

VII. CASE FINDING AND CONTACT INVESTIGATION

MODULE OUTLINE

1. Standards of Public Health Practice
 2. Principles of a Contact Investigation
 - a. Factors Affecting Transmission
 3. Initiating a Contact Investigation
 - a. Determining the Infectious Period
 - b. Prioritization of Contacts
 4. Timeframes
 5. Contact Investigations in Congregate Settings
 - a. Correctional Facilities
 - b. Educational Settings
 - c. Shelters
 - d. Hospital/Other Medical Facilities
 6. Source Case Investigations
 7. Expanding a Contact Investigation
 8. Identification and Evaluation of Exposed Travelers
 9. Evaluation and Treatment of Contacts
 - a. Evaluation of Contacts
 - b. Window Therapy
-

1. STANDARDS OF PUBLIC HEALTH PRACTICE

- VII-1. The regional/metro TB case manager ensures the contact investigation is completed with all required documentation.
- VII-2. A contact investigation is initiated for each patient with suspected or confirmed pulmonary, laryngeal or pleural TB disease, and continues until pulmonary and laryngeal TB disease is ruled out.
- VII-3. A source case investigation is conducted for patients <18 years of age with suspected or confirmed TB disease.
- VII-4. Contact investigation data are reviewed weekly to analyze the results, and to focus and prioritize contact investigation activities.
- VII-5. For each patient with suspected or confirmed TB disease, the infectious period is documented on the contact investigation forms.
- VII-6. Environmental assessments of sites of potential TB exposure are documented on the contact investigation forms.
- VII-7. Contacts to patients with suspected or confirmed TB disease are prioritized and evaluated in accordance with the TTBE Manual.
- VII-8. Contacts <5 years of age with known TB exposure are fully evaluated and treated by “window therapy” in accordance with the TTBE Manual.

2. PRINCIPLES OF A CONTACT INVESTIGATION

The primary goals of contact investigations are to:

- Identify persons who were exposed to an infectious case of TB disease to ensure that these contacts receive prompt evaluation
- Find and treat additional TB disease cases (potentially interrupting further transmission)
- Find and treat persons with TB infection (TBI) to prevent future cases
- Prevent and respond to TB outbreaks

Factors Affecting Transmission

Tables VII-1 through VII-5 outline various clinical and environmental factors that affect the transmission of *M. tuberculosis*.

Table VII-1: Factors that Determine the Probability of *M. tuberculosis* Transmission

Factor	Description
Susceptibility	Susceptibility (immune status) of the exposed individual
Infectiousness	Infectiousness of the person with TB disease is directly related to the number of tubercle bacilli that he/she expels into the air. Persons who expel many tubercle bacilli are more infectious than patients who expel few or no bacilli
Environment	Environmental factors that affect the concentration of <i>M. tuberculosis</i> organisms
Exposure	Proximity, frequency, and duration of exposure

Table VII-2: Characteristics of a Patient with TB Disease that are Associated with Infectiousness

Factor	Description
Clinical	<ul style="list-style-type: none"> • Presence of a cough lasting ≥ 2-3 weeks • Respiratory tract disease, especially with involvement of the larynx • Failure to cover the mouth and nose when coughing • Inappropriate or inadequate treatment
Procedure	<ul style="list-style-type: none"> • Undergoing cough-inducing or aerosol-generating procedures (e.g., bronchoscopy, sputum induction, administration of aerosolized medications)
Radiographic and laboratory	<ul style="list-style-type: none"> • Cavitation on chest radiograph • Positive culture for <i>M. tuberculosis</i> • Positive AFB sputum smear results

Table VII-3: Likelihood of Disease Transmission

Person		
Clinical Data	Higher	Lower
TB disease location	Laryngeal, pulmonary or pleural	Extrapulmonary
Sputum smear status	Positive	Negative
Smear source	Spontaneous	Induced or clinical
Chest X-ray	Cavitary	Non-cavitary
Symptoms	Coughing or sneezing	No cough or sneezing
Place		
Environmental Factor	Higher	Lower
Volume of air common to case and contacts	Small	Large
Adequacy of ventilation	Poor	Good
Recirculated air	Yes	No
Upper room ultraviolet (UV) light	Not present	Present

Table VII-4: Proximity and Length of Exposure Factors that can Affect Transmission of *M. tuberculosis*

Factor	Description
Duration of exposure to a person with infectious TB	The longer the duration of exposure, the higher the risk for transmission
Frequency of exposure to infectious person	The more frequent the exposure, the higher the risk of transmission
Physical proximity to infectious person	The closer the proximity, the higher the risk of transmission

Table VII-5: Environmental Factors that Enhance the Probability that *M. tuberculosis* will be Transmitted

Factor	Description
Concentration of infectious droplet nuclei	The more droplet nuclei in the air, the more probable that <i>M. tb</i> will be transmitted
Space	Exposure in small, enclosed spaces
Ventilation	Inadequate local or general ventilation that results in insufficient dilution or removal of infectious droplet nuclei
Air circulation	Recirculation of air containing infectious droplet nuclei
Specimen handling	Improper specimen handling procedures that generate infectious droplet nuclei
Air pressure	Positive air pressure in infectious patient's room that causes <i>M. tuberculosis</i> organisms to flow to other areas

Reference for Table VII-1, Table VII-2, Table VII-3, Table VII-4 and Table VII-5:

1. CDC. Core Curriculum on Tuberculosis: What the Clinician Should Know. 2013.
http://www.cdc.gov/tb/education/corecurr/pdf/corecurr_all.pdf

3. INITIATING A CONTACT INVESTIGATION

A contact investigation is initiated for each patient with suspected or confirmed pulmonary, laryngeal or pleural TB disease and continues until pulmonary and laryngeal TB disease is ruled out (**Standard of Public Health Practice VII-2**). Pleural disease is categorized with pulmonary disease because sputum cultures can yield *Mycobacterium tuberculosis* even when no lung abnormalities are apparent on a chest radiograph. If acid-fast bacilli are not detected by microscopy of three (3) sputum smears, an investigation is still recommended if the chest X-ray (CXR) or computerized tomography (CT) indicates the presence of cavities in the lung. A positive result from an approved nucleic acid amplification test (NAAT) supports a decision to initiate the highest priority. However, even if these conditions are not present, contact investigations should be considered if a CXR or CT is consistent with pulmonary TB.

The region/metro TB case manager will initiate a contact investigation upon notification of first abnormal report consistent with TB, including positive labs (positive AFB smear, positive nucleic acid amplification test [NAAT], positive AFB culture or a report(s) of persons with suspected or confirmed TB disease from a local physician or facility. **Figure VII-1** outlines the decision-making process for initiating a contact investigation.

The process of performing a TB contact investigation is the same whether a case is drug resistant or not, and includes:

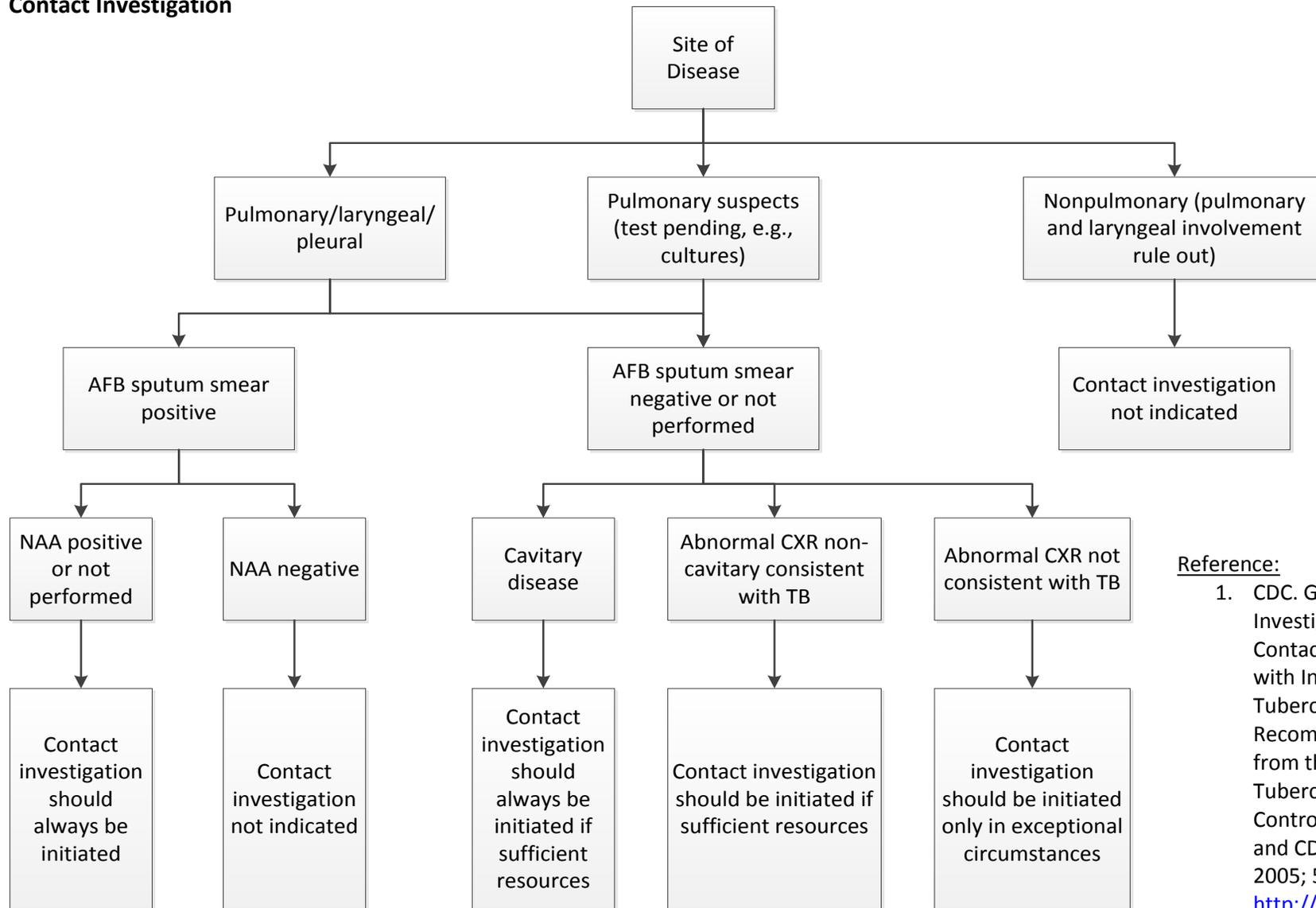
- Review of the index case's medical history and history of present illness
- Interview of the case to identify contacts
- Performance of a field investigation
- Risk assessment for TB transmission
- Prioritization of contacts for evaluation
- Evaluation of contacts
- Provision of treatment of TBI and essential follow-up of contacts
- Evaluation of contact investigation outcomes and decision of whether to expand the investigation

