HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

CASE STUDIES IN TUBERCULOSIS

Nurse Case Management Training
Tools for Patient Success

EXCELLENCE | EXPERTISE | INNOVATION

TABLE OF CONTENTS

TB Infection (LTBI)
These case studies will provide guidance in the management of patients undergoing TB infection diagnosis and treatment with complicating factors including:

APPENDICES

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Introduction

Public health nurses new to TB prevention and care face multiple challenges including:

- Learning the basics of tuberculosis infection, disease, diagnosis and treatment.
- Gaining problem solving skills essential to TB case management.

For learning the basics of TB prevention and care, it is highly recommend to complete the Centers for Disease Control and Prevention (CDC) *Self-Study Modules on Tuberculosis* available at http://www.cdc.gov/tb/education/ssmodules/default.htm before using these case studies.

However, patients with TB seldom follow the relatively straight-forward path outlined in the CDC *Self Study Modules on TB*. Patients have multiple barriers to accurate diagnosis and completion of therapy and public health nurses must develop skills in problem solving to successfully treat and care for a patient with TB disease and TB infection. These case studies are designed to provide guidance and the necessary reference material to gain experience in TB case management challenges.

The cases are based on real-life experiences of TB nurse case managers in the Heartland National TB Center (HNTC) Region and are designed to illustrate key concepts in TB prevention and care. We recommend utilizing them for training new nurses inexperienced in TB case management; for continuing education for TB staff; to generate discussion; and to help prepare your program for similar situations in your jurisdiction.

How to Use This Product

This collection of nursing case studies and their accompanying tools are intended to complement a TB program's education and training of its nursing staff. It can be incorporated into new employee introduction and training on TB case management; used as a continuing education tool for current employees; or as an individual learning tool.

Suggested Group Training

The individual nursing cases should be copied and distributed to the group. Cases do not need to be taught in the order presented in the manual. Specific cases may be pulled out to instruct on a particular programmatic issue.

The group leader or instructor should have a copy of the answers and if possible, a copy of each corresponding reference for each lesson. The case study should be read aloud; the instructor should stop to ask the group the questions and facilitate the answers using the references to underscore the learning point. Answers to the questions should be made available to the group after the discussion.

It is recommended that a copy of the references be readily available to the TB program staff both as a supplemental learning tool and as a future resource.

Suggested Individual Training: Part of a structured program of employee learning

This product can be used for individually structured training. It can be used to orient new employees; as part of a continuing education system; or a re-teaching tool when specific issues arise. A schedule of completion can be devised by the training coordinator and mutually agreed upon by the trainee(s).

The individual nursing cases should be copied and distributed as arranged by the trainer. A copy of the corresponding references should be available at the same time.

As an individual works through a case study, it is preferable that the case questions first be answered by the trainee and then shared with the trainer – discussing the learning points and clarifying any incorrect answers using the corresponding references.

A less reinforcing method (in the interest of time) is to have the trainer supply the answers to the trainee AFTER they have completed the case study and have the trainee follow up errors by reviewing the corresponding references.

Suggested Individual Continuing Education

The case studies manual can be read and used to record the answers to the questions for each case. A copy of each corresponding reference should be available at the same time.

Acronyms and Abbreviations

AFB	Acid-fast Bacilli	***M. bovis***	*Mycobacterium bovis*
AII	Airborne Infection Isolation	**MDR-TB**	Multidrug-resistant Tuberculosis
ALT	Alanine Aminotransferase	***MTBC***	*Mycobacterium tuberculosis complex*
ART	Antiretroviral Therapy	***M. tb***	*Mycobacterium tuberculosis*
AST	Aspartate Aminotransferase	**NAAT**	Nucleic Acid Amplification Test
ATS	American Thoracic Society	**PA**	Posteroanterior
BCG	Bacille Calmette-Guérin	**PSA**	Prostate Specific Antigen
BPH	Benign Prostatic Hypertrophy	**PZA**	Pyrazinamide
CBC	Complete Blood Count	**QFT-G**	QuantiFERON®-TB Gold
CDC	Centers for Disease Control and Prevention	**QFT-GIT**	QuantiFERON®-TB Gold In Tube
CNE	Continuing Nursing Education	**RFB**	Rifabutin
CXR	Chest X-ray	**RIF**	Rifampin
DOT	Directly Observed Therapy	**TB**	Tuberculosis
DST	Drug Susceptibility Testing	**TBI**	Tuberculosis Infection
ED	Emergency Department	**TID**	Three times a day
EMB	Ethambutol	**TST**	Tuberculin Skin Test
ESR	Erythrocyte Sedimentation Rate		
HepBsAg	Hepatitis B Surface Antigen		
HIV	Human Immunodeficiency Virus		
HNTC	Heartland National Tuberculosis Center		
IGRA	Interferon Gamma Release Assay		
INH	Isoniazid		
LFT	Liver Function Test		

CASE STUDY #1

Directly Observed Therapy

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Directly Observed Therapy

A 67-year-old Hispanic male presented to a hospital emergency department with a three week history of night sweats, weight loss, nausea, shortness of breath, and a productive cough. A chest x-ray (CXR) was done and revealed extensive bilateral cavitary disease. Per hospital protocol, sputum specimens were collected and resulted in positive Acid Fast Bacilli (AFB) with >10 organisms per high power field (see Appendix A). He was diagnosed with active pulmonary TB.

1) What are some potential barriers to completion of treatment for this patient?

A. Cigarette and alcohol use.
B. Previous history of heroin addiction.
C. Hepatitis C positivity.
D. All of the above.

Further evaluation revealed a medical history of hepatitis C, and a social history that included previous intravenous drug use (heroin), cigarette and alcohol use, incarceration, and a hospitalization 30 years ago with a gunshot wound that resulted in a nephrectomy and colostomy, which was later re-anastomosed.

Six weeks into treatment his isolate was reported to be susceptible to all first line drugs and EMB was discontinued. The remaining three drugs were changed to twice weekly dosing by DOT. After 2 months of therapy the PZA was discontinued and sputa collected were AFB smear and culture positive. The patient was adherent to his medication, tolerated the drug regimen, and had resolution of symptoms. He was cooperative with the public health worker and requested to self-administer his medications.

2) Should the patient be taken off DOT and allowed to self-administer?

A. Yes, allowing him to self-administer will help build trust and rapport with the patient.
B. Yes, it is general practice to allow most patients to self-administer during the continuation phase of treatment.
C. No, explain to him that all patients stay on DOT because no one trusts TB patients.
D. No, explain that DOT is the standard of care for all TB patients.

DOT is the standard of care for all patients diagnosed with TB disease regardless of circumstances, however the nurse case manager provided this patient with a one month supply of medications to self-administer and instructed him to return to the clinic every month to refill his prescription. After 2 ½ months of self-administered treatment, sputa were obtained and smears and cultures were reported as positive. The culture grew *Mycobacterium tuberculosis (M. tuberculosis)* and susceptibility studies continued to show that the isolate was sensitive to all first-line medications.

3) What is the most likely cause for the persistently positive cultures?

A. It is probably a laboratory error.
B. He is probably not absorbing his medication due to a previous colon resection.
C. He is probably not taking his medication.
D. He has treatment failure due to his Hepatitis C co-infection.

Due to the persistently positive culture the nurse case manager contacted the prescribing physician. A repeat CXR was ordered and revealed continuing cavitary changes in the right upper lobe. In speaking with the patient, he identified that he was given medications to self-administer, but did not take them because he developed intolerable side effects. A pill count was conducted and confirmed the patient had not receiveded treatment for two months.

4) What should be included in the evaluation process?

A. Collection of three sputum specimens.
B. Evaluate hearing.
C. Repeat a TST.
D. All of the above.

A thorough evaluation that included three sputum specimens and repeat drug susceptibility testing was done. TB medications were restarted and given by DOT. Repeat drug susceptibility testing indicated no drug resistance and after 2 months of anti-TB therapy, sputum smears and cultures converted to AFB negative, and symptoms improved. The patient completed adequate TB treatment successfully.

REFLECTION

In this scenario, the patient had an extensive medical history which included multiple biological and social factors that pose as potential barriers to treatment completion. Though he was cooperative with the public health worker, it is important to remember that DOT is the standard of care for all patients diagnosed with TB disease. DOT allows the health care provider to identify and address challenges with treatment and is associated with improved treatment success.

