacts who are at high risk of developing disease if infected including: young children less than 4 years of age, HIV-infected and other immunosuppressed persons, and persons with certain medical conditions (Table 6.6).
“First dose of reality”

- Not all contacts with substantial exposure are identified during the contact investigation.
- Although brief exposure can lead to tuberculosis infection and disease, certain contacts never become infected even after long periods of intensive exposure.

“Second dose of reality”

Available tools to detect TB infection lack sensitivity and specificity and do not differentiate between persons recently or remotely infected.
More is not always better

- Over testing of contacts is not productive
- Unfocused testing encourages false fears of epidemic of TB
- Contact follow up efforts should be directed at those truly at risk

Priorities for testing

Priorities are based on the likelihood of infection and the risk of progression to active tuberculosis disease.
Exposure to Disease

- 5% First Year
- 2-3% Second Year
- ~0.1% per year thereafter

No Disease (90%)

Factors for Assigning Contact Priorities

- Characteristics of the index patient (how infectious were they?)
- Characteristics of contacts- how vulnerable are they?
  - Age
  - Immune status
  - Other medical conditions
- Exposure
  - intensity, frequency,
  - duration

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Priority Contacts

- **High**: household, under age 5, medical risk factor (HIV), exposure during medical procedure (bronch, sputum induction or autopsy), congregate setting, exceeds duration/environmental limit

- **Medium**: age 5-15, exceeds duration/environmental limits

- **Low** priority: all other identified contacts

Decision to Initiate a TB Contact Investigation

*Approved indication for NAA
*Chest radiograph, *Acid-fast bacilli
*Nucleic acid assay: this is our MTB/RIF test
Contacts who are at high risk of developing disease if infected

young children less than 4 years of age, HIV-infected and other immunosuppressed persons persons with certain medical conditions (Table 6.6).

Most Important Contact Characteristics

Table 6.6
High-Priority Contacts for Testing
CA Contacts Most Likely to Be Infected
(Close Contacts at High Risk of Developing TB Disease Once Infected
CA Contacts exposed to patients with a high degree of infectiousness based on the following factors:
- Laryngeal or pulmonary TB
- AFB sputum smear-positive
- Cavitary disease on chest x-ray
- Cough
- Positive culture for Mycobacterium tuberculosis
CA Contacts exposed to patients in:
- Small or crowded rooms
- Areas that are poorly ventilated
- Areas without air-cleaning systems
CA Contacts who:
- Frequently spend a lot of time with the patient
- Have been physically close to the patient
CA Contacts who are young children less than 4 years of age:
CA Contacts with any of these conditions:
- HIV infection
- Injection of illicit drugs
- Diabetes mellitus
- Silicosis
- Prolonged corticosteroid therapy
- Immunosuppressive therapy
- Certain types of cancer
- Severe kidney disease
- Certain intestinal conditions
- Low body weight (15% or more below ideal)
Age

- After infection, TB disease is more likely to occur in younger children.
  - The incubation or latency period is briefer;
  - And lethal, invasive forms of the disease are more common.

- Children <5 years who are contacts are assigned high priority for investigation

Immune Status

- HIV infection results in the progression of TB infection to TB disease more frequently and more rapidly than any other known factor, and a greater likelihood of disseminated and extrapulmonary disease.

- HIV infected contacts are assigned high priority, and starting at the time of the initial encounter, extra vigilance for TB disease is recommended.
Other Immunosuppressions

- Contacts receiving >15mg of prednisone or its equivalent for >4 weeks also should be assigned high priority.
- Other immunosuppressive agents, including:
  - multiple cancer chemotherapy agents,
  - anti-rejection drugs for organ transplant and tumor necrosis factor alpha (TNF alpha) antagonists,
increase the likelihood of TB disease after infection; these contacts also are assigned a high priority.