Contact investigation data are reviewed weekly to analyze the results, and to focus and prioritize contact investigation activities (**Standard of Public Health Practice VII-4**). The TB case manager should ensure that weekly TB team discussions/meetings are held to ensure that all contact investigation activities are being performed according to the TTBE program requirements. The regional/metro TB case manager ensures the contact investigation is completed with all required documentation (**Standard of Public Health Practice VII-1**) (**Refer to Appendix J and Appendix K for TTBE contact investigation forms and instructions**).

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)
2. CDC. Self-Study Modules on Tuberculosis. 2014. <http://www.cdc.gov/tb/education/ssmodules/pdfs/Module8.pdf>

Figure VII-1: Decision to Initiate a TB Contact Investigation



Reference:
 1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

Determining the Infectious Period

The TB physician and TB case manager will determine an infectious period for each patient with suspected or confirmed TB disease and document this infectious period on the contact investigation form (**Standard of Public Health Practice VII-5**). At any point during the contact investigation, the infectious period may be revised as more information becomes available.

Table VII-6 and **Figure VII-2** provide guidelines for estimating the infectious period based on characteristics of the index case.

Table VII-6: Guidelines for Estimating the Infectious Period of a TB Case

Index Case Characteristic			Recommended Minimum Beginning of Likely Period of Infectiousness
TB Symptoms	AFB Sputum Smear Positive	Cavitary Chest Radiograph	
Yes	No	No	Three (3) months before symptoms onset or first positive finding (e.g., abnormal chest radiograph) consistent with TB disease, whichever is longer
Yes	Yes	Yes	Three (3) to six (6) months before symptom onset or first positive finding consistent with TB disease, whichever is longer
No	No	No	Four (4) weeks before date of suspected diagnosis
No	Yes	Yes	Three (3) to six (6) months before first positive finding consistent with TB

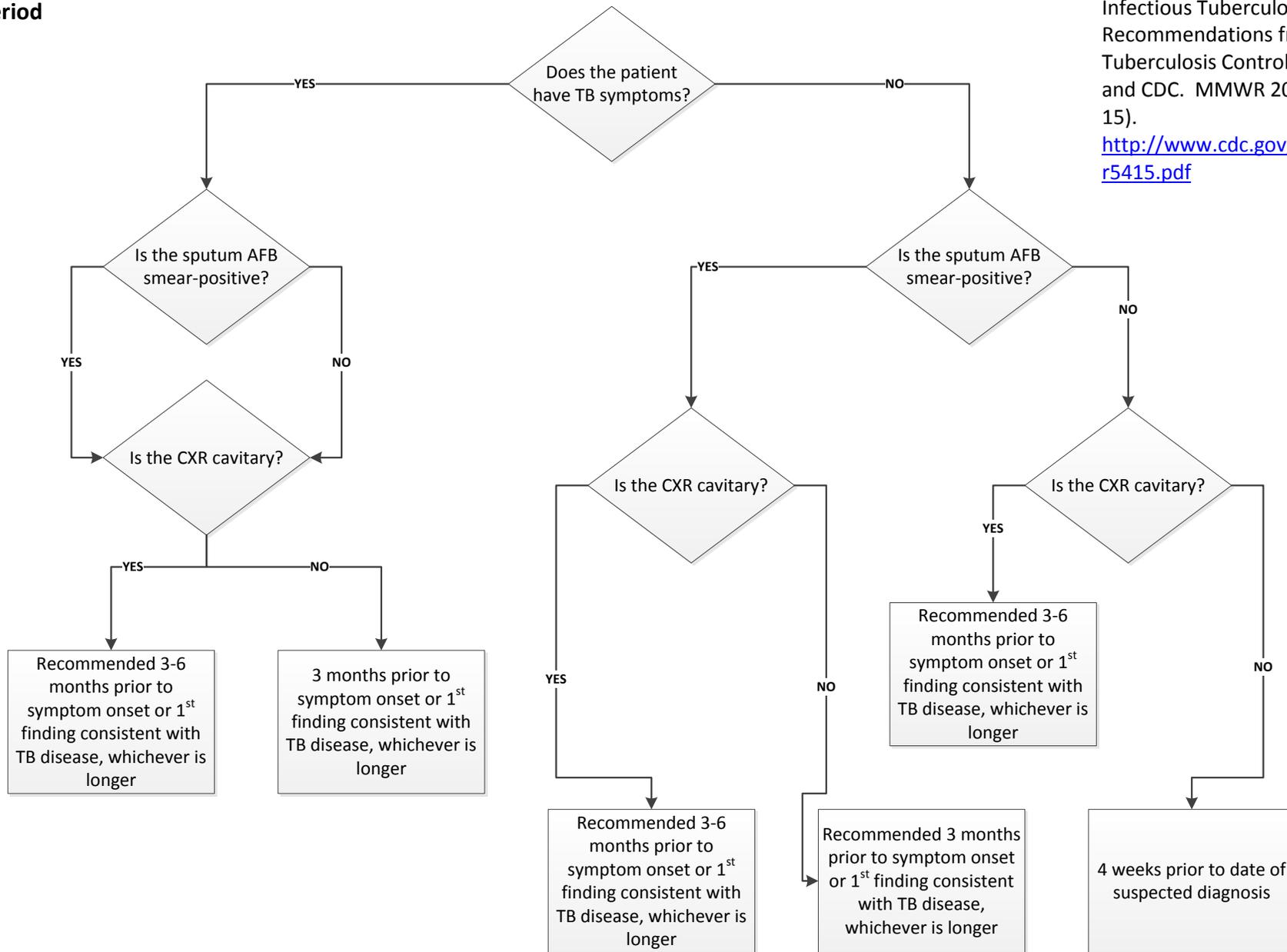
Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/r5415.pdf>