DOT allows the health department to identify and manage intolerable side effects. The patient was classified as a treatment failure because he was four months into treatment and had not converted his culture to negative. The patient was forthcoming with the physician about not taking his medication, therefore a pill count was conducted to verify how much medication was taken. It is essential to determine if the patient took monotherapy as this could potentially lead to drug resistance to the TB medications.

ANSWERS

1) **What are some potential barriers to completion of treatment for this patient?**

   Answer: All of the above.

   Rationale: One role of the nurse case manager is to identify potential social and biological barriers to treatment which can include current or previous substance use and Hepatitis C positivity.[17]

2) **Should the patient be taken off DOT and allowed to self-administer?**

   Answer: No, explain that DOT is the standard of care for all TB patients.

   Rationale: DOT is the standard of care recognized by experts in the field and has been associated with improved treatment success.[17]

3) **What is the most likely cause for the persistently positive cultures?**

   Answer: He is probably not taking his medication.

   Rationale: Although there are many reasons why a culture will remain positive, treatment not received by DOT is an indicator that the medications are being taken improperly.[17]

4) **What should be included in the evaluation process?**

   Answer: Collection of three sputum specimens.

   Rationale: Patients who are being reconsidered for treatment should have 3 additional sputa collected and repeat culture and drug susceptibility testing.[17]

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[17] Nahid, P., Dorman, S.E., Alipanah, N., Barry, P.M., Brozek, J.L., Cattamanchi, A., Chaisson, L.H., Chaisson, R.E., Daley, C.L., Grzemska, M., Higashi, J.M., Ho, C.S., Hopewell, P.C., Keshavjee, S.A., Lienhardt, C., Menzies, R., Merrifield, C., Narita, M., O'Brien, R., Peloquin, C.A., Raftery, A., Saukkonen, J., Schaaf, H.S., Sotgiu, G., Starke, J.R., Migliori, G.B., Vernon, A. *Executive Summary: Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis*. Clin Infect Dis 2016; 63 (7): 853-867. doi: 10.1093/cid/ciw566

CASE STUDY #2

Respiratory Isolation

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Respiratory Isolation

A 31-year-old caucasian male presented to the Emergency Department (ED) after experiencing gross hemoptysis. He had a 2 month history of productive cough, a 25 pound weight loss, night sweats, and fatigue. A CXR revealed bilateral cavitary infiltrates. The initial sputum specimen was smear postive 4+ (see Appendix A) and was submitted for a Nucleic Acid Amplification Test (NAAT), culture, and sensitivity. The patient has a history of heavy alcohol and drug use. He is HIV negative, Hepatitis B and C positive, has a long history of cigarette use, and a chronic smoker's cough.

1) The patient was admitted to the hospital, should he be placed in an Airborne Infection Isolation (AII) room?

A. No, TB has not been confirmed yet.
B. No, he should be admitted to a private room because he probably has lung cancer and isolation would be too distressing.
C. No, he can be admitted into a shared room.
D. Yes, he should be placed in an AII room.

The patient's NAAT was positive for *M. tuberculosis*. He was immediately started on a standard four drug regimen and tolerated the medications well. After four days of hospitalization the physician called the local health department to report the person with TB disease and his intention to discharge the patient with a prescription for INH, RIF, PZA, EMB, and vitamin B6.

2) What is the appropriate response for the request to discharge?

A. Document the patient information, fill the prescription as ordered and proceed with discharge plans.
B. Document the patient information and inform the physician that the patient cannot be discharged until the prescription is filled by the local health department.
C. Document the patient information and inform the physician that the patient does not meet the standard criteria for discharge.
D. Document the patient information and discharge the patient with a follow-up appointment to the local health department.

The patient was fairly cooperative during the first week of hospitalization, however, the nursing staff reported the patient had been out in the hallway a couple of times without his mask. The hospital staff was becoming anxious, so the physician called the local health department to coordinate the discharge.

3) What is the appropriate response to the physician's request?

A. Agree to coordinate discharge as long as the patient is on DOT.
B. Advise the physician to delay discharge until 3 consecutive negative smears are received, patient has received a minimum of 10 days of treatment, and is clinically improving; or home arrangements have been made.
C. Agree to coordinate the discharge since the patient is a nuisance in the hospital and keeping him there is doing more harm than good.
D. Deny discharge until susceptibilities are known.

The patient was visited in the hospital by a nurse from the local health department to coordinate his discharge. Based on recommendations from the local health department, the mother made arrangements to have the children stay next door with their grandmother as a precaution.

4) Regarding respiratory isolation precautions, what is an important task of this hospital visit?
   A. Educate the patient on TB infection control (home isolation precautions) in the home.
   B. To avoid a missed dose, have TB medications ready for the patient.
   C. Confirm that the patient completely understands the pathophysiology and transmission of TB.
   D. Establish a referral for smoking cessation classes.

The patient was discharged home, and was adherent to home isolation precautions during the first week. Sputa were obtained by the local health department during his first week home, the results were still positive (1+ AFB smear, 0 AFB smear, 1+ AFB smear) and home isolation continued. At the next visit the patient was not home. The wife shared that "he got stir crazy," went drinking with his friends Friday night, and has not been back since.

5) What should the local health department do at this point?
   A. Ask the wife's assistance in locating the patient and leave contact information with instructions to call the local health department when the patient returns.
   B. Leave TB medications with the wife for the patient to self-administer.
   C. Report patient to police.
   D. No action needed.

Two weeks later, the patient was found at a relative's house. After re-educating the patient, he was adherent to the respiratory isolation precautions. During this time, three consecutive sputa results were reported as negative, his symptoms improved and he remained on an appropriate TB treatment regimen for two weeks. At that point, the local health department discontinued respiratory isolation precautions (see Appendix B).

REFLECTION

In this scenario, the patient presented to the ER with symptoms consistent with tuberculosis and was evaluated appropriately by the ER physician. Due to his positive AFB smears and his potential to infect others, the patient was immediately placed in an AII room. As soon as patients become stable, they are often released from the hospital, however since TB is a communicable disease additional criteria is required prior to dishcarge. This patient, although fairly cooperative did not always adhere to the respiratory isolation instructions he was given. The local health department should encourage the hospital to refrain from discharging the patient until 3 negative smears are received and provide education on infection control precautions. Additionally, the local health department should work with the patient in making alternative living arrangements in the event that he is discharged or leaves the hospital against medical advice.

The patient was released home once appropriate arrangements were made but he did not remain in isolation as instructed. Still considered contagious, it is the responsibility of the local health department to locate and place the patient back on respiratory isolation precautions.

ANSWERS

1) **The patient was admitted to the hospital, should he be placed in an Airborne Infection Isolation (AII) room?**
Answer: Yes, he should be placed in an AII room.
Rationale: The patient is AFB smear positive 4+, which suggests that he is probably very infectious and should be isolated in a room with proper environmental controls for airborne precautions.[4]

2) **What is the appropriate response for the request to discharge?**
Answer: Document the patient information and inform the physician that the patient does not meet the standard criteria for discharge (see Appendix C).
Rationale: The patient does not meet the criteria for discharge from hospitalization to the home with high-risk individuals. He has not had three consecutive negative smears, has not received medications for a minimum of 10 days, and documentation of clinical improvement has not been noted.[7]

3) **What is the appropriate response to the physician's request?**
Answer: Discuss with the physician that discharge should still be delayed until 3 negative smears are received and/or home arrangements can be made.
Rationale: Local health departments are pressured to agree to discharge patients for various reasons. Pediatric patients exposed to TB are at high risk of developing severe forms of TB disease once infected; advocating for their protection is a critical role for public health.[7]

4) **Regarding respiratory isolation precautions, what is an important task of this hospital visit?**
Answer: Educate the patient on TB infection control (home isolation precautions) in the home (see Appendix B).
Rationale: It is important to educate the patient on steps to take to prevent the further spread of TB while in home isolation. Education should include instructions on cough etiquette, isolating self to a room, and not allowing visitors into their home until they are no longer infectious.[4]

5) **What should the local health department do at this point?**
Answer: Ask the wife's assistance in locating the patient and leave contact information with instructions to call the local health department when the patient returns.
Rationale: It is important to reinstitute home isolation because the patient has documented signs of TB disease and remains infectious despite treatment.[4]

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4. Centers for Disease Control and Prevention. (2013). *Core curriculum on Tuberculosis: What the clinician should know, 5th ed.* Atlanta, GA: US Department of Health and Human Services, CDC.

