Tuberculosis Active Case Finding Strategies in the United States

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WHO Scoping Meeting on TB Screening / Active Case Finding
May 31, 2011
Overview

• Epidemiology of TB
• Active case finding strategies
• Contact investigation
• Results of a prospective contact investigation study
Reported TB Cases
United States, 1982–2010*

*Updated as of February 26, 2011. Data are provisional.
TB Case Rates in U.S.-born vs. Foreign-born Persons United States, 1993–2010*

*Updated as of February 26, 2011. Data are provisional.
Number of TB Cases in U.S.-born vs. Foreign-born Persons
United States, 1993–2010*

*Updated as of February 26, 2011. Data are provisional.
Active Case Finding Strategies in the US

- Contact investigation
- Screening HIV-infected persons
- Targeted testing of high risk groups
  - immigrants and refugees
  - correctional facilities
  - congregate settings
  - healthcare workers
- Outbreak investigations
Active Case Finding Strategies in the US

• Screening HIV-infected persons
• 2009 National Guidelines for prevention and treatment of opportunistic infections
  - baseline screening with TST or IGRA
  - preventive treatment only if (+) TST/IGRA
  - annual screening if high exposure risk
  - CXR if (+) TST or IGRA
• No national data on implementation or yield
• TB/HIV co-infection rate 6% / NNS >1500
Active Case Finding Strategies in the US

• Targeted testing of immigrants and refugees
• 400,000 immigrants annually
• Overseas screening
  - CXR, if abnormal 3 smears
• High rates of TB in first 6 months in the US
• No national data
Active Case Finding Strategies in the US

- Lowenthal IJTLTD 2011
  - addition of culture to overseas screening algorithm resulted in decrease in TB rates
  - 86 TB / 2049 (4.2%)  CXR, 3 smears
  - 22 TB / 1430 (1.5%)  CXR, 3 smears, culture
  - NNS: 24 before, 65 after
Active Case Finding Strategies in the US

- Targeted testing in correctional facilities
- 1996 CDC Guidelines for prevention and control of TB in correctional facilities
  - symptom screen + TST at intake
- No national data
- Federal Bureau of Prisons, 2001
  - 75 TB cases / 25,707 screened (NNS=343)
- NYC Jails, 2009
  - 2 TB cases / 64,948 screened (NNS=32474)
Contact Investigation

Household

CLOSE CONTACTS
• 30-40% latent TB
• 2-4% TB disease

Social

Work / School

SOURCE PATIENT

CONTACTS
- High Priority
- Medium Priority
- Low Priority

Close Contacts

Other-than-Close Contacts
Who Should Be Identified And Screened

• Investigation of contacts and treatment of infected contacts an important component of US TB elimination strategy
• 2nd in priority to treatment of TB disease
• Priority-based screening of persons at highest risk of TB exposure, infection, and disease
• National Guidelines developed in 2005
Active Case Finding Strategies in the US

• Contact investigation

<table>
<thead>
<tr>
<th>Report</th>
<th>No. contacts</th>
<th>Active TB (%)</th>
<th>NNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks AJRCCM 2000</td>
<td>6225</td>
<td>2%</td>
<td>46</td>
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<tr>
<td>Reichler JAMA 2002</td>
<td>2095</td>
<td>2%</td>
<td>50</td>
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<tr>
<td>Jereb IJTLD 2003</td>
<td>33521</td>
<td>1%</td>
<td>89</td>
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Rates, Timing, and Risk Factors for TB Disease Among Contacts to Culture-Positive Pulmonary TB Patients Enrolled in TBESC Task Order 2

TBESC Task Order 2


WHO Meeting on Tuberculosis Screening/ Active Case Finding
Geneva, Switzerland
May 31, 2011
Study Objectives

- Determine the yield of contact investigations for new cases of active TB
- Evaluate rates and timing of TB disease among contacts to active pulmonary TB patients
- Determine the proportion of TB cases which can still be prevented at the time of contact investigation
Study Design

