TB Contact investigation – the role of pulmonologists?

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Disclosure of speaker’s interests

<table>
<thead>
<tr>
<th>(Potential) conflict of interest</th>
<th>None</th>
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<tbody>
<tr>
<td>Potentially relevant company relationships in connection with event</td>
<td>None</td>
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TB in the Netherlands

- 2018: 806 TB cases (4.8/100,000) in the Netherlands
- Approximately 80% of the TB patients were diagnosed in a hospital

Patients (20%) found by the GGD (Public Health Service of the Municipality):
- 50% - screening protocols for immigrants, asylum seekers, risk groups by the GGD¹
- 50% - contact investigation (CI) concerning TB patients by the GGD¹

¹ Bron: Handboek tuberculose in Nederland 2018
Cl: example of a Somalian family

- Index 10 yrs old schoolgirl
- parents, 3 brothers and 2 sisters
- Diagnosed in a hospital (via general practitioner) because of coughing and malaise
- Coughing for approximately 2-3 months
Example of a Somalian family

- Index 10 yrs old schoolgirl
- 2 parents, 3 brothers and 2 sisters
- Found in a hospital (via general practitioner) because of coughing complaints and malaise
- Coughing for approximately 2-3 months
- Smear positive and PCR positive
- Conclusion: contagious!
Why do we investigate contacts?

1. Because contacts are an important high risk group for tuberculosis and
2. The investigation of contacts is a very effective intervention
   1. To reduce morbidity and fatality due to TB
   2. To arrest further transmission
   3. To contribute to the elimination of TB

A meta-analysis on CI done by Fox et al, showed that in high income countries the TB and LTBI prevalence in close household contacts were resp. 1,4% and 30%*.

What determines the infectiousness of an index patient?

**TABLE 1** Parameters to assess the infectiousness of the index patient

- Anatomical site: pulmonary tuberculosis [54]
- The production of sputum [54]
- Results of sputum smear examination [55]
- Results of sputum culture [55]
- Cavitations [55, 56]
- Coughing [45, 57, 58]


**THE INFECTIOUS PERIOD:** Onset of cough - two weeks Rx or:

1. **smear-positive PTB:** (a maximum of 3 months before diagnosis)
2. **smear-negative, culture positive, PTB:** considered infectious for 1 mo
What determines transmission from index patients to contacts

<table>
<thead>
<tr>
<th>TABLE 10</th>
<th>Degree of exposure</th>
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</table>
| **Intensity of exposure** | Degree of proximity (talking distance) between the contact and the index, if exposure was only outdoors  
Concentration of tubercle bacilli in the ambient indoor air, determined by cough intensity and bacillary load in the sputum  
The volume of air shared and quality of air circulation and ventilation indoors |
| **Duration of exposure** | Cumulative time of contact during the putative period of infectiousness period |
Who should we investigate?
Prioritization of contacts based on degree of exposure

Figure 6.5 The health care worker is conducting a field investigation. She is looking for evidence of other contacts (for example, pictures of others who may live in or visit the house, shoes of others who may live in the house, or toys left by children.

Source: Self-study modules on Tuberculosis
CDC Atlanta, Georgia, USA
### Contact investigation, “ring principle”

Circles related to duration of exposure and proximity

<table>
<thead>
<tr>
<th>Proximity</th>
<th>The exposure site may be compared with*</th>
<th>Estimated volume of de room</th>
<th>Cumulative exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Long</td>
</tr>
<tr>
<td>close</td>
<td>car</td>
<td>&lt; 5 m³</td>
<td>Daily or &gt; 48 hrs</td>
</tr>
<tr>
<td></td>
<td>room</td>
<td>10-30 m³</td>
<td>Weekly or 6-48 hrs</td>
</tr>
<tr>
<td>less close</td>
<td>Classroom / office**</td>
<td>100-200 m³</td>
<td>Casually or 1-6 hrs</td>
</tr>
<tr>
<td></td>
<td>Closed room, larger than a house**</td>
<td>&gt; 200 m³</td>
<td>Rare or &lt; 1 hr</td>
</tr>
</tbody>
</table>

Note: Numbers 1, 2, 3 correspond to the number of circles drawn for each exposure duration and proximity level.
Contact investigation, “ring principle”

Home contacts

Leisure pubs, clubs

work/school environment

1

2

3

Smear + PTB
Exercise: prioritize the contacts
Ms, 10 yrs, smear-positive infiltrative pulmonary tuberculosis
Below the contact list from the patient’s interview

HOME
R1 Household: parents, 5 siblings of 18, 16, 12, 8 and 2 years
R2 Regular visitors: “aunt”
R2 Family/friends: at least →13 adults and children

SCHOOL
R1 Grade 4 and 5 5 days/week;
R2 Lunch Helping the kids in grade 2 (5 year olds)
R3 Teachers
R3 Other kids in school

LEISURE
None

OTHER
None
The concentric circle approach:

Home contacts
- family/relatives/friends/neighbours

Leisure:
- Pubs,
- Sports,
- other

Daily activities:
- School,
- Work,
- other

Parents + 5 siblings
- 13 adults and children

1st/inner

2nd/middle

3rd/outer

PTB smear +

61 lunch schoolkids

55 kids and teachers

206 other schoolkids and teachers
Which contacts have a higher susceptibility for TB disease?