7. Centers for Disease Control and Prevention. *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Settings.* MMWR 2005b; 54 (No. RR-17). Retrieved from https://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf

CASE STUDY #3

Evaluation of a Contact to a Patient with Pulmonary TB

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Evaluation of a Contact to a Patient with Pulmonary TB

A 20 year old Marshallese woman was identified and screened during a contact investigation. She provided documentation of TST results she received two years ago prior to her admission into school which indicated she was negative with a 0 mm induration. Her current skin test is indurated at 6 mm. She denies any symptoms of cough, fatigue, night sweats, chills, or fever but did report an unintended weight loss of 14 pounds.

1) How do we interpret the TST reaction?
A. Negative, she is foreign-born and it is less than 10 mm.
B. Positive, she is a contact to a TB patient with pulmonary disease.
C. Negative, there is <10 mm difference in reaction size from her previous TST.
D. Positive, any change in TST induration should be interpreted as positive.

2) What places her at high risk for TB disease?
A. Age
B. She is foreign-born.
C. Recent contact to a person with active TB disease.
D. Both B and C

She was referred for a CXR and medical evaluation. Her CXR report was abnormal with cavitary lesion in the left apex with left apical pleural thickening and her medical examination revealed no significant findings. Given her multiple risk factors for TB disease, she is placed in respiratory isolation and instructed to provide sputa. She is unable to provide a natural sputum specimen, even with coaching.

3) What is the next appropriate action by the local health department nurse?
A. Do nothing, if she cannot produce a sputum she likely doesn't have TB disease.
B. Start her on treatment for TB infection.
C. Arrange for a sputum induction.
D. Start her on treatment for TB disease.

With the help of induction, she is able to provide one sputum sample which was reported back as AFB-smear negative. The physician initiated standard four drug regimen based on radiographic abnormality, positive skin test and significant weight loss.

4) Is this patient considered infectious?
A. This patient could potentially be infectious.
B. This patient is not infectious since her sputum was AFB smear negative.
C. This patient is not infectious since she has only extrapulmonary TB.
D. This patient is not infectious since her sputum had to be induced.

5) Should a contact investigation be initiated?
A. No, she is already part of a contact investigation.
B. No, culture confirmation has not been received.
C. No, her sputum was negative.
D. Yes, she is a secondary case of TB.

REFLECTION

In this scenario, the local health department has identified a contact to a patient diagnosed with pulmonary TB. The contact was initially evaluated with a TST and a symptom screening. Although the contact is foreign born and there was less than a 10 mm difference between her previous TST and her current one, any person identified during a contact investigation with a TST induration > 5 mm is considered positive. Along with her risk factors for TB disease her abnormal CXR report changes her classification from a contact to a potential secondary case of TB. Often when patients are asymptomatic, they are unable to produce sputa spontaneously and must be coached. Coaching can include demonstrating deep breathing techniques such as huffing and physically repositioning the patient for optimal production of sputa. If after proper coaching, the patient is unable to produce a natural sputa the local health department should arrange for a sputum induction. It is important to recognize that a patient with one AFB smear negative result does not meet the requirement for determining potential infectiousness, regardless of the patient's inability to produce a sputa naturally. Given that she is being considered for pulmonary TB, has negative AFB sputum smears, and a cavitaty CXR, a contact investigation surrounding this patient should be initiated.

ANSWERS

1) **How do we interpret the TST reaction?**
Answer: Positive, she is a contact to a TB patient with pulmonary disease.
Rationale: This patient is considered TST positive with a TST $\geq$5 mm and known recent contact to a person with infectious TB disease (see Appendix D).[6]

2) **What places her at high risk for TB disease?**
Answer: Both B and C.
Rationale: People at high risk for progressing to TB disease after becoming infected with *M. tuberculosis* includes those identified in a contact investigation and foreign-born persons from areas with high incidence of TB.[17]

3) **What is the next appropriate action by the local health department nurse**
Answer: Arrange for a sputum induction.
Rationale: A sputum induction procedure should be arranged for patients who are unable to produce a natural sputum specimen.[4]

4) **Is this patient considered infectious?**
Answer: This patient could potentially be infectious.
Rationale: A cavity in the lung is one of many factors associated with infectiousness.[4]

5) **Should a contact investigation be initiated?**
Answer: Yes, she is a secondary case of TB.
Rationale: A contact invetigation should be initiated for a person suspected of pulmonary tuberculosis with a cavitary CXR.[6]

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[4] Centers for Disease Control and Prevention. (2013). *Core curriculum on Tuberculosis: What the clinician should know*, 5th ed. Atlanta, GA: US Department of Health and Human Services, CDC. Retrieved from https://www.cdc.gov/tb/education/corecurr/pdf/corecurr_all.pdf

[6] Centers for Disease Control and Prevention. *Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC*, United States. MMWR 2005a; 54 (No. RR-15). Retrieved from https://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf

[17] Nahid, P., Dorman, S.E., Alipanah, N., Barry, P.M., Brozek, J.L., Cattamanchi, A., Chaisson, L.H., Chaisson, R.E., Daley, C.L., Grzemska, M., Higashi, J.M., Ho, C.S., Hopewell, P.C., Keshavjee, S.A., Lienhardt, C., Menzies, R., Merrifield, C., Narita, M., O'Brien, R., Peloquin, C.A., Raftery, A., Saukkonen, J., Schaaf, H.S., Sotgiu, G., Starke, J.R., Migliori, G.B., Vernon, A.; *Executive Summary: Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis*. Clin Infect Dis 2016; 63 (7): 853-867. doi: 10.1093/cid/ciw566

CASE STUDY #4

Supporting Private Providers Who Manage TB Infection in the Community

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Supporting Private Providers Who Manage TB Infection in the Community

A 52 year old Hispanic female presented to her private provider with complaints of shortness of breath and left upper quadrant abdominal pain. She immigrated to the United States from Mexico 20 years ago but returns on occasion to visit family. Her medical assessment reveals that she is a diabetic and a non-smoker. A sonogram of the abdomen was normal, however, her CXR revealed a density in the left upper lung with no hilar, mediastinal or axillary adenopathy. She has no prior history of TB and denies symptoms of cough, fever, chills, night sweats, fatigue, or recent weight loss. A TST was done and was found to be positive with an induration of 25mm. Her private provider referred her to the local health department for further evaluation.

1) What is the most significant issue that may suggest active TB disease in this patient?
   A. Left upper quadrant abdominal pain.
   B. Density in the left upper lung.
   C. History of immigration from Mexico.
   D. Diabetes

2) What is the next appropriate action by the local health department nurse?
   A. Collect three sputa for AFB smear and culture.
   B. Refer back to her private provider.
   C. Identify this patient's contacts and place patient in home isolation.
   D. Get an order to start patient on treatment for TB Infection.

While waiting for smear and culture results, the patient was placed in respiratory isolation. The AFB smear and culture results were reported as negative. Upon receipt of the culture results, she was referred back to her private provider with a diagnosis of TB infection as well as a recommendation to treat with INH and Vitamin B6 for 9 months.

3) What is the local health department's next step in management of this patient?
   A. Encourage the private provider to contact the local health department with any questions.
   B. Order INH and begin case management of this patient with TB infection.
   C. Provide INH by DOT as this patient is high risk for progressing to TB disease.
   D. Provide all 9 months of INH, this will optimize the patient's ability to complete treatment while traveling back and forth to Mexico.

Based on the recommendation of the local health department the private provider started the patient on 9 months of INH and Vitamin B6. During the second month follow-up the patient complained of nausea and vomiting; the private provider contacted the local health department for recommendations.

4) What recommendations should the local health department make?
   A. Lab monitoring to assess for hepatotoxicity.
   B. Transfer care back to the local health department.
   C. Suggest an antiemetic and continue treatment.
   D. Suggest a different regimen.

Patient's labs come back as normal. The local health department recommends following patient closely through the remainder of treatment. After completion of 9 months of therapy the private provider contacted the local health department and asked what to do next. The local health department recommends providing the patient with a TB treatment completion card and education on the signs and symptoms of active TB.

REFLECTION

In this scenario, the private provider was alert to the possibility of the patient having tuberculosis and took the appropriate action in referring the patient to the local health department. Thinking TB, the local health department placed the patient in respiratory isolation pending sputa results. Three AFB smears were collected with no fewer than 8 hours in between each collection. The local health department can generally expect to receive the results of the sputa within 24-72 hours. Given that her AFB smear results were negative, a decision was made to transfer care back to the private provider with the recommendation of treating her with INH and Vitamin B6 for 9 months. This regimen is one of four acceptable options for treating TB infection. It is important to consider the medical and social characteristic of the patient and select a regimen that will provide the greatest chance for treatment completion. This scenario showcases opportunities for the local health department to provide education and support to the private providers who are treating patents for TB infection in the community.