- 9 TBESC project sites
- Enrollment 2002 - 2006
- Case eligibility: Culture (+) pulmonary TB cases ≥ 15 years of age
- Contacts with ≥ 15 hrs/week of exposure
- Procedures:
  - Case and contact interviews
  - Environmental assessment
  - TB / HIV registry matches
Study Design

- 9 Sites:

- US / Canadian- and foreign-born populations well characterized with regard to:
  - Frequency, duration, and timing of TB exposure
  - TB case infectiousness, host susceptibility, and exposure environment
Study Design

- 718 TB patients and 4566 contacts enrolled
- 197 TB cases among contacts (4.3%)
- Dates of treatment start used to define onset of TB in TB patients and contacts

<table>
<thead>
<tr>
<th>Treatment interval</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; - 30 days</td>
<td>Prior TB</td>
</tr>
<tr>
<td>-30 – 30 days</td>
<td>Co-prevalent TB</td>
</tr>
<tr>
<td>&gt; 30 days</td>
<td>Secondary TB</td>
</tr>
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</table>
Timing of TB Among Contacts By Interval from TB Patient Treatment Start

N=197

- Prior TB (n=28)
- Co-prevalent TB (n=75)
- Secondary TB (n=94)
Timing of TB Among Contacts By Interval from TB Patient Treatment Start

Number of Contact-cases

Time after TB Patient Diagnosis (months)
### Diagnosis of TB Among 4566 Contacts

#### Treatment Interval

<table>
<thead>
<tr>
<th>Interval</th>
<th>Cases</th>
<th>Cumulative %</th>
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</thead>
<tbody>
<tr>
<td>&lt; -30</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td>-30 – 0</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>1 - 30</td>
<td>55</td>
<td>52</td>
</tr>
<tr>
<td>31 – 60</td>
<td>34</td>
<td>72</td>
</tr>
<tr>
<td>61 – 90</td>
<td>19</td>
<td>81</td>
</tr>
<tr>
<td>91 – 180</td>
<td>10</td>
<td>86</td>
</tr>
<tr>
<td>181 – 270</td>
<td>7</td>
<td>90</td>
</tr>
<tr>
<td>271 – 365</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>366 – 730</td>
<td>4</td>
<td>94</td>
</tr>
<tr>
<td>731 - 1096</td>
<td>2</td>
<td>95</td>
</tr>
</tbody>
</table>
## TB Case Rates Among Contacts By Interval From TB Patient Treatment Start

<table>
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<tr>
<th>Interval</th>
<th>Cases</th>
<th>Rate*</th>
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<tr>
<td>-30 – 0</td>
<td>20</td>
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<tr>
<td>181-270</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>271-365</td>
<td>8</td>
<td>2892/10^5</td>
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<tr>
<td>366-730</td>
<td>4</td>
<td>87/10^5</td>
</tr>
<tr>
<td>731-1095</td>
<td>2</td>
<td>43/10^5</td>
</tr>
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*Cases per 10^5 population per year
### Characteristics of Contacts With TB vs. No TB

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<tr>
<th>Characteristic</th>
<th>TB (N=169)</th>
<th>No TB (N=4397)</th>
<th>NNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 5 years</td>
<td>51 (30)</td>
<td>411 (9)*</td>
<td>9</td>
</tr>
<tr>
<td>Household</td>
<td>114 (67)</td>
<td>2726 (62)</td>
<td>25</td>
</tr>
<tr>
<td>Shared bedroom</td>
<td>36 (32)</td>
<td>492 (18)*</td>
<td>15</td>
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<tr>
<td>HIV+</td>
<td>15 (17)</td>
<td>44 (4)*</td>
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<td>Tuberculin skin test +</td>
<td>120 (96)</td>
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<td>Smear+</td>
<td>139 (82)</td>
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<tr>
<td>Cough</td>
<td>152 (90)</td>
<td>3584 (82)</td>
<td>25</td>
</tr>
<tr>
<td>Weight loss</td>
<td>141 (83)</td>
<td>3039 (69)*</td>
<td>23</td>
</tr>
<tr>
<td>Exposure hrs ≥500</td>
<td>102 (60)</td>
<td>1999 (45)*</td>
<td>21</td>
</tr>
<tr>
<td>Smear+ and household</td>
<td>93 (55)</td>
<td>2218 (50)</td>
<td>25</td>
</tr>
</tbody>
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Conclusions