Figure VII-2: Establishing the Infectious Period

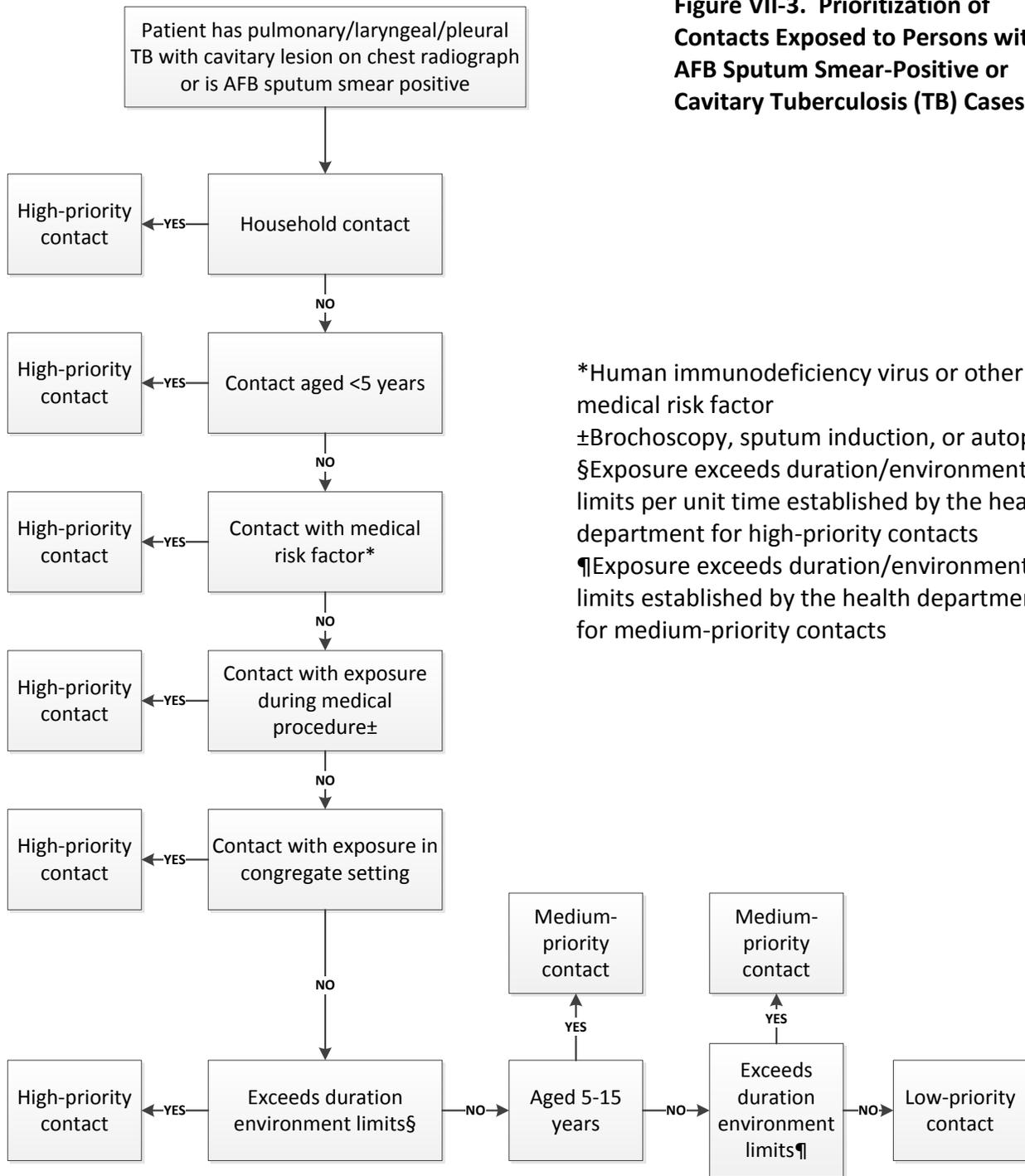


Prioritization of Contacts

Priorities for contact investigation are determined on the basis of the characteristics of the index patient, susceptibility and vulnerability of contacts, and circumstances of the exposures. Any contact that is not classified as “high” or “medium” priority is assigned a “low” priority. Contacts to patients with suspected or confirmed TB disease are prioritized and evaluated in accordance with this manual (**Standard of Public Health Practice VII-7**).

Figures VII-3 through **VII-5** shows prioritization of contacts:

Figure VII-3. Prioritization of Contacts Exposed to Persons with AFB Sputum Smear-Positive or Cavitory Tuberculosis (TB) Cases



*Human immunodeficiency virus or other medical risk factor
 ±Brochoscopy, sputum induction, or autopsy
 §Exposure exceeds duration/environment limits per unit time established by the health department for high-priority contacts
 ¶Exposure exceeds duration/environment limits established by the health department for medium-priority contacts

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

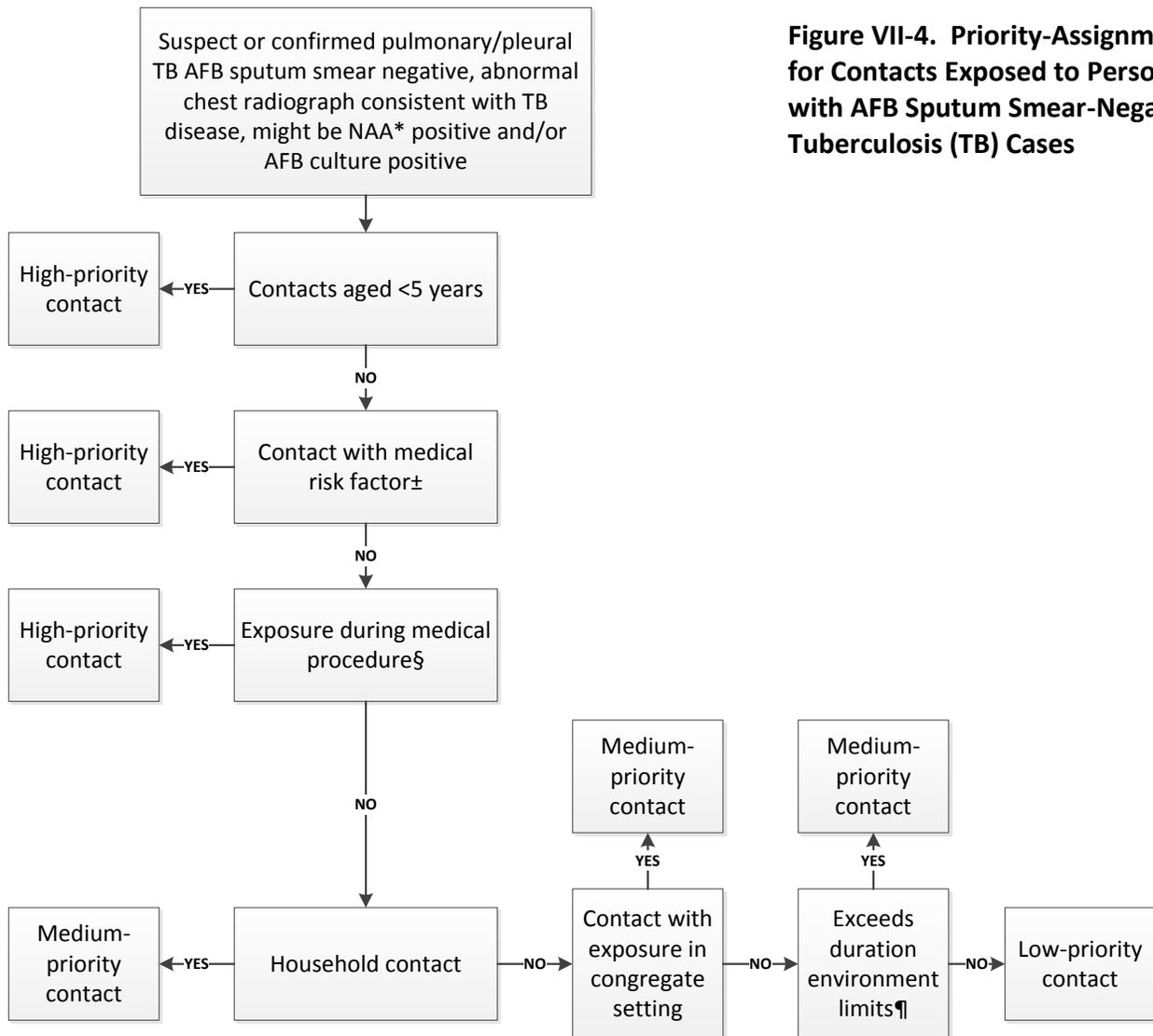


Figure VII-4. Priority-Assignment for Contacts Exposed to Persons with AFB Sputum Smear-Negative Tuberculosis (TB) Cases

*Nucleic acid assay

±Human immunodeficiency virus or other medical risk factor

§Bronchoscopy, sputum induction, or autopsy

¶Exposure exceeds duration/environment limits per unit time established by local TB control program for medium-priority contacts

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

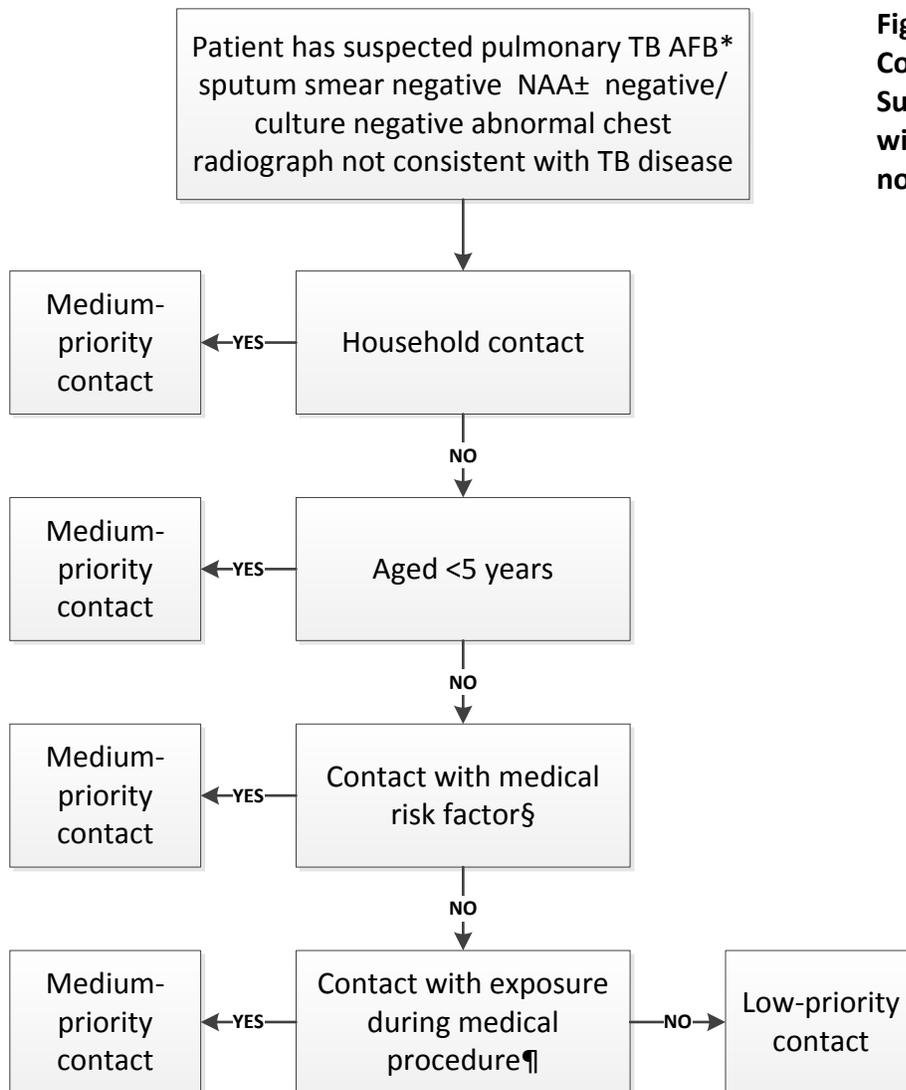


Figure VII-5. Prioritization of Contacts Exposed to Persons with Suspected Tuberculosis (TB) Cases with Abnormal Chest Radiographs not Consistent with TB Disease