ANSWERS

1) **What is the most significant issue that may suggest active TB disease in this patient?**
Answer: Density in the upper left lung.
Rationale: Although TB can be found anywhere in the body it is most often associated with the lungs. A CXR is not a confirmatory diagnostic tool, but is usually the first indicator of possible TB disease.[11]

2) **What is the next appropriate action by the local health department nurse?**
Answer: Collect three sputa for AFB smear and culture and place her in respiratory isolation.
Rationale: Collection of three sputum specimen on any patient with symptoms suggestive of TB disease should be obtained for AFB smear and culture.[16]

3) **What is the local health department's next step in management of this patient?**
Answer: Encourage the private provider to contact the local health department with any questions.
Rationale: A private provider treating TB infection should be encouraged to reach out to the local health department for questions in managing their patient. The local health department is the expert in providing information on CDC guidelines, drug-drug interactions, as well as any treatment related issue.[8]

4) **What recommendations would the local health department make?**
Answer: Lab monitoring to assess for hepatotoxicity.
Rationale: INH can be associated with many advere reactions such as GI upset which can be indicative of hepatotoxicity. A liver function test should be ordered to include AST/ALT/Bilirubin to rule out liver injury.[4]

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4. Centers for Disease Control and Prevention. (2013). *Core curriculum on Tuberculosis: What the clinician should know*, 5th ed. Atlanta, GA: US Department of Health and Human Services, CDC.

8. Centers for Disease Control and Prevention. (2016). *Latent Tuberculosis Infection: A Guide for Primary Health Care Providers*. Retrieved from https://www.cdc.gov/tb/publications/ltbi/default.htm

11. Centers for Disease Control and Prevention. (2017). *Self-Study Modules on Tuberculosis 1-5*. Atlanta, GA: US Department of Health and Human Services, CDC. Retrieved from https://www.cdc.gov/tb/education/ssmodules/default.htm

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CASE STUDY #5

Multi-Drug Resistant TB

HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

Multi-Drug Resistant TB

A 45 year old foreign-born male presented to the ED with cough, fever, chills, night sweats, fatigue and weight loss. The patient's CXR showed cavitation in the right upper lobe and his TST was positive at 23 mm. He was admitted to an AII room and sputa were collected. Sputum results were positive AFB smear 3+ (see Appendix A), baseline labs were taken and the patient was started on INH, RIF, PZA, EMB and vitamin B6. The patient was discharged home with an appointment to the local health department.

1) What should be done during his first visit with the local health department?

A. Clinical assessment
B. Sputum collection
C. HIV testing
D. All of the above

During the clinical assessment a sputum was collected and a rapid HIV test was done. While obtaining the patient history, he disclosed that he was previously treated for TB in Russia, but does not recall the treatment duration or regimen.

2) Does his previous treatment history impact his current treatment plan?

A. Yes, he is from a high burden country and could have drug-resistant TB.
B. No, he does not have documentation of treatment.
C. Yes, he may not need treatment.
D. No, previous treatment history is irrelevant.

3) What should the local health department do with this information?

A. Send the sputum for rapid molecular DST.
B. Nothing, the information is irrelevant.
C. Call the laboratory for susceptibilities.
D. Monitor the patient closely.

The sputum was sent for rapid molecular drug susceptibility testing (DST) - three days later preliminary susceptibilities reported resistance to INH and RIF. The local health department sought a consultation with a TB expert (see Appendix E). Recommendations were to treat empirically with EMB, PZA, amikacin, levofloxacin, and linezolid (see Appendix F).

4) What should the local health department nurse do prior to starting this regimen?

A. Hearing screening
B. Psychological evaluation
C. EKG
D. Do nothing

Baseline hearing test results were documented and the patient was started on the recommended regimen. During a DOT visit the local health department nurse noticed the patient had difficulty hearing questions.

5) What should the local health department nurse do next?

A. Send the patient for audiometry and compare with the baseline.
B. Stop all medications.
C. Draw CBC and CMP labs.
D. Conduct the visit in a quieter space.

The audiometry screening indicated no changes from baseline and the MDR-TB treatment regimen was continued. Final susceptibilities were received, which confirmed resistance to INH and RIF. The patient tolerated the remainder of his treatment with minimal side effects and adequate MDR-TB treatment was completed successfully.

REFLECTION

In this scenario, the ED physician evaluated and managed the patient appropriately. Once care was transferred to the local health department, the staff continued to evaluate the patient appropriately. While obtaining the patient history, the patient disclosed that he was previously treated for TB in Russia but did not recall the treatment duration or regimen. Prior treatment, especially treatment received in a country with high prevalence for drug resistant TB should be considered when developing a treatment regimen. The local health department nurse should ask questions to probe for details regarding his previous treatment such as; can he recall how many medications he was taking, did he ever experienced red-orange urine, or can he recall the clinic name or address where he received treatment.

Given that the local health department is alert to the possibility of drug resistant TB, his sputum was sent for rapid molecular DST. It is important to quickly diagnose drug resistant TB so that the patient can be started on an appropriate treatment regimen. In this scenario, the patient was prescribed EMB, PZA, amikacin, levofloxacin, and linezolid, please note that this is not the only acceptable regimen for INH and RIF resistance. A regimen should be prescribed based on the patient's individual treatment plan in conjunction with TB expert recommendations.

ANSWERS

1) **What should be done during his first visit with the local health department?**

Answer: All of the above.

Rationale: A thorough evaluation should include a clinical assessment, sputum specimen collection for AFB smear and culture, and HIV testing.[17]

2) **Does his previous treatment history impact his current treatment plan?**

Answer: Yes, he is from a high burden country and could have drug-resistant TB.

Rationale: History of previous treatment impacts his current treatment plan because the patient has two predictors of MDR-TB, which include previous TB treatment and is native to a country with a high prevalence of MDR-TB.[14]

3) **What should the local health department do with this information?**

Answer: Send the sputum for rapid molecular DST

Rationale: A rapid molecular DST is recommended for individuals who have received treatment for TB in the past and are native to a country with high prevalence of MDR-TB.[16]

4) **What should the local health department nurse do prior to starting this regimen?**

Answer: Hearing screening.

Rationale: Patients who are starting a regimen including an injectable should have a baseline hearing test.[14]

5) **What should the local health department nurse do next?**

Answer: Send the patient for audiometry and compare with the baseline.

Rationale: Difficulty hearing is an adverse reaction of an injectable (amikacin). Patients who are on a regimen including an injectable should have monthly hearing test (see Appendix G).[14]

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[14] Curry International Tuberculosis Center and California Department of Public Health. (2016). *Drug-Resistant Tuberculosis: A Survival Guide for Clinicians, 3rd ed.* Retrieved from http://www.currytbcenter.ucsf.edu/sites/default/files/tb_sg3_book.pdf

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CASE STUDY #6

Pediatric TB

HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

Pediatric TB

A 15-year-old male presented to his primay care physician with frequent cough, weight loss, fatigue, and night sweats for four months. Two months ago he was treated for bronchitis that was unresolved. His CXR showed extensive right upper lobe infiltrates and multiple cavitary lesions. TB was suspected and a TST was placed and read at 25 mm induration. Patient was referred to a pediatric pulmonologist.

The pulmonologist collected sputum specimens that were positive with numerous AFB. The patient was accompanied by his mother and 5 month old brother when the pulmonologist initially saw this patient and suspected active TB. The infant appeared healthy with no signs and symptoms of TB. The pulmonologist immediately reported the 15 year old and infant brother to the local health department.

1) **Regarding the infant brother, which is the most appropriate response by the local health department?**
   A. No action necessary at this time, the infant is not symptomatic and in no immediate danger.
   B. The infant may be infected with TB, but it is premature to react until the older brother is confirmed to actually have active TB.
   C. The infant has had household contact with an active case of TB. This is an urgent public health matter and the infant should be evaluated as soon as possible.
   D. The infant probably has been exposed and should immediately be scheduled to have gastric aspirates collected.

The local health department nurse visited the home of the teenager and infant and placed TSTs on all the household members including the infant. The nurse and the mother worked together to schedule a CXR (PA and lateral views) and physical exam for the infant that same week.