1. Age < 5 yrs, in particular < 2 yrs.

2. Certain clinical conditions e.g. immunocompromised persons or people with certain chronic diseases
Combining risk of exposure and vulnerability into high priority

**TABLE 12**

<table>
<thead>
<tr>
<th>Priority groups of contacts</th>
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<tbody>
<tr>
<td><strong>High-priority contacts</strong></td>
</tr>
<tr>
<td>First-circle contacts at increased risk of developing tuberculosis following infection</td>
</tr>
<tr>
<td>Other first-circle contacts</td>
</tr>
<tr>
<td>Second-circle contacts at increased risk of developing tuberculosis following infection</td>
</tr>
<tr>
<td><strong>Medium-priority contacts</strong></td>
</tr>
<tr>
<td>Second-circle contacts</td>
</tr>
<tr>
<td>Third-circle contacts at increased risk of developing tuberculosis following infection</td>
</tr>
<tr>
<td><strong>Low-priority contacts</strong></td>
</tr>
<tr>
<td>Third-circle contacts or outer circle</td>
</tr>
</tbody>
</table>
CI of the Somalian family (1)

What exactly needs to be done?
Ring 1 contacts: - skintest (PPD)
(as soon as possible) - X-ray thorax

Ring 2 contacts based on the findings in the first round etc
CI of the Somalian family (2)

CI of the close household contact
Ring 1: family (householdcontacts) of the index
- Two sisters (12 and 2 yrs old) had abnormalities on the x-ray
- They others had normal X-rays
CI of the Somalian family (3)

Ring 1: family (household contacts) of the index
- Two sisters (12 and 2 yrs old) at the same time diagnosed with lymph node and pulmonal TB (smear neg, pos cultures)
- Rest of the family (parents and 3 brothers): (5x) LTBI
Cl of Somalian family (4)

- Cl of the close household contact
- Ring 1: family
  - 2 sisters with TB; parents and 3 brothers with LTBI
- Ring 1: children from the same group at school and the teachers
  - 2 children with TB and 9 with LTBI
CI of Somalian family (5)

- Ring 1: family
  - 2 sisters with TB; parents and 3 brothers with LTBI
- Ring 1: children from the same group at school and the teachers
  - 2 children with TB and 9 with LTBI
- Ring 2: Group of 5 yrs old the index helped with lunch
  - 1 LTBI
- Ring 2: the friends/other family members
  - 3 LTBI
- Ring 3: other kids and teachers at school
  - 1 LTBI
The concentric circle approach:

Home contacts
family/relatives/friends/neighbors

Leisure:
- Pubs,
- Sports,
- other

Daily activities:
- School,
- Work,
- other

PTB smear +

Class: 2 TB and 9 LTBI
1st/inner

Friends: 3 LTBI

Lunchgroup: 1 LTBI

2nd/middle

Other schoolkids: 1 LTBI

3rd/outer

5 LTBI + 2TB

5 L TBI + 2 TB

2 L TBI

1 L TBI

1 L TBI
Found by chance:

Home contacts
family/relatives/friends/neighbours

Friend of sister 1tb

Neighbour child 1TB

Leisure:
Pubs,
Sports,
other

PTB smear +

1st/inner

2nd/middle

3rd/outer

Daily activities:
School,
Work,
other
CI of Somalian family (6)

FINAL RESULTS
- Ring 1: Family 2 TB and 5 LTBI
- Outcomes at school:
  - Ring 1: Classmates of index: 55 children → 2 active TB and 9 with LTBI
  - Ring 2: Lunchgroup of index 37 children → 1 LTBI
  - Ring 3: other schoolchildren 206 → 1 LTBI
- Apart from the school other people were infected as well:
  - Ring 2: friends → 3 LTBI
  - 2017-4: a girl (16 yrs) → active TB (pulmonary) with same WGS (VNTR)
  - 2017-6: a girl (2 yrs) → active meningitis and pulmonary TB with same WGS
- In total:
  - CI of 334 people: outcome
    - 6 TBC (all linked to the index)
    - 19 LTBI
The role of the pulmonologist

- Speed of notification is important, especially
  - When children < 5yrs
  - When immunocompromised people are close to the index

- Postmortem cases where TB was found, the GGD need to be notified as well.

- When people are referred to the hospital for TB diagnostics and the person does not show up anymore, especially when small children or vulnerable people are involved, the GGD needs to be notified even if no TB has been diagnosed yet.

- Basically: treat the patient and be aware of the consequences of a contagious TB patient i.e. small children and immunocompromised persons and use the GGD as much as you can.
Thank you!

Questions?

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