*Acid-fast bacilli

±Nucleic acid assay

§Human immunodeficiency virus infection or other medical risk factor

¶ Bronchoscopy, sputum induction, or autopsy

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

4. TIMEFRAMES

Table VII-7 outlines timeframes for investigating the index patient and sites of transmission

Table VII-7: Timeframes for Investigating the Index Patient and Sites of Transmission

Activity	Suspects with Indications of Infectiousness (AFB Smear+ and/or Cavitory CXR)	Suspects without Indications of Infectiousness (AFB Smear- and Non-Cavitory on CXR)
First Index Patient Interview Number of days following notification within which the index patient should be interviewed in person (i.e., not by phone)	≤ 1 business day of reporting	≤ 3 business days of reporting
Residence Visit Number of days following the first index patient interview within which the place of residence of the index patient should be visited	≤ 3 business days after the first interview	≤ 3 business days after the first interview
Field Investigation Number of days following initiation of the contact investigation within which all potential settings for transmission should be visited	≤ 5 business days after the start of the investigation (<3 days from the initial interview)	≤ 5 business days after the start of the investigation
Index Patient Re-Interviews Length of time after the first interview within which the index patient should be re-interviewed one or more times for clarification and additional information	1 or 2 weeks after the first interview	1 or two weeks after the first interview
Reassessment of the Index Patient Information about the index patient should be reassessed at least weekly until drug-susceptibility results are available for the <i>Mycobacterium tuberculosis</i> isolate or for two (2) months following notification, whichever is longer.		

References:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

2. CDC. Guidelines for Using the QuantiFERON[®]-TB Gold Test for Detecting *Mycobacterium tuberculosis* Infection, United States. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

Tables VII-8 and VII-9 outline contact investigation timelines and activities.

Table VII-8: Contact Investigation Timelines for Screening Testing and Evaluation of Contacts

Category	Timeframe	Process
All contacts	≤3 working days from listing as a <u>contact</u>	Initial face-to-face assessment of contact to determine his/her health status, risk, priority status and to start the TB screening process
	3 months from initiation of contact investigation	Completion of second round evaluations of high-risk and medium-risk contacts and completion of TST or IGRA on low-risk contacts should be complete. The regional or metro TB case manager will review for completeness.
High-Risk Contacts	≤7 working days of being listed as a high-risk contact (index case or suspect: AFB smear+ or cavitory disease on CXR)	TB screening complete including TST reading or IGRA result
	≤5 working days from completed screening of high-risk contact (index case: AFB smear positive or cavitory disease on CXR)	Medical evaluation for TB should be complete including medical exam and chest X-ray
	≤7 working days of being listed as a high-risk contact (index case: AFB smear negative)	TB screening complete including TST reading or IGRA result
	≤10 working days from completed screening of high-risk (index case: AFB smear negative)	Medical evaluation for TB complete including medical exam and chest X-ray
Medium-Risk Contacts	≤14 working days of being listed as a medium-risk contact (regardless of AFB sputum smear or culture result of index case)	TB screening complete including TST reading or IGRA result
	≤10 working days from completed screening of medium-risk contact (regardless of AFB sputum smear or culture result of index case)	Medical evaluation for TB complete including medical exam and chest X-ray
	≤30 days (1 month) from initiation of the contact investigation	Initial CI should be complete. The regional/metro TB case manager will determine whether to expand the investigation or not

Category	Timeframe	Process
High and Medium-risk Contacts	8-10 weeks from date of last exposure to infectious index case (high-risk and medium-risk contacts)	Start second round of TST or IGRA and assessment of high-risk and medium-risk contacts
Low-risk Contacts	8-10 weeks from date of last exposure to infectious index case (low-risk contacts)	Low-risk contact need only one TST or IGRA

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

Table VII-9: Overview of Ongoing Case Management Activities and Maximum Timeframes

Activity	Purpose	Maximum Time Interval
Review all documentation	To ensure that contact list is complete	Ongoing
Review and assess completeness of each contact's medical follow-up and treatment plan	To ensure appropriate and complete medical follow-up	5 business days after each contact's medical evaluation is completed
Review and assess the timeliness of initiating the treatment plan	To avoid delays in treatment initiation, particularly in high-risk contacts	10 business days after each contact's medical evaluation is completed (disposition as TBI/TB disease or test results pending)
Determine if transmission occurred	To decide whether to expand contact investigation	At completion of follow-up testing or if secondary cases are identified
Obtain and review drug-susceptibility results	To determine if contacts are receiving appropriate treatment for TBI	1-2 months after the index patient's initial sputum collection date
Repeat TST or IGRA if contact is initially TST- or IGRA-negative	To determine if contact has converted TST or IGRA	8-10 weeks after each contact's initial TST or IGRA or last exposure to the index patient
Re-evaluate contacts who were initially TST or IGRA-negative and started on window period treatment	To determine if treatment for TBI should be continued	8-10 weeks after each contact's initial TST or IGRA or last exposure to the index patient before the end of the infectious period*

Activity	Purpose	Maximum Time Interval
Assess contact's adherence with medical follow-up and TB medication	To remove barriers and ensure timely and complete evaluation and follow-up	At least monthly, at the time of each visit
Ensure contacts are monitored for adverse reactions and toxicity of TBI treatment regimens	To prevent development of adverse effects and toxicity from drug regimens	Monthly (and more frequently if needed) while on treatment for TBI
Evaluate problems and concerns that arise and may delay or hamper the contact investigation	To remove barriers and ensure timely and complete evaluation and follow-up	Whenever problems are identified
Collect and analyze data to evaluate the contact investigation	To provide epidemiologic analysis of investigations and to measure performance using indicators that reflect performance objectives	Ongoing
Collect data to complete the Aggregate Reports for Program Evaluation (ARPE) form (Refer to Appendix L)	To report on investigation to the Centers for Disease Control and Prevention (CDC)	Ongoing

*In rare circumstances, an infectious index patient with advanced disease can remain infectious for several months. In these circumstances, the second TST/IGRA for negative contacts should be performed within the usual timeframe (8-10 weeks). This will identify any contacts who have already converted so they can be evaluated for treatment. However, any household members who remain TST/IGRA-negative and have continued exposure to the index patient should have a 3rd TST/IGRA 8-10 weeks after the index patient becomes noninfectious. This is especially true for contacts who are infants in a household where a resident is culture-positive after three (3) months or has multidrug-resistant TB (MDR-TB).

Reference:

1. California Department of Health Services (CDHS)/California Tuberculosis Controllers Association (CTCA). Contact Investigation Guidelines. CDHS/CTCA Joint Guidelines, November 12, 1998:18 (adapted).

The following cases of **non-cavitary** pulmonary TB may not require a complete contact investigation:

- Smear and culture negative pulmonary TB
- Smear and culture negative clinical case of pulmonary TB
- Smear and culture negative provider-verified case of pulmonary TB

For these cases, the contact investigation may be closed when all final smear and culture results are available and after the following have occurred:

- High-priority/high-risk contacts have been fully evaluated for TBI and TB disease has been ruled out
- Household contacts have been fully evaluated for TBI and TB disease has been ruled out
- All known site visits have been completed with appropriate follow-up
- There are no findings of transmission or positive TB tests among the contacts

The case manager must ensure that a summary of the findings leading to the decision to close the contact investigation is documented on the contact investigation forms.

Field Investigations (Site Visits)

Contacts cannot be correctly prioritized until the TB case manager has made a field visit to each site where the index patient spent time during his/her infectious period. Environmental assessments of sites of potential exposure are documented on the contact investigation forms (**Standard of Public Health Practice VII-6**). Site visits provide the case manager with information regarding:

- Factors that increase the probability of transmission of *M. tuberculosis*
 - Environmental factors:
 - Exposure to TB disease in small, enclosed space (e.g., floor plan or drawing, square footage and ceiling height of exposure places)
 - 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
 - Distance between contact and index case
 - Length of time contacts spent with the index case

Probable exposure occurs when contacts are within a 15 feet radius of the index case for 12 or more hours (during the infectious period).