2) **Which statement is most accurate with regard to infants and children exposed to TB?**
   A. Infants and children are highly prone to developing symptoms of active TB.
   B. At least half of infants and children diagnosed with active TB who are found in contact investigations are not symptomatic at time of diagnosis.
   C. Infants and children with active TB are frequently infectious because of increased upper respiratory secretions.
   D. Infants and children are very resilient and do not typically develop active TB.

In 48 hours the nurse returned to the home and read all TSTs. Everyone in the household (mom, dad, 9 year old brother and 12 year old brother) was TST positive. The infant was TST negative.

3) **What should the local health department nurse do next?**
   A. Cancel the CXR appointment since the infant is TST negative and CXRs are traumatic for infants.
   B. Keep the CXR appointment since a negative TST in 5 month old infants does not rule out infection.
   C. Postpone the CXR appointment until the older brother is confirmed to have TB.
   D. Review signs and symptoms of TB and only do a CXR if the infant becomes symptomatic.

The local health department nurse called the morning of the appointment for the infant's CXR and the mother said that she could not make the appointment because she had no gas in her car and could not afford the gas for the appointment. She was not concerned because the infant appeared to be fine.

4) How should the nurse handle this situation?
- A. Agree with the mother and instruct her to call if the infant develops symptoms.
- B. Agree with the mother and say that you will check on the infant next week.
- C. Report the mother to Family Services for child endangerment.
- D. Assist the mother with enablers so she can keep the appointment.

An enabler (gas card) was provided to the patient and the mother was able to keep the appointment. The CXR was performed and the infant had a significant right middle lobe infiltrate and decreased breath sounds on the right. The pulmonologist performed a bronchoscopy and diagnosed endobronchial TB – a rare form of TB that affects the bronchus and often occludes bronchial tubes. The physician immediately prescribed treatment for active TB disease with the standard four drug regimen – INH, RIF, PZA, and EMB in pediatric doses by DOT.

5) What should the health department do?
- A. Do not worry about it, the doctor is experienced in pediatric TB and knows what he/she is doing.
- B. Assess the infant's visual acuity before treatment.
- C. Look for strategies to administer medications to the pediatric patient.
- D. Provide instructions to the mother for administering medications to the infant.

The nurse reached out to the pharmacy to compound the medications for the infant so that the mother could be included in the administration process. The local health department administrator was concerned about how much time and effort it was taking to treat this family for TB infection and active TB disease. The mother obviously cared very much for the children and wanted them to get better, so the administrator suggested that the mother provide DOT for the baby and the rest of the family.

6) What is the best response?
- A. Agree with the administrator, the needs of this family must be balanced with the rest of the priorities at the local health department.
- B. Explain to the administrator that DOT is the standard of care for all TB patients.
- C. Train the mother to provide medications via DOT and ask her to notify the local health department if any problems with DOT occur.
- D. Suggest continuing DOT through the initial phase of treatment and then allow the mother to monitor therapy for the continuation phase of treatment.

REFLECTION

Evaluation of the 5 month old brother should be regarded as a high priority regardless of presence of symptoms due to the shorter incubation period and risk of developing a severe form of TB. His medical evaluation should include a TST, and a PA and lateral CXR.

The mother shared with the local health department nurse that she was unable to keep the clinic appointment because she could not afford gas for her car. The nurse used an enabler (gas card) as a case management intervention, which allowed the mother to keep the clinic appointment. Enablers are resources that aid the patient in overcoming barriers to treatment.

Upon receipt of a treatment order, the local health department nurse should begin to look for strategies for administering medication for a pediatric patient. Any identified strategies should be discussed with the mother to determine what will yield the best results; keep in mind that you may need to alter your approach often.

ANSWERS

1. **Regarding the infant brother, which is the most appropriate response by the local health department?**
   Answer: The infant has had household contact with an active case of TB. This is an urgent public health matter and the infant should be evaluated as soon as possible.
   Rationale: Age <5 years is one of the most important factors in prioritizing contacts because TB disease is more likely to be severe with higher mortality rates (e.g. TB meningitis).[12]

2) **Which statement is most accurate with regard to infants and children exposed to TB?**
   Answer: At least half of infants and children diagnosed with active TB who are found in contact investigations are asymptomatic at time of diagnosis.
   Rationale: Children may appear asymptomatic, however, at the same time they can have an abnormal CXR and disease that can progress rapidly to more severe forms of TB.[1]

3) **What should the local health department nurse do next?**
   Answer: Keep the CXR appointment since a negative TST in 5 month old infants does not rule out infection.
   Rationale: A CXR and physical exam is needed to rule out active TB in this infant even if the TST induration is less than 5 mm in diameter.[12]

4) **How should the nurse handle this situation?**
   Answer: Assist the mother with enablers so she can keep the appointment.
   Rationale: Health departments should have some assistance available to enable their clients to comply with medical appointments and be willing to provide them as needed. Some health departments provide gas cards or vouchers for taxi or bus fares, and others will allow employees to transport clients.[12]

5) **What should the health department do?**
   Answer: Look for strategies to administer medications to the pediatric patient.
   Rationale: Treating a pediatric patient can present unique challenges. The local health department nurse should identify a treatment delivery method that uses easy-to-take preparations. [12]

6) **What is the best response?**
   Answer: Explain to the administrator that DOT is the standard of care for all TB patients.
   Rationale: DOT should be conducted by the local health department staff and not delegated to a parent. The local health department staff may either administer the medications directly or observe a parent administering them, whatever is more acceptable for the child. [12]

CASE STUDY #7

Hepatotoxicity in TB Treatment

HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

Hepatotoxicity in TB Treatment

A 38 year old Latin American male was recently diagnosed with active tuberculosis while incarcerated. He was started on standard four drug therapy. Baseline lab values were ALT (SGPT) 42 units/L and AST (SGOT) 63 units/L. He was released from jail and his care was transferred to the local health department where an assessment revealed a social history of previous alcohol and cocaine use, bipolar disorder, and homelessness.

1) What increases his risk of hepatotoxicity while taking TB medications?

A. Alcohol use
B. Cocaine use
C. Bipolar disorder
D. Homelessness

The local health department nurse educated the patient on the risks of alcohol use and hepatotoxicity. The sputum results that were collected in jail were reported as pan-susceptible, he was tolerating medications well and EMB was discontinued. During his follow up visit the patient complained that he was not feeling well.

2) What are early signs and/or symptoms associated with hepatotoxicity?

A. Abdominal tenderness, nausea, and fatigue
B. Jaundice and dark urine
C. Peripheral neuropathy and joint pain
D. All of the above

The nurse assessment further identified that he had bloating, nausea and fatigue. The patient admitted to drinking alcohol.

3) What should the local health department nurse do next?

A. Draw labs that include LFTs.
B. Do nothing, these are expected side effects of TB medications.
C. Stop TB medications.
D. Refer to a GI doctor.

His laboratory results revealed an increase in the ALT to 304 U/L and AST to 245 U/L. He was evaluated by the local health department physician, TB medications were stopped, he was instructed to return to the clinic for repeat labs, and he was re-educated to abstain from alcohol.

4) Which of the following statements is true of hepatotoxicity?

A. Drug-induced hepatitis is the most frequent serious adverse reaction of the first-line drugs.
B. Other causes of abnormal liver tests must be excluded before diagnosing drug-induced hepatitis.
C. If LFTs are consistent with hepatotoxicity, all hepatotoxic drugs-must be stopped.
D. All of the above.

5) What is the best approach to continue TB treatment?

A. A drug rechallenge should be initiated once the ALT returns to <2x the upper limit of normal.
B. Restart all the TB medications once LFTs are normal.
C. Discontinue TB treatment and have the patient follow-up every six months for symptoms of TB.
D. Refer the patient to an alcohol rehabilitation center and restart all TB medications.

Once the LFTs were <2x upper limits of normal the TB medications were restarted sequentially. The PZA was discontinued because it was identified as the cause for recent elevation in the ALT and treatment was continued with INH and RIF. The patient tolerated the medications well without any other side effects or adverse reactions and the treatment was extended to nine months.

REFLECTION

A drug re-challenge is reintroducing medications one at a time to determine which drug is causing the increase in liver function tests. The order of the re-challenge is as follows: start with RIF for approximately one week, if no increase in liver function tests then add INH for approximately one week, if no increase in liver function tests then add PZA and recheck labs after approximately one week. If symptoms recur or liver function tests increases, the last drug added should be stopped and the challenge should continue with the next drug. If any of the drugs other than PZA cannot be restarted without the LFTs rising, medical consultation should be considered to assure the patient is receiving a strong enough regimen to cure.