TNF alpha antagonists

- Remicade (infliximab)
- Enbrel (etanercept)
- Humira (adalimumab)
- Cimzia (certolizumab pegol)
- Simponi (golimumab)
- Kineret (anakinra)
Other medical conditions to consider

- **Silicosis**: 3,600-7,300 cases per year in the United States from 1987 to 1996.

- **Diabetes Mellitus**: affects 25.8 million people of all ages (8.3 percent of the U.S. population)
  Diagnosed: 18.8 million people
  Undiagnosed: 7.0 million people- *2011 stats*

- **Gastrectomy or jejunoileal bypass surgery**: over 200,000 performed annually in the US.

Environment

Contacts exposed to patients in:

- Small or crowded rooms
- Areas that are poorly ventilated
- Areas without air-cleaning systems
“Congregate Settings”

- correctional facilities,
- workplaces,
- hospitals or other health care settings,
- schools,
- shelters,
- transportation modes, (airplanes, ships)
- drug or alcohol usage sites

Environment

- In large indoor settings, because of diffusion and local circulation patterns, the degree of proximity between contacts and the index patient can influence the likelihood of transmission.
- Other subtle environmental factors (eg humidity and light) are impractical to incorporate into decision making.
Environment

Air volume, exhaust rate, and circulation predict the likelihood of transmission in an enclosed space.

Circulation of Air

Local circulation and overall room ventilation also dilute infectious particles, but both factors can redirect exposure into spaces that were not visited by the index patient. These factors have to be considered.
Priorities should be assigned to contacts, and resources should be allocated to complete all investigative steps for high and medium priority contacts. Any contact not classified as high or medium priority is assigned a low priority.

### CDC Prioritization

<table>
<thead>
<tr>
<th>Patient has <strong>pulmonary, laryngeal, or pleural</strong> TB disease with cavitary lesion on chest radiograph or is AFB sputum smear positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household contact</td>
</tr>
<tr>
<td>Contact &lt;5 years of age</td>
</tr>
<tr>
<td>Contact with medical risk factor (HIV or other medical risk factor)</td>
</tr>
<tr>
<td>Contact with exposure during medical procedure (bronchoscopy, sputum induction, or autopsy)</td>
</tr>
<tr>
<td>Contact in a congregate setting</td>
</tr>
<tr>
<td>Contact exceeds duration/environment limits (limits per unit time established by the health department for high-priority contacts)</td>
</tr>
<tr>
<td>Contact is ≥ 5 years and ≤ 15 years of age</td>
</tr>
<tr>
<td>Contact exceeds duration/environment limits (limits per unit time established by the health department for medium-priority contacts)</td>
</tr>
</tbody>
</table>

*Any contact not classified as high or medium priority is assigned a low priority.*
Prioritization of Contacts (2)

Patient has suspected/confirmed pulmonary/pleural TB – AFB smear negative, abnormal chest radiograph consistent with TB disease, may be NAA and/or culture positive

<table>
<thead>
<tr>
<th>Contact</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact &lt;5 years of age</td>
<td>High</td>
</tr>
<tr>
<td>Contact with medical risk factor (e.g., HIV)</td>
<td>High</td>
</tr>
<tr>
<td>Contact with exposure during medical procedure (bronchoscopy, sputum induction, or autopsy)</td>
<td>High</td>
</tr>
<tr>
<td>Household contact</td>
<td>Medium</td>
</tr>
<tr>
<td>Contact exposed in congregate setting</td>
<td>Medium</td>
</tr>
<tr>
<td>Contact exceeds duration/environment limits (limits per unit time established by the local TB control program)</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Any contact not classified as high or medium priority is assigned a low priority.
Prioritization of Contacts (3)

Patient is a suspect pulmonary TB – AFB smear negative, NAA negative/culture negative, abnormal chest radiograph not consistent with TB disease