The TB case manager is to ensure that documentation for each site visit is fully completed on the contact investigation forms (**Refer to Appendix J**).

References:

1. CDC. Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005. MMWR 2005; 54 (No. RR-17).
<http://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf>
2. CDC. Core Curriculum on Tuberculosis: What the Clinician Should Know. 2013.
http://www.cdc.gov/tb/education/corecurr/pdf/corecurr_all.pdf

5. CONTACT INVESTIGATIONS IN CONGREGATE SETTINGS

The ultimate goal of the contact investigation in a congregate setting (CICS) is to stop transmission of TB in that setting and in the community, and to educate both the identified contacts and the concerned public in a planned, well-organized manner.

The regional/metro TB program manager should notify the TTBE Central Office (C.O.) in advance of any contact investigation in a congregate setting in order to anticipate media coverage that may be directed to the Tennessee Department of Health (TDH). Such notification is particularly important if a contact investigation may be needed in a state prison in any public health jurisdiction.

The following 9 areas of activity will ensure a successful CICS:

1. Assessment of the need for a CICS
2. Interaction with the presenting patient
3. Interaction with congregate setting management staff
4. On-site assessment of congregate setting
5. Identification of high-priority contacts
6. Notification and testing of high-priority contacts
7. Education for management, high-priority contacts, and all those associated with the congregate setting
8. Expansion of investigation, as needed
9. Closure of investigation

Reference:

1. New Jersey Medical School Global Tuberculosis Institute. Tuberculosis Contact Investigations in Congregate Settings: A Resource for Evaluation. 2004.
<http://globaltb.njms.rutgers.edu/downloads/products/Contact%20Investigations.pdf>
(adapted)

Correctional Facilities

The best preparation for conducting contact investigations in jails and prisons is creating formal collaboration between the correctional facility and the health department before a contact investigation is needed. Investigations in jails can be especially challenging because of rapid turnover of inmates and crowding. The number of contacts who had close proximity to an index patient/inmate can be great, and yet brief. Unless tracking records for inmates who were in a confined space with an infectious TB patient allow a determination that aggregate exposure was brief (e.g., **<8 hours**), these contacts should be assigned **high-priority**. High-priority contacts that are transferred, released, or paroled from a correctional facility before medical evaluation for TB will be traced by the health department. Contact investigations at juvenile detention centers and adult education systems should be managed along the same lines as investigations conducted in correctional settings.

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf>

The regional TB program manager will ensure the following:

1. Prison warden or sheriff/jail supervisor is notified of the need for a planned meeting to discuss and begin evaluating for the possibility of exposure; TTBEP recommends that the contact from the prison or jail originate from the regional health officer.
2. Request the tracking records for the location(s) of inmates to:
 - a. Determine potential contacts,
 - b. Estimate exposure periods, and
 - c. Assign priorities to contacts
3. Make a site visit at the prison or jail to check exposure sites within each setting to estimate exposure intensity
4. Establish an investigation plan for:
 - a. Screening and testing of contacts
 - b. Clinical evaluation, including CXR for persons with a positive IGRA
 - c. Treatment after exposure to TB
5. Provide education sessions for employees, inmates, and visitors at the facility
6. Conduct the contact investigation in jail or prison (**Refer to Appendix M Site Visit Worksheet**)
7. Data management and evaluation of the contact investigation

Educational Settings

Educational settings include:

- Child care centers
- Preschools
- Primary through secondary schools
- Vocational schools
- Colleges or universities

Early collaboration with school officials and community members is essential when considering an investigation related to a school, even if preliminary information suggests that an investigation may not be necessary. The presence of TB in schools often generates publicity; therefore the health department should be proactive in communicating favorable, accurate information to the school and parents/guardians. Maintaining confidentiality is challenging; issues of consent, assent, and disclosure of information are more complex for minors.

The regional TB program manager will ensure the following:

1. School superintendent and/or the school principal are notified of the need for a planned meeting to discuss and begin evaluating for the possibility of TB exposure; TTBEP

recommends that the initial contact with the school system or school originate from the regional health officer.

2. Request classroom assignment records to:
 - a. Determine potential contacts,
 - b. Estimate exposure periods, and
 - c. Assign priorities to contacts
3. Make a site visit at the school to:
 - a. Check indoor spaces,
 - b. Observe general conditions, and
 - c. Interview maintenance personnel regarding ventilation.
4. Establish an investigation plan for:
 - a. Screening and testing of contacts
 - b. Clinical evaluation, including CXR for persons with positive TST or IGRA
 - c. Treatment after exposure to TB
5. Provide education sessions for school employees, parents, and students of the school
6. Conduct the contact investigation at the school (**Refer to Appendix M Site Visit Worksheet**)
7. Data management and evaluation of the contact investigation

School breaks, vacations, graduations, and transfers disrupt the contact investigation. In collaboration with school officials, the health department can notify, by mail, students and other contacts that will be unavailable at the school. These contacts should be referred for evaluation at the health department.

Shelters

The challenges that can be anticipated for a contact investigation involving a homeless TB patient include:

- Difficulty locating the patient and contacts if they are mobile
- Episodic incarceration
- Migration from one jurisdiction to another
- Psychiatric illnesses (including chemical dependency disorders)
- Pre-existing medical conditions (i.e., HIV, hepatitis B, diabetes, etc.)

When names or locations of specific contacts are unknown, interview with the patient and potential contacts should focus on social networks and settings, including correctional facilities.

The regional TB program manager will ensure the following:

1. Shelter Director is notified of the need for a planned meeting to discuss and begin evaluating for the possibility of TB exposure; TTBEF recommends that the initial contact with the shelter direct originate from the regional health officer.
2. Request the bed/cot assignment(s) or sign-in lists to:
 - a. Determine potential contacts. The proximity and duration of overlap should be estimated as closely as possible for selecting high-priority contacts. Certain

- daytime use settings keep sign-in lists, but these might lack information regarding overlap of visits
- b. Estimate exposure periods, and
 - c. Assign priorities for contacts
3. Make a site visit to the shelter to check exposure sites within each setting to estimate exposure intensity
 4. Establish an investigation plan for:
 - a. Screening and testing of contacts
 - b. Clinical evaluation, including CXR for persons with positive IGRA
 - c. Treatment after exposure to TB
 5. Provide education sessions for employees, volunteers, and visitors at the shelter
 6. Conduct the contact investigation at the shelter (**Refer to Appendix M Site Visit Worksheet**)
 7. Data management and evaluation of the contact investigation

Hospitals/Other Medical Facilities

Transmission of *M. tuberculosis* is a risk in health-care settings. The magnitude of risk varies by:

- Setting
- Occupational group
- Prevalence of TB in the community
- Patient population
- Effectiveness of TB infection-control measures

Medical facilities will have an infection control plan (ICP). As part of the ICP, the facility will complete a Tuberculosis (TB) Risk Assessment Worksheet per CDC recommendations to determine the need for a TB testing program for HCW's and the frequency of testing, regardless of the likelihood of encountering persons with TB disease.

Reference:

1. CDC. Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005. MMWR 2005; 54 (No. RR-17). Appendix B.
<http://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf>

The health department is responsible for notifying the hospital or medical facility of any person with suspected or confirmed TB disease for contact investigation within the facility (staff, patients, visitors, etc.). Most hospitals will have employee health nurses or infection control preventionists that will perform screening and testing of potential contacts within the facility. However, if the facility is unable to perform necessary screening and testing of contacts, for any reason, the health department is ultimately responsible to provide this service.

If a facility chooses to perform their own contact investigation, aggregate data should be provided back to the regional TB program in the form of an ARPE report (**Refer to Appendix L**). The health department is then responsible for incorporating these aggregate numbers into the ARPE report for the individual TB case.

6. SOURCE CASE INVESTIGATIONS

A source case investigation is conducted for patients <18 years of age with suspected or confirmed TB disease (**Standard of Public Health Practice VII-3**).

Utilizing the concentric circle (**Refer to <http://www.cdc.gov/tb/education/ssmodules/pdfs/6.pdf>**) of epidemiological investigation, begin by examining the closest associates (individuals who have had the closest contact) to the child, expanding the circle only if it clearly appears a course of infection must be close by and yet unidentified.

In a source case investigation of a child **<5 years of age** who has TB disease and attends preschool or child care, all adults in these settings need to be screened if the source case has not been located in the family or household contacts.

7. EXPANDING A CONTACT INVESTIGATION

The extent of contact investigations will be determined utilizing the concentric circle approach (**Refer to <http://www.cdc.gov/tb/education/ssmodules/pdfs/6.pdf>**). When determining whether to expand the contact investigation (CI), consideration of the following factors is recommended:

- Extent of recent transmission, as evidenced by:
 - Unexpectedly high rate of infection or TB disease in high-priority contacts (e.g., $\geq 10\%$),
 - Evidence of secondary transmission (i.e., additional TB cases who developed TB disease as a result of contact to an index patient),
 - TB disease in any contacts who had been assigned a low priority,
 - Infection of contacts aged <5 years, and
 - Contacts with change in TST or IGRA status from negative to positive between their first and second test.

In the absence of evidence of recent transmission, an investigation should not be expanded to lower priority contacts. As in the initial investigation, results should be reviewed at least weekly so the strategy can be reassessed.

At times, results from an investigation indicate a need for expansion that available resources do not permit. In these situations, the regional/metro program manager should seek consultation and assistance from the TTBE CO. Consultation offers:

- An objective review of strategy and results,
- Additional expertise, and
- A potential opportunity to obtain personnel or funds for meeting unmet needs.

8. IDENTIFICATION AND EVALUATION OF EXPOSED TRAVELERS

When it is determined that a patient with suspected or confirmed TB disease has traveled by plane during the infectious period, the Atlanta Quarantine Station will need to be notified by

the TTBEPC.O. In order for the Atlanta Quarantine Station to start a case for this patient and provide recommendations, the following information must be obtained by the TB case manager and forwarded to the TTBEPC.O.:

- Patient demographic information
 - name
 - date of birth
 - gender
 - address
 - phone number
- Place of birth/origin
- Immigration status
- Passport #
- Driver's license #
- History of present illness
 - List of symptoms
 - When symptoms began
 - When they were diagnosed with TB
- Dates and results of all sputum smears, cultures, DSTs, PCR/NAAT to date
- Did the patient ever have a TST or IGRA? If yes, provide results
- All radiological reports done to date
- Confirm RIPE TB meds start date
- Do they have MDR-TB or are they in contact of anyone with MDR-TB?
- Has patient been treated for TB previously? If so, when and where?
- Has patient been compliant with:
 - TB treatment
 - Public health recommendations to self-isolate
- Does the Health Department believe that the patient will travel in the near future?

If the Centers for Disease Control and Prevention (CDC) receives notification that a TB case or suspect has traveled via any mode of transportation for >8 hours, a contact investigation is initiated. If any of the potential contacts identified are residents of Tennessee, TTBEPC.O. staff are notified. The information on the contact(s) will be sent via secure email or fax to the regional TB program. The regional TB program will then attempt to contact the exposed person(s) and schedule a clinic visit for a full evaluation that includes:

- Administration of a TB Risk Assessment Tool (TB RAT)
- TST (if contact <5 years or age) or IGRA
- Chest X-ray (if applicable)
- Sputum collection (if applicable)

NOTE: TST or IGRA should be repeated at 8-10 weeks post-exposure

The TTBE C.O. will also email/fax an Outcome Reporting Form to the regional TB program that must be completed and returned to TTBE C.O. via email/fax upon completion of the evaluation and disposition of the contact.

9. EVALUATION AND TREATMENT OF CONTACTS

Figures VII-6 through VII-11 outlines the evaluation, treatment and follow-up of contacts as well as an algorithm that describes “fully evaluated” contacts.

Evaluation of Contacts

Persons exposed to an individual with infectious TB disease are at a high risk for acquiring TB infection; and, if these persons or "contacts" acquire TB infection, they are at further risk for developing TB disease within the first two years after becoming infected with TB. To prevent the development of TB disease and/or to treat the TB infection, it is important to screen and test these contacts.

Any contact that needs to be treated for TBI should have a medical evaluation and a chest radiograph to exclude pulmonary TB disease prior to starting treatment.

Healthy contacts that have a documented previous positive skin test result but have not been treated for TBI can be considered for treatment as part of the contact investigation.

Decisions to treat contacts that have documentation of a previous positive skin test result or previous treatment for TBI must be individualized because their risk for TB disease is unknown. Considerations for the decision may include:

- Medical conditions putting the contact at risk for TB disease (e.g., HIV, diabetes, etc.)
- Duration of exposure
- Intensity of exposure
- Infectiousness of the index case

Immunocompetent contacts that report a history of TB infection or TB disease but do not have documentation of testing or treatment should be evaluated according to the standard algorithm (**Refer to Figure VII-7**). Contacts that are immunocompromised or otherwise susceptible are recommended for diagnostic testing to exclude TB disease and for a full course of treatment for *M. tuberculosis* infection after TB disease has been excluded; regardless of their previous TB history and documentation (**Refer to Figure VII-8**).

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

Window Therapy

Some contacts to TB cases/suspects with a negative IGRA or TST result should be evaluated for treatment of TBI only after TB disease has been ruled out. These contacts include:

- Children <5 years of age (**Standard of Public Health Practice VII-8**) (**Refer to Table VII-10**)
- Immunosuppressed persons
- Those at risk for rapid progression to TB disease once infected

Close contacts that have a negative IGRA or TST result are to be retested 8 to 10 weeks after they were last exposed to infectious TB disease. It can take 2 to 8 weeks after exposure to TB for the body’s immune system to react and for the infection to be detected.

Table VII-10. TBI in Children (“Window” Therapy)

Infants and Young Children <5 Years of Age	Treating Children <5 Years of Age Who Are Close Contacts
<ul style="list-style-type: none"> • Are known to have been infected recently (because of their age) • At a high risk of their infection progressing to TB disease • Are more likely than older children and adults to develop life-threatening forms of TB disease (e.g., disseminated TB, TB meningitis), because they do not have fully developed immune systems 	<ul style="list-style-type: none"> • Should receive TBI treatment (“window” therapy) even if initial TST result is negative once TB disease is excluded by CXR and symptom review (infected infants may be anergic as late as 6 months of age)
	<ul style="list-style-type: none"> • Administer a second TST 8-10 weeks after the last exposure to infectious TB disease
	<ul style="list-style-type: none"> • Discontinue window prophylaxis if all of the following conditions are met: <ul style="list-style-type: none"> ○ Infant is at least 6 months of age ○ Second TST result is also negative ○ Second TST was performed at least 8 weeks after the last exposure to infectious TB disease ○ Repeat clinical exam reveals no evidence of TB disease

Reference:

1. CDC. Core Curriculum on Tuberculosis: What the Clinician Should Know. 2013. <http://www.cdc.gov/tb/education/corecurr/default.htm> (adapted)

HIV-infected and other immunocompromised persons may be anergic and not be able to manifest a positive TST or IGRA result if infected. A full course of treatment for presumptive *M. tuberculosis* infection is recommended for HIV-infected or otherwise immune-suppressed contacts, after TB disease has been excluded, even if TST or IGRA results are negative >8 weeks after the end of exposure.

HIV-infected persons who are re-exposed to an infectious TB case should be re-treated for TBI, even if they completed a course of therapy previously. They may not develop sufficient immunity after their initial exposure or treatment.

Contacts of Persons with Multidrug Resistant TB (MDR TB)

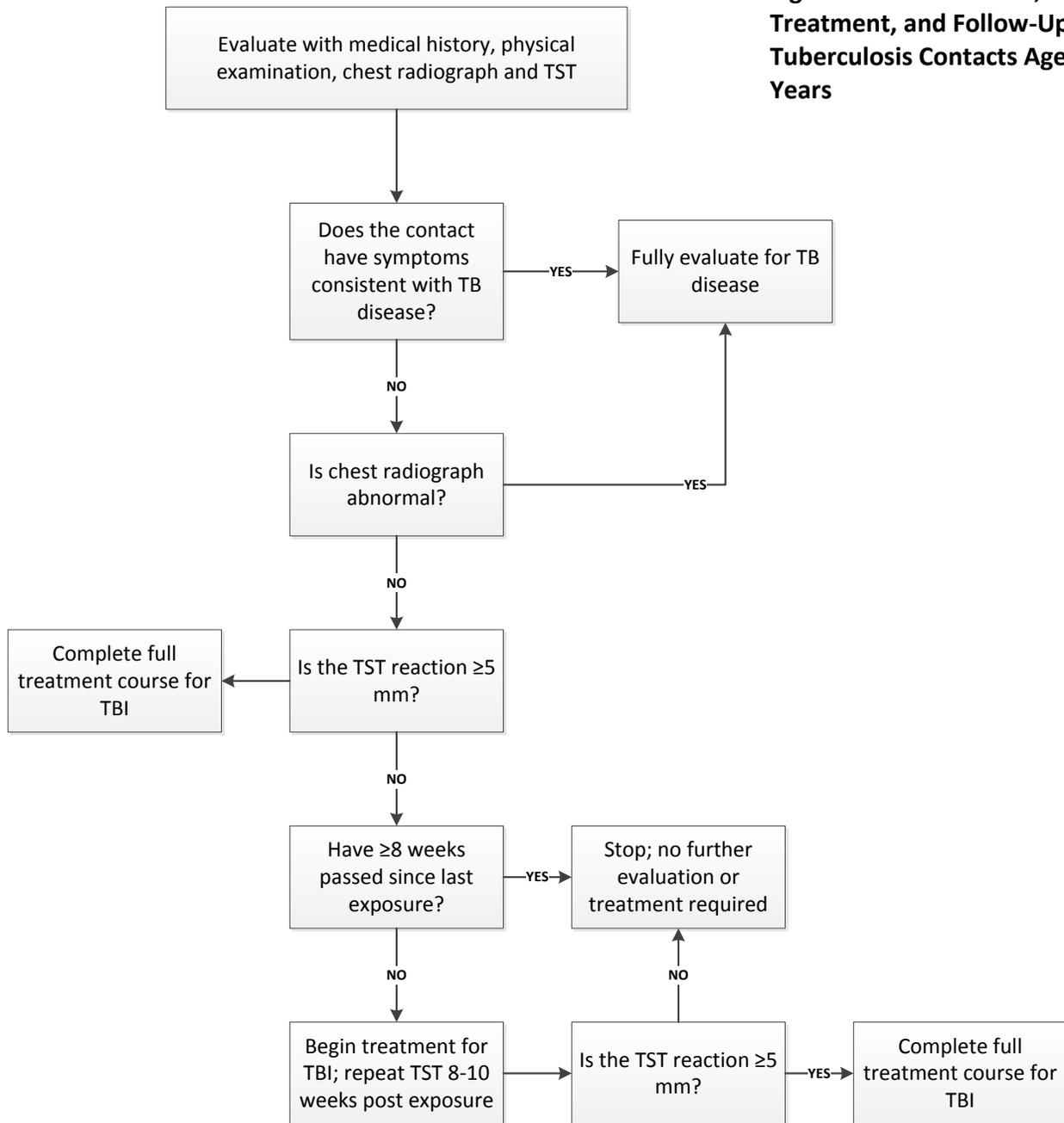
If a person is a contact of a patient with multidrug resistant (MDR) TB, the risk of progressing to MDR TB disease should be considered for recommending treatment for TBI.

Consultation from the TTEBP Medical Director should be obtained prior to initiation of treatment. In general, contacts to MDR TB are treated with PZA and EMB or PZA and a fluoroquinolone (Levaquin, moxifloxacin or gatifloxacin) for 6-12 months is recommended depending upon the specific drug sensitivity of the presumed *M. tuberculosis* strain causing TBI.

After appropriately ruling out active TB disease, immunocompetent contacts who have received a diagnosis of TB infection attributable to MDR TB exposure should be clinically monitored for 2 years after exposure. Regardless of whether the patient is treated for TBI, such monitoring should include screening for symptoms of active TB and a focused clinical evaluation at 6, 12, 18, and 24 months. At the clinician's discretion, repeat chest X-ray and sputum collection may be warranted.

Also, immunocompromised or immunosuppressed contacts to MDR TB, with or without a positive test for TB infection, should be similarly monitored at 6, 12, 18, and 24 months, with a low threshold for repeating the chest X-ray and sputum collection by induction.

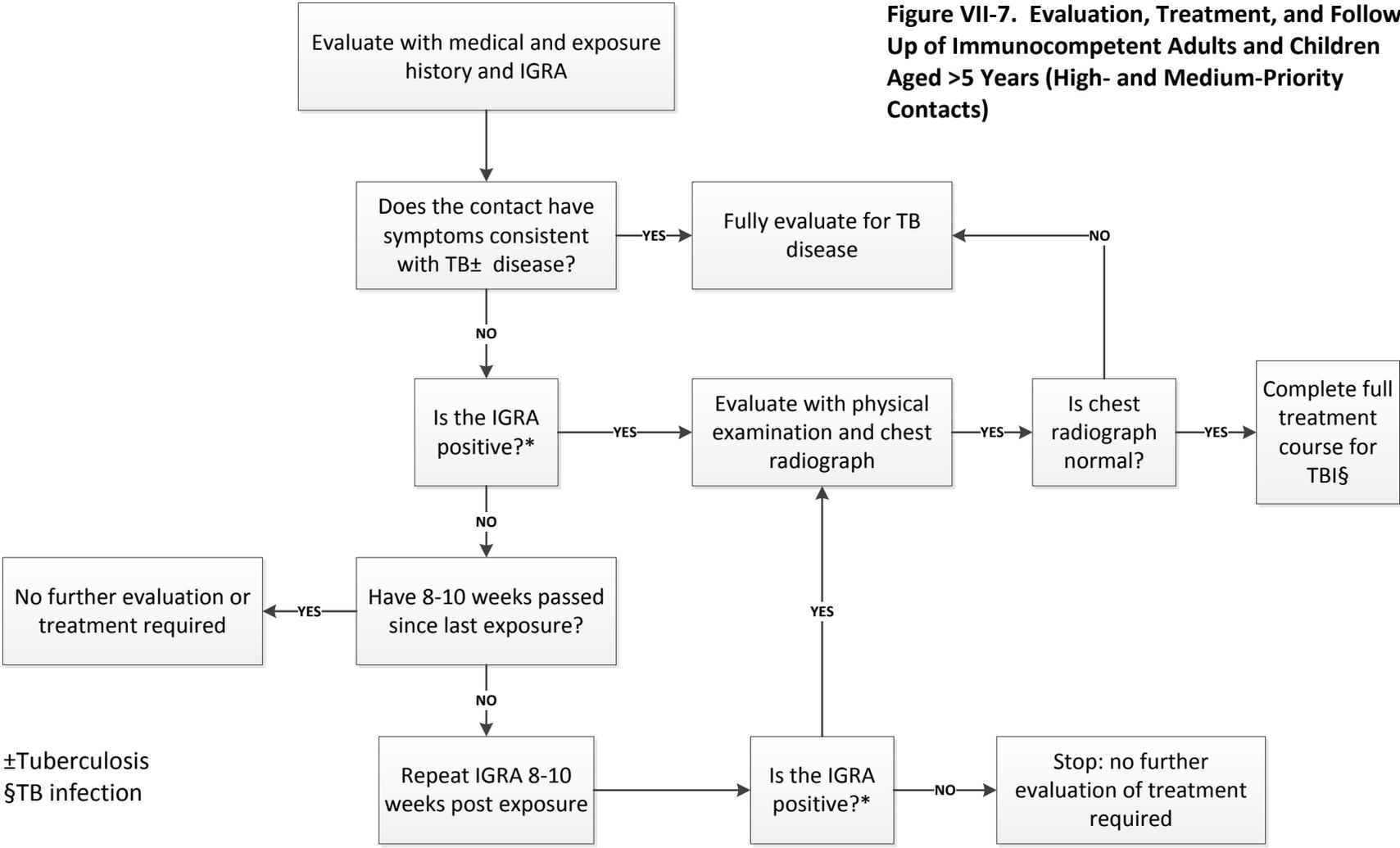
Figure VII-6: Evaluation, Treatment, and Follow-Up of Tuberculosis Contacts Aged <5 Years



Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

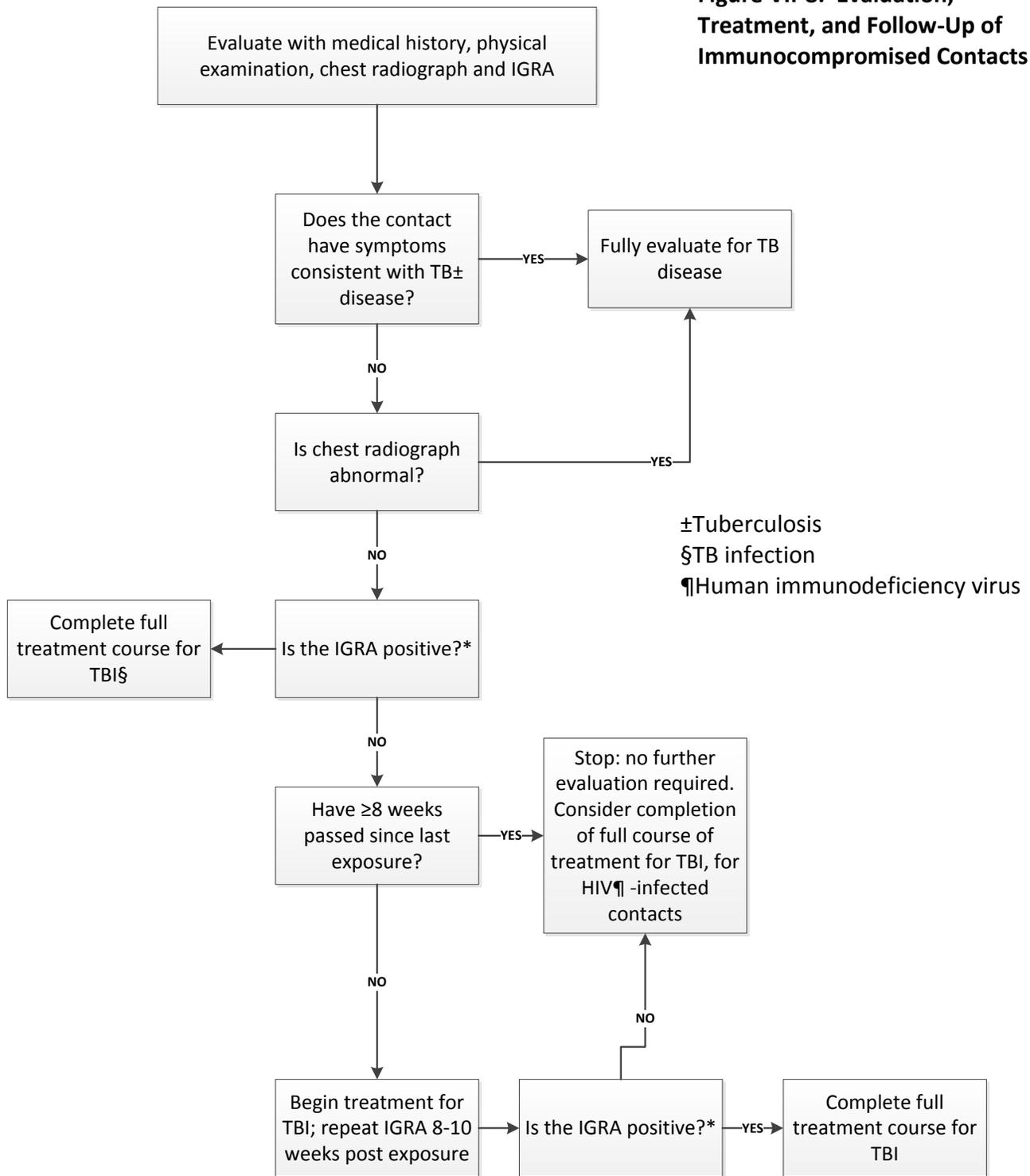
Figure VII-7. Evaluation, Treatment, and Follow-Up of Immunocompetent Adults and Children Aged >5 Years (High- and Medium-Priority Contacts)



Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

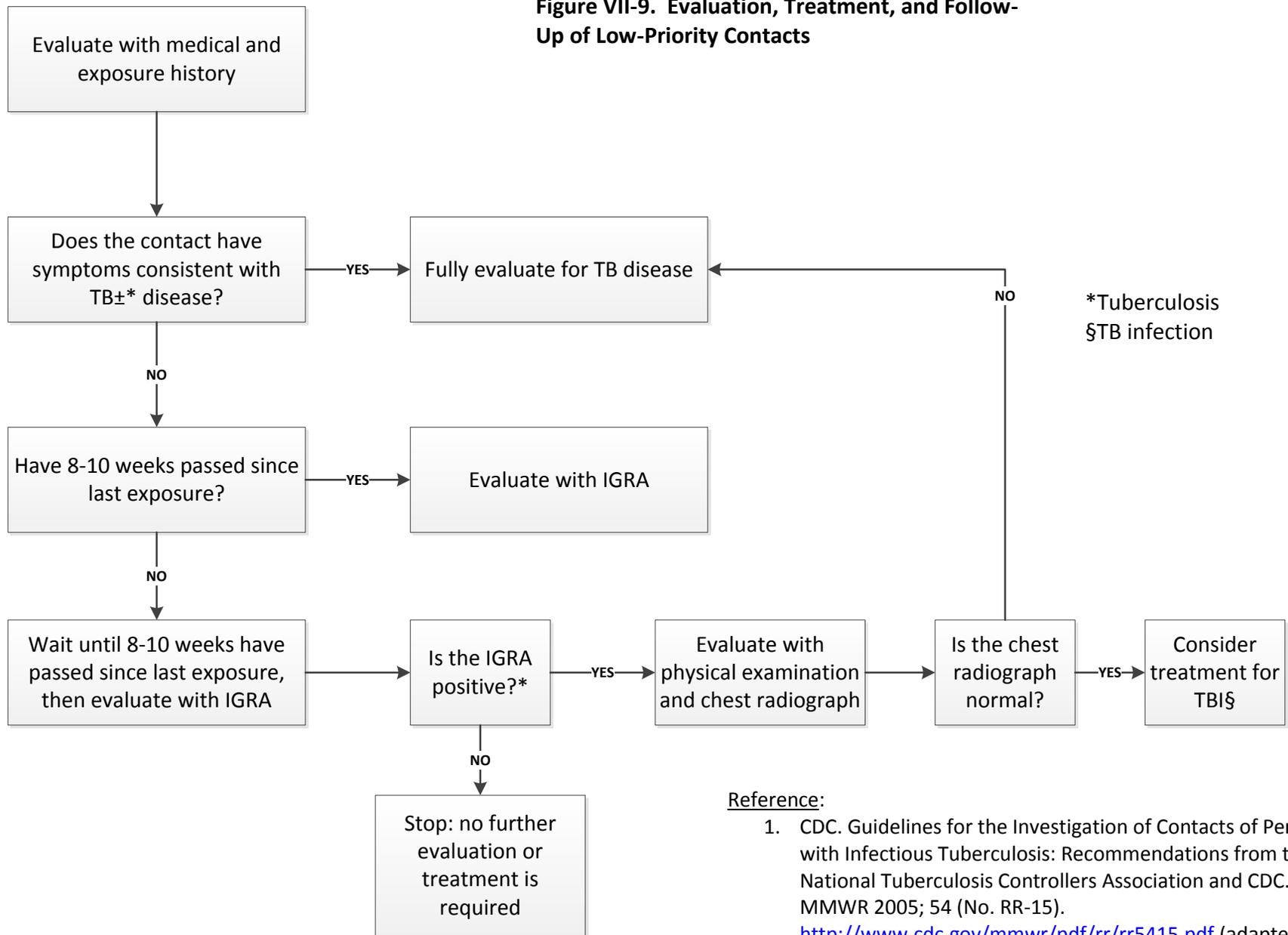
Figure VII-8. Evaluation, Treatment, and Follow-Up of Immunocompromised Contacts



Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

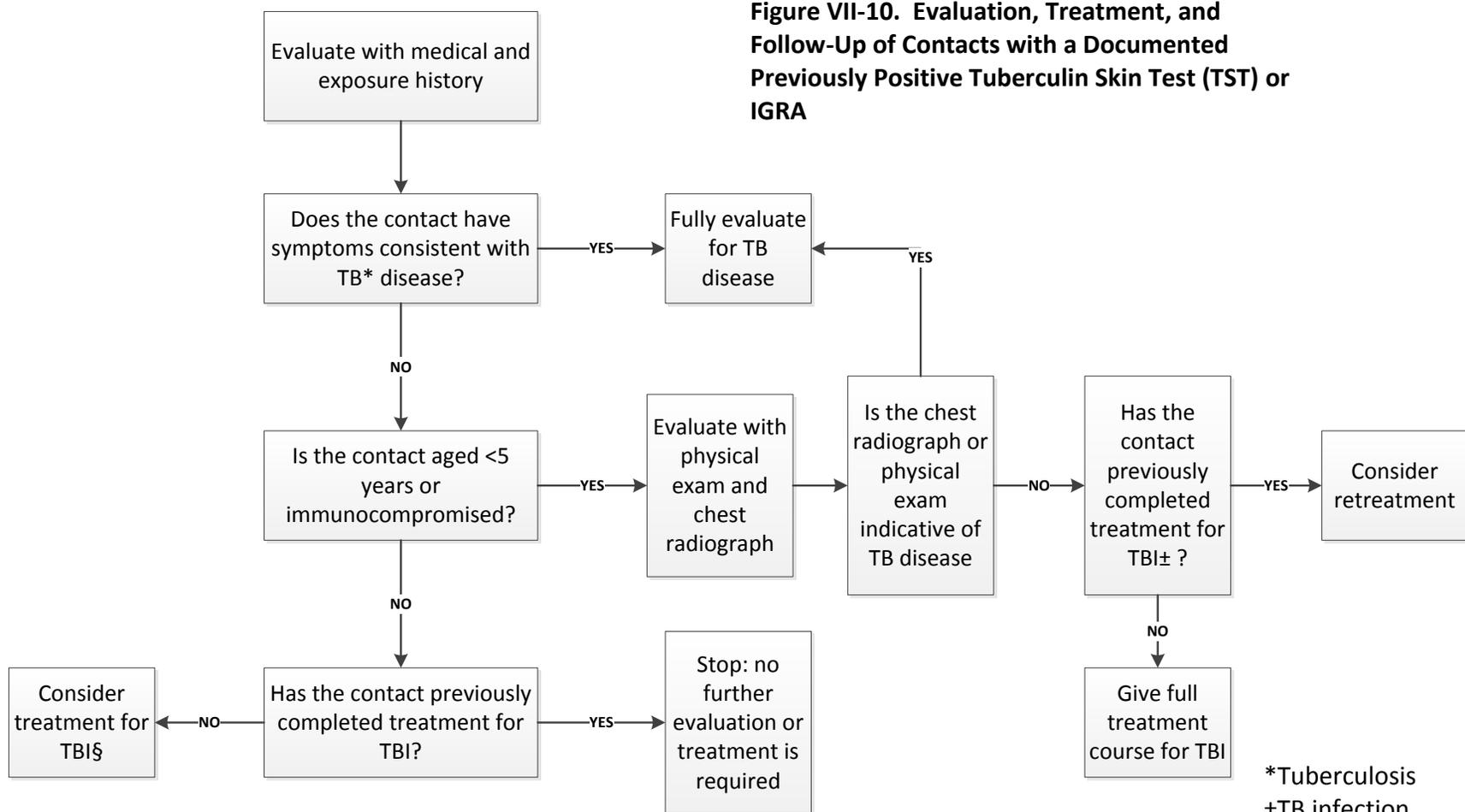
Figure VII-9. Evaluation, Treatment, and Follow-Up of Low-Priority Contacts



Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

Figure VII-10. Evaluation, Treatment, and Follow-Up of Contacts with a Documented Previously Positive Tuberculin Skin Test (TST) or IGRA



*Tuberculosis
 ±TB infection
 §Before initiation of treatment, contacts should be evaluated fully for TB disease

Reference:

1. CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. MMWR 2005; 54 (No. RR-15). <http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf> (adapted)

Figure VII-11. Fully Evaluated