In this scenario, treatment was extended to nine months because the patient did not tolerate PZA. A regimen that does not include PZA for 2 months should be extend to 9 months.

ANSWERS

1) **What increases his risk of hepatotoxicity while taking TB medications?**

Answer: Alcohol use.

Rationale: The consumption of alcohol while on anti-TB medications is known to cause liver injury and places the patient at an increased risk for hepatotoxicity.[3]

2) **What are early signs and/or symptoms associated with hepatotoxicity?**

Answer: Abdominal tenderness, nausea, and fatigue.

Rationale: Some patients treated with the standard four-drug regimen may have symptoms of hepatotoxicity. Early signs and symptoms include unexplained anorexia, nausea, vomiting, fatigue, and abdominal tenderness.[14]

3) **What should the local health department nurse do next?**

Answer: Draw labs that include LFTs.

Rationale: Routine LFTs are recommended prior to starting the standard four-drug therapy for a person with active TB disease. If the tests are normal, no further tests are required. If symptoms of hepatotoxicity develop during treatment or if the patient consumes alcohol, monthly LFTs are required.[14]

4) **Which of the following statements is true of hepatotoxicity?**

Answer: All of the above.

Rationale: INH, RIF and PZA are known to cause hepatotoxicity because these drugs are metabolized by the liver. It is important to exclude other causes of abnormal liver function tests (hepatitis A, B, C and history of any other liver disease or substance abuse) before diagnosing drug-induced hepatotoxicity. It is important to take an inventory of *all* medications (prescribed and over the counter) to identify all hepatotoxic agents. If signs and symptoms develop, consideration should be given to stopping all hepatotoxic medications.[14]

5) **What is the best approach to continue TB treatment?**

Answer: A drug rechallenge should be initiated once the ALT returns to <2x the upper limit of normal.

Rationale: Closely monitoring the patient during sequential reintroduction of drugs is used to identify the agent causing the adverse reaction (hepatotoxicity).[17]

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[3] Bernardo, J., Cohn, D.L., Gordin, F.M., Jasmer, R.M., Jereb, J.A., Nolan, C.M., Nunes, D., Peloquin, C.A., Saukkonen, J.J., Schenker, S., Sterling, T.R., Strader, D.B., Venkataramanan, R., on behalf of the ATS Hepatotoxicity of Anti-tuberculosis Therapy Subcommittee; *An Official ATS Statement: Hepatotoxicity of Anti-tuberculosis Therapy*, American Journal of Respiratory and Critical Care Medicine 2006; 174 (8):935-52. doi: 10.1164/rccm.200510-1666ST

[14] Curry International Tuberculosis Center and California Department of Public Health. (2016). *Drug-Resistant Tuberculosis: A Survival Guide for Clinicians,* 3rd ed. Retrieved from http://www.currytbcenter.ucsf.edu/sites/default/files/tb_sg3_book.pdf

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CASE STUDY #8

TB and Biologics

HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

TB and Biologics

A 55-year-old caucasian female was recently diagnosed with rheumatoid arthritis and was prescribed Humira® [adalimumab - a biologic agent].

1) Should she receive an evaluation for TB prior to starting this medication?

A. No, she is not at risk for developing TB disease.
B. No, if she has TB infection it is probably from an infection many years ago and is no longer a concern.
C. Yes, she should be screened and evaluated for TB.
D. Yes, she should undergo two-step TST testing and medical evaluation for TB.

The patient should receive a TB screening prior to starting a biologic, however in this scenario, the patient did not undergo an evaluation. Three months after starting Humira® she experienced generalized weakness, cough, and shortness of breath, which she attributed to the biologic and stopped taking it. Two months later she went to visit family in Virginia where she was hospitalized with complaints of cough, shortness of breath, fatigue, chills, headaches, persistent fever, and a 16 pound weight loss. A TST was placed and interpreted as negative.

2) Can TB be ruled out by the negative TST?

A. No, the TST may not be reactive due to immunosuppression related to drug treatment and active TB disease.
B. A TST is not relevant because she has no risk factors for TB.
C. Yes, since the immune suppressive treatment stopped two months ago, there should be no lingering effect on the TST.
D. Yes, there is probably some other infectious process going on.

3) What should be the next step?

A. Restart Biologics treatment; the abrupt stop in treatment probably caused the symptoms
B. Admit patient to an AII room and evaluate for active TB disease.
C. Discharge patient with contact information for the local health department.
D. Send her back to Texas for TB evaluation.

A CXR and CT scan revealed interstitial infiltrates throughout both lungs primarily affecting the upper lobes. An ultrasound-guided lung biopsy revealed a positive AFB smear and the culture grew *Mycobacterium tuberculosis*. She was placed on INH, RIF, EMB, PZA, and azithromycin and was reported to the local health department in Virginia who assumed TB care. After respiratory isolation precautions were discontinued she returned home to Texas.

4. **What are the appropriate actions for the Virginia local health department nurse to take regarding transfer of care?**
    - A. Immediately make direct contact with the patient's close contacts in Texas.
    - B. Contact the Texas Department of State Health Services to report the case.
    - C. Maintain patient confidentiality and do not let anyone know this patient has TB.
    - D. Ask the patient's permission to contact the Texas Department of State Health Services.

The nurse completed the Interjurisdictional Follow-up Form (see Appendix H) with treatment details and sent it to the Texas Department of State Health Services, TB Control Program for transfer of TB care. After returning home, the patient successfully completed 6 months of TB treatment under DOT. Humira® was restarted by the rheumatologist after completion of treatment as recommended by the American College of Rheumatology Guidelines.

REFLECTION

In this scenario, the prescribing physician did not follow the ACR RA treatment guidelines which recommend that patients be screened and treated (if indicated) for tuberculosis prior to starting treatment for rheumatoid arthritis. The guidelines further suggest biologics should be started/restarted after completion of TB treatment, however for special situations seek expert medical consultation by a TB expert (see Appendix J).

The patient in this scenario was diagnosed in Virginia but returned home to Texas to continue her treatment warranting the need for an Interjurisdictional transfer. Any patient whose care is being transferred from one state or program to another requires that an Interjurisdictional TB Notification (IJN) Form be competed and submitted to the receiving health department.

For more information on interjurisdictional transfers seehttp://www.tbcontrollers.org/resources/interjurisdictional-transfers/

ANSWERS

1) **Should she receive an evaluation for TB before starting these medications?**
Answer: Yes, she should be screened and evaluated for TB.
Rationale: According to 2015 American College of Rheumatology Guidelines, screening for TB in the context of biologics should be done because persons who are receiving immunosuppressive therapy such as tumor necrosis factor-alpha (TNF) antagonists are at increased risk for progression to active TB disease if they have been infected with TB.[4]

2) **Can TB be ruled out by the negative TST?**
Answer: No, the TST may not be reactive due to immunosuppression related to drug treatment and active TB disease.
Rationale: The negative TST should not exclude the possibility of TB. Some medications are known to weaken the immune system causing a false negative TST reaction. Additionally, patients with overwhelming active TB disease may have a negative TST.[2]

3) **What should be the next step?**
Answer: Admit patient to an AII room and evaluate for active TB disease.
Rationale: The patient is having signs and symptoms of TB and should be placed in isolation until she is no longer infectious and evaluated for TB disease with a CXR and sputum specimen collection.[4]

4) **What are the appropriate actions for the nurse to take with this case?**
Answer: Contact the Texas Department of State Health Services to report the case.
Rationale: Interstate communication is essential to coordinate TB treatment and the investigation surrounding this patient diagnosed with TB disease. An interjurisdictional form (see Appendix H) should be completed for transfer of care.[6]

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CASE STUDY #9

Positive Tuberculin Skin Test (TST) and Pregnancy

HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

Positive Tuberculin Skin Test (TST) and Pregnancy

A 25-year-old pregnant woman (22 weeks) requested to be screened for TB during a routine prenatal visit. A TST was placed which resulted in a 24 mm induration; she was referred to the local health department.

1) What should the local health department nurse do next?

A. Conduct a TB nurse assessment to identify symptoms and risk factors for TB.
B. Disregard the TST result because her pregnancy caused a false positive reaction.
C. Order a CXR, but delay until after delivery.
D. Discourage further evaluation for TB infection or TB disease because of pregnancy.

The TB nurse assessment revealed that three years ago, while pregnant with her first child, her TST was negative. She immigrated from Guatemala to the U.S. twelve years ago with her parents and recently returned to visit family. During her visit she stayed with an aunt and uncle for six months and recalls the uncle as being thin and frail with a chronic cough. The uncle was eventually diagnosed with TB. During the physical examination a scar on her right shoulder consistent with BCG vaccination was noted; otherwise, the physical examination was unremarkable.

2) What is the next appropriate action by the local health department nurse?

A. Do nothing because the TST is positive due to BCG vaccine
B. Send the patient back to the prenatal clinic with a prescription for one month of INH.
C. Send the patient for a CXR with abdominal shielding.
D. Instruct patient to schedule an appointment at three months postpartum for further TB evaluation.

Active TB disease was ruled out by medical evaluation that included a sign and symptom screen and a CXR. The radiology report indicated a solitary, calcified granuloma in the right upper lobe, not consistant with active TB disease.

3) What is the TB classification for this patient?

A. Class 1 - TB exposure, no evidence of infection.
B. Class 2 - TB infection, no TB disease.
C. Class 3 - TB, clinically active.
D. Class 4 - Suspected of TB.

4) Which TB treatment should this patient receive?

A. Treatment for TB infection with RIF for four months or INH for nine months.
B. Treatment for TB infection with a short course regimen of INH and rifapentine (3HP).
C. None, inform the patient she should be followed with annual chest X-rays.
D. None, inform the patient that she should not have any more children because of her TB diagnosis.

The patient was started on treatment for TB infection with INH 300 mg daily for nine months.

5) How should the local health department nurse monitor this patient that is being treated with INH?

A. Monitor LFTs while on INH and assess for signs and symptoms of hepatotoxicity.
B. Monitor visual acuity.
C. Evaluate for peripheral neuropathy monthly.
D. A and C.

She received a total of nine months of INH (five months during pregnancy and four months postpartum). The local health department monitored her closely after delivery because of her increased risk of hepatotoxicity in the postpartum period. She completed treatment successfully without side effects or adverse reactions.

REFLECTION

In this scenario, the patient requested a TB screening with her obstetrician because her uncle was diagnosed with TB. In some areas in the United States with a high rate of TB or with individuals with risk factors such as recent travel to a high burden area, a tuberculin skin test may be included in a prenatal office visit. Refer to your programs policy and procedures for screening expectant mothers for TB.

A CXR is recommended for expectant mothers who have a positive skin tests or who have a negative skin test but have been identified as a recent contact to a person with infectious TB disease. CXR with appropriate shielding may be done as soon as possible even during the first trimester of pregnancy. Although treating a woman for tuberculosis infection during pregnancy may be a challenge, in some circumstances the potential risks to mom and child may be greater if left untreated.

ANSWERS

1) **What should the local health department nurse do next?**
Answer: Conduct a TB nurse assessment to identify symptoms and risk factors for TB.
Rationale: A nurse assessment for a pregnant woman is crucial to identify factors that may increase her risk for progression to TB disease such as contact to an active TB case, past history of TB, and comorbidities.[8]

2) **What is the next appropriate action by the local health department nurse?**
Answer: Send the patient for a CXR with abdominal shielding.
Rationale: Contacts to people with active TB disease should undergo further examination, starting with a CXR. Abdominal shielding is recommended for pregnant patients.[9]

3) **Which is her TB classification?**
Answer: Class 2 - TB infection, no TB disease.
Rationale: Her CXR revealed a solitary, calcified granuloma in the right upper lobe, not consistant with active TB disease however, her TST result was positive.[4]

4) **Which TB treatment should this patient receive?**
Answer: Treatment for TB infection with RIF for four months or INH for nine months.
Rationale: INH daily for nine months is the preferred treatment regimen for TB infection. 3HP is not recommended for pregnant women.[8]

5) **How would you monitor this patient that is being treated for INH?**
Answer: A and C.
Rationale: INH is one of the drugs most commonly know to cause peripheral neuropathy. Although LFT testing is not indicated for all patients on TB infection treatment, it is recommended for women who are pregnant or in the immediate postpartum period.[4]

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[4] Centers for Disease Control and Prevention. (2013). *Core curriculum on Tuberculosis: What the clinician should know, 5th ed.* Atlanta, GA: US Department of Health and Human Services, CDC.

[8] Centers for Disease Control and Prevention. (2016). *Latent Tuberculosis Infection: A Guide for Primary Health Care Providers.* Retrieved from https://www.cdc.gov/tb/publications/ltbi/default.htm

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CASE STUDY #10

TB Infection and INH Resistant Contact

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TB Infection and INH Resistant Contact

A 55 year old Vietnamese male contacts the local health department to schedule an appointment because he was identified as a close contact to a person with active TB disease. The nurse confirms that his brother who lives in the home with him was recently diagnosed with active TB disease and schedules an appointment for him. He tells the nurse he understands some English, but prefers to speak Vietnamese.

1) **Which of these actions should the local health department nurse take?**
   - A. Find a qualified interpreter to facilitate the clinician-patient interaction.
   - B. Ask the patient to bring a family member to the appointment to translate.
   - C. Ask him to use an app for translation during the interview.
   - D. Do not consider the language barrier and continue speaking slowly.

The nurse employed the services of Language Line® the interpreting service used by the clinic to conduct the screening. The clinic visit included the placement of a TST and a symptom screening. During the visit, he reported having a TST 4 months ago as part of a job-readiness screening which was negative and did not indicate having signs or symptoms of TB. The patient returned to the clinic two days later as instructed for his TST results which was interpreted as 9mm indurated.

2) **How is this TST result interpreted?**
   - A. This is a false positive reaction due to prior BCG vaccine.
   - B. The TST is positive because the cutoff point for recent contacts is 5 mm induration.
   - C. Interpret the TST as negative because it is less than 10 mm induration which is the cutoff point for foreign-born individuals.
   - D. The TST result is unreliable for this patient and should be confirmed with an IGRA test.

Upon classification of a positive TST reaction, the patient is referred for a CXR and a clinical assessment to rule out TB disease. His medical history includes hypertension and history of BCG vaccine at birth, but is otherwise unremarkable. The patients CXR results were normal. His social history revealed that the he is currently living alone, is a recovering alcoholic, and denies all other substance use. He seems quiet and withdrawn and has a disheveled appearance.

3) **Which of these actions should the local health department nurse take?**
   - A. Nothing, he probably won't take treatment anyway.
   - B. Start him on treatment for TB infection.
   - C. Wait for susceptibilities from the source case.
   - D. Collect sputum specimens for AFB.

The local health department nurse provided TB education materials in his primary language and explained the difference between TB infection and TB disease. He was started on treatment with INH for nine months. 2 weeks after starting treatment the local health department received susceptibility results for the source case indicating that he has INH resistant TB.

4) What should the next course of action be?
   - A. Explain to the patient that he may be infected with a drug resistant strain of TB.
   - B. Consult an expert with experience in treating patients exposed to INH resistant TB.
   - C. Place the patient in respiratory isolation.
   - D. A and B.

The nurse consulted with a TB expert for treatment options, and the patient was instructed to stop taking the INH, and return to the clinic with the bottle of untaken medications.

5) Which treatment for TB infection would molst likely be recommended for a close contact to a patient with INH resistant TB?
   - A. RIF for four months
   - B. INH for nine months
   - C. RIPE
   - D. 3HP

At the clinic the patient was reeducated to include drug resistant TB, discuss the new treatment plan, and potential side effects and adverse reactions. The patient was started on RIF daily for four months.

6) What are some potential side effects of RIF?
   - A. Rash
   - B. orange discoloration of urine
   - C. Gastrointestinal symptoms
   - D. All of the above

REFLECTION

In this scenario, an interpreter was used to facilitate the patient visit. When providing care for individuals whose primary language is different from the provider, it is important to secure interpretation services so that the patient is aware of all medical procedures and questions can be addressed appropriately in order to reduce the potential for medical errors and increase the quality of care.

The patient was started on treatment for TB infection with INH for nine months because he was a recent contact to a case and drug resistance was not suspected. If there is concern that the source case may have drug resistance, treatment for TB Infection should be delayed until susceptibilities for the source case are received. Given that the patient was starting a new treatment regimen, it is important that he is re-educated in his primary language on potential side effects and adverse reactions to the new regimen.

ANSWERS

1) **Which of these actions should the local health department nurse take?**
Answer: Find a qualified interpreter to facilitate the clinician-patient interaction.
Rationale: In order to communicate effectively, the local health department should use interpreters who are fluent in the patient's primary language during clinician/patient interaction.[6]

2) **How is this TST result interpreted?**
Answer: The TST is positive because the cutoff point for recent contacts is 5 mm induration.
Rationale: The TST interpretation depends on risk factors (close/recent contact to source case) for progression to TB disease.[4]

3) **Which of these actions should the local health department nurse take?**
Answer: Start him on treatment for TB infection.
Rationale: Individuals who are recent contacts of persons diagnosed with infectious TB disease should be given high priority for treatment of TB infection.[11]

4) **What should the next course of action be?**
Answer: A and B
Rationale: Consultation with a TB expert is recommended for selecting or modifying a regimen to treat contacts of patients with drug resistant pulmonary TB.[6]

5) **Which treatment for TB infection would molst likely be recommended for a close contact to a patient with INH resistant TB?**
Answer: RIF for four months.
Rationale: Patients who have been exposed to INH resistant TB should be treated with RIF for four months.[6]

6) **What are some potential side effects of RIF?**
Answer: All of the above
Rationale: Rash, orange discoloration of urine, gastrointestinal symptom, hypersensitivity are some potential side effects of RIF.[11]

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[4] Centers for Disease Control and Prevention. (2013). *Core curriculum on Tuberculosis: What the clinician should know, 5th ed*. Atlanta, GA: US Department of Health and Human Services, CDC.

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CASE STUDY #11

Tuberculosis Infection in a Homeless Man

HEARTLAND
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Tuberculosis Infection in a Homeless Man

A 45 year old male was referred to the local health department from a homeless shelter to be screened per protocol that requires residents to present evidence that they have been screened for TB prior to admission. The local health department nurse conducts a symptoms screening which is unremarkable and places a TST on the patient with instructions to return in 48-72 hours for his results. The patient returned to the clinic 2 days later with an induration of 11 mm. The patient stated that this is how my arm looked the last time I had this test. Upon further investigation, the nurse did not find record that the patient was ever tested or offered/received treatment for TB infection or disease.

1) **How should the TST be interpreted?**
   - A. Negative, he was tested as per a screening protocol and his induration is less than 15 mm.
   - B. Negative, he was a previous positive which negates this test.
   - C. Too close to tell, any induration on the cusp of a cut point should be re-evaluated by a colleague.
   - D. Positive, an induration > 10 mm is considered positive in high risk groups such as residence of a homeless shelter.

Given that he belongs to a high risk group with a positive TST results, the local health department nurse proceeded with a clinical and social assessment to rule out active TB disease. The social assessment revealed that he is U.S. born, currently unemployed, has stayed at several homeless shelters and does not have a permanent residence. His clinical assessment revealed a history of mental illness which he is being treated for with Lamictal®. A CXR was requested, however the patient stated that he had one seven months ago and he was *just fine*.

2) **What should the local health department nurse do?**
   - A. Delay ordering a CXR because he already had one in the last year.
   - B. Explain the risk of exposure to TB in congregate settings and the importance of the diagnostic evaluation and send him for a current CXR.
   - C. Prescribe a one-month supply of TB infection medication.
   - D. Recommend against any further follow-up once you ascertain that he does not have TB disease; TB infection treatment in homeless is rarely successful.

The local health department nurse explained the risk of exposure to TB in homeless shelters, sent him for a CXR; results were normal. He was diagnosed with TB infection and initially offered the standard nine months therapy with INH but he expressed a concern about spending the next several months taking medication.

3) **Given his medical history and social circumstances which treatment regimen would offer the best chance for treatment completion?**
   - A. RIF for four months.
   - B. INH for nine months.
   - C. 3HP for twelve weeks.
   - D. This patient is not a good candidate for TB infection treatment.

Taking the patients concerns to the physician, the patient was then offered once weekly Isoniazid/Rifapentine (3HP) treatment by DOT for a total of twelve doses.

The patient was present at the clinic for DOT the first two weeks but did not return to the clinic stating that he did not have transportation, however expressed his willingness to adhere to treatment until completion.

4) What should the clinic do for this patient who has had an interruption in treatment?

A. Count the first two weeks as completed and continue INH-RPT treatment where he left off.
B. Do not restart treatment, as this patient is unreliable.
C. Initiate treatment of patient with a new 12 dose 3HP regimen. The patient will need to begin as if starting over which will include a symptom screen, baseline LFTs and a repeat CXR.
D. Warn the patient that erratic treatment could cause INH-resistant/Rifapentine (rifamycin) resistant TB disease and admonish him to be more responsible.

Ten weeks after restarting LTBI treatment with the 3HP regimen the patient kept all his clinic appointments which were uneventful with exception of missing two doses. Records tallied at each visit indicated he completed twelve doses of 3HP.

Date	DOT Adm.	Dose Missed	DOT Provider Signature	Client's Signature	Comments/Notes
6/12	✓		Jane Doe	John Smith	
6/19	✓		Jane Doe	John Smith	
6/26		✓	Jane Doe		Did not show for DOT appointment
7/03	✓		Jane Doe	John Smith	Indicated he did not have a ride last week, willing to continue to completion.
7/10	✓		Jane Doe	John Smith	
7/17	✓		Jane Doe	John Smith	
7/24		✓	Jane Doe		Did not show for DOT appointment
7/31		✓	Jane Doe		Did not show for DOT appointment
8/07	✓		Jane Doe	John Smith	Indicated he was working and couldn't leave work for visit. Made arrangements with work to continue treatment.
8/14	✓		Jane Doe	John Smith	
8/21	✓		Jane Doe	John Smith	
8/28	✓		Jane Doe	John Smith	
9/04		✓	Jane Doe		Did not show for DOT appointment
9/11	✓		Jane Doe	John Smith	Re-educated on importance of completing treatment.
9/18	✓		Jane Doe	John Smith	
9/25	✓		Jane Doe	John Smith	

5) According to his DOT log below, what should be done at this point?

A. Give patient a letter or LTBI card documenting completion of TB infection treatment.
B. Instruct patient of potential signs and symptoms of TB disease and give him information on where to go if he develops signs and symptoms.
C. Instruct the patient that he is allergic to TST and he should never have one again.
D. Both A and B.

REFLECTION

One role the local health department nurse assumes when caring for patients with or at risk for tuberculosis is the role of social worker. It is essential to identify potential barriers to treatment and possible resources, while at the same time not making generalizations about the patient. Patient education and referrals are key to successful completion of therapy for a patient who has special social and medical considerations that may impede care. In this scenario, the patient was very compliant with the evaluation and treatment process. He missed a few DOT appointments, but still completed treatment within the required timeframe of 16 weeks. The 3HP regimen was designed to allow for minor interruptions in treatment with the understanding that life circumstances can disrupt treatment.

ANSWERS

1) **How should the TST be interpreted?**
Answer: All of the above
Rationale: It is important to ask about clinical signs and symptoms of TB to assess the possibility of TB disease and need for further diagnostic evaluation. If documentation of his previous TST results is not readily available, it is best to proceed with TB screening at this time. Use of an IGRA as a replacement for a TST is an acceptable method. An IGRA is preferred for testing persons from groups that historically have low rates of returning to have TSTs read such as homeless persons and substance users. The use of IGRAs for such persons can increase test completion rates, so control efforts can focus on those most likely to benefit from further evaluation and treatment. Successful patient education will enable him to accept and invest in his future evaluation and treatment plan. It is important to collect information on how to successfully contact the patient for follow-up; especially homeless individuals.[4]

2) **What should the local health department nurse do?**
Answer: Explain the risk of exposure to TB in congregate settings and the importance of the diagnostic evaluation and send him for a current CXR.
Rationale: Persons with positive TST or IGRA should be evaluated to rule out TB disease. Once TB disease has been ruled out the patient should be conisdered for treatment of TB infection. Individuals who reside in congregate settings, such as a homeless shelters, are at high risk of progression to TB disease and should be screened appropriately.[4]

3) **Given his medical history and social circumstances which treatment regimen would offer the best chance for treatment completion?**
Answer: 3HP for twelve weeks.
Rationale: Weekly 3HP should be considered for treating TB infection in patients that are unlikely to complete nine months of daily INH or are in high risk categories such as homeless shelters.[10]

4) **What should the clinic do for this patient who has had an interruption in treatment?**
Answer: Count the first two weeks as completed and continue INH