<table>
<thead>
<tr>
<th>Contact Type</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household contact</td>
<td>Medium</td>
</tr>
<tr>
<td>Contact &lt;5 years of age</td>
<td>Medium</td>
</tr>
<tr>
<td>Contact with medical risk factor (e.g., HIV infection or other immunocompromising condition)</td>
<td>Medium</td>
</tr>
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<td>Contact with exposure during medical procedure (bronchoscopy, sputum induction, or autopsy)</td>
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</tr>
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Contact Terminology

The terms “close” and “casual”, which are frequently used to describe exposures and contacts, have not been defined uniformly and therefore are not useful for these guidelines.
Case 1

Mary Jones is a 33 year old single detention officer at the local jail. She is diagnosed with pulmonary TB following an annual skin test conversion to positive. There was an inmate who was diagnosed with TB after going through the facility about eleven months ago. Mary refused to have a skin test during that investigation because she thought she was pregnant. She found out later that she was not, but the excitement of the investigation had died down and she was never tested. She has an abnormal CXR with infiltrates and her three sputums were 1+, 1+, and 2+ respectively. Mary plays softball on the local recreation league. Her mother runs a home day care. Mary and her mother are very close and spend many evenings together each week. One of the daycare moms is the local health reporter for the small town newspaper. The jail facility that Mary works at is a regional overflow facility with contracts to house inmates from several neighboring counties. Mary is assigned to Cellblock A, but occasionally provides meal break relief on cellblock C. She is dating John, the infection control nurse at the facility and they are talking about marriage.

Mary broke her arm in the last softball game of the season and had to stay at home for two weeks about a month ago. Her sister Tanya came by every afternoon with her four year old son Josh to prepare dinner for Mary and to help her with her shower and laundry. Josh is a real fan of his aunt’s back yard because it has an old tree house in it that he thinks is just really cool. He is not much hanging out with grown-ups when he has villains to destroy in his tree house kingdom.

Who are the contacts and what is their priority for investigation?

Prioritization of Contacts Exercise

Case 2

Jose Garcia is a 45-year-old Hispanic male who has lived in Kansas for 10 years. He returns to his native home in Mexico about once every two years. He speaks fluent English, as does his family in Kansas. He is diagnosed with MTB following a positive skin test when he applied for a new job at St. Mary’s Hospital as a registered nurse. He has been working for in a dialysis facility for the past five years and has a history of negative TSTs for the past five years. His CXR shows a large cavity in the upper right lobe and his smears were all three 4 plus positive. He is married to Maria, a stay at home mom, and has four children, Jose Jr. (age 24 attending college in Missouri), Mary (age 17 attending high school, living at home, diagnosed with Type 1 diabetes), Julie (age 12, attending middle school and active in basketball and softball) and Tony (age 8, attending elementary school but has been out of school for two weeks with a nagging cough and occasional fever). Julie has a girlfriend names Sally who stays with her everyday after school because Sally’s parents work until six. Mary has a boy friend, Larry, who eats dinner with Garcia’s two or three times a week. Jose is active on his church bowling league and is a member of the Lion’s club in his town where he serves as Secretary and Special Events Planner. Jose and his wife celebrated their twenty-fifth wedding anniversary last Saturday night. They celebrated with a reception lasting about four hours in the basement fellowship hall of their church. Many family members from around the country and Mexico were present as were many local friends of the couple. Their son came home from college for the event as a surprise as he had not been home for several months because of obligations at school. Jose and his wife care for the nursery at church one Sunday a month during the worship service. In Jose’s previous job, he worked a regular schedule with two other registered nurses and six techs. There was also a social worker that worked regularly with his clients while they were on the machines. There was also a PRN nurse who worked about three or four shifts a month to relieve staff on vacation or out ill. This nurse is under treatment for breast cancer. There are fifteen dialysis patients who are identified as patients regularly cared for by Jose. There is a food service worker who brings lunch into patients on dialysis each day. There is a nutritionist who works with clients once a week for an hour who is HIV positive.

Who are the contacts and what is their priority for investigation?