- Contact investigations have a high yield for new cases of TB

- Contact investigations are an important means of detecting co-prevalent and secondary TB cases and placing them on treatment, thus preventing further transmission
Conclusions

• TB case detection rates among exposed contacts were highest in the month following TB patient diagnosis, then fell steadily but remain elevated for at least three years
Conclusions

• 4% of exposed contacts developed TB disease

• 81% of the contact-cases occurred within the first three months after TB patient diagnosis

• 16% of the contact-cases were preventable

• Rates of preventable TB:
  - 1\textsuperscript{st} year: 0.5-1.5%
  - 2\textsuperscript{nd} year: 0.09%
  - 3\textsuperscript{rd} year: 0.04%
Conclusions

• Children < 5 years of age, HIV+ contacts, and contacts with > 2000 total hours of exposure had the highest likelihood of TB

• Contacts with a new TST+ were at greatest risk of developing TB
Conclusions

• These data and further multivariate analyses may be useful to health departments in:
  - prioritizing contact investigations
  - developing risk-based screening algorithms
  - focusing preventive treatment efforts towards contacts at highest risk of developing TB disease
TO2 Investigators and Study Coordinators

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<table>
<thead>
<tr>
<th>Columbia University</th>
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<tr>
<td>Neil Schluger</td>
<td>Tim Sterling (Co-PI)</td>
</tr>
<tr>
<td>Yael Hirsch-Moverman</td>
<td>Tamara Chavez-Lindell</td>
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<td>Joyce Thomas</td>
<td>Fernanda Maruri</td>
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<td>Christina Hirsch</td>
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DTBE, CDC

DTBE Study Personnel and Other Contributors

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Study Design

- **Preventable cases** defined as contact-cases with treatment >30 days after TB patient treatment start with no evidence of TB disease at initial timely evaluation.

- **Possibly preventable cases** defined as contact-cases with treatment > 30 days after TB patient treatment with delayed or no initial evaluation and subsequent abnormal CXR.

- **Not preventable cases** defined as contact-cases with treatment before or < 30 days after TB patient treatment start, or abnormal CXR < 30 days after TB patient treatment start.
Proportion of TB Cases Among Contacts Preventable At Contact Investigation

N = 197

- Not preventable: 121 (61%)
- Possibly preventable: 45 (23%)
- Preventable: 31 (16%)
Conclusions

• These data may be useful to research groups planning clinical trials for TLTBI by providing:

- data on timing and risk of TB among exposed contacts useful for sample size calculations and determining length of follow-up

- data on epidemiologic characteristics of contacts at risk for TB useful for developing enrollment and randomization criteria
TST Screening of 4,566 Contacts

- Completed screening: 3246 (71%)
- Prior TB/TST(+): 216 (5%)
- Not screened: 389 (8%)
- No post-exposure TST: 721 (16%)
TST and Evaluation Results
Among 3,246 Contacts Who Completed Screening

- TST negative 1665 (51%)
- Initial TST positive 1222 (38%)
- TST conversion 200 (6%)
- Active TB 169 (5%)
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</tr>
<tr>
<td>HIV+ or Age &lt; 5</td>
<td>82 (48)</td>
<td>883 (20)*</td>
</tr>
<tr>
<td>HIV+ or Age &lt; 5 or shared</td>
<td>65 (38)</td>
<td>455 (10)*</td>
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<tr>
<td>Cough and weight loss</td>
<td>134 (79)</td>
<td>2638 (60)*</td>
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<tr>
<td>Cough or weight loss</td>
<td>159 (94)</td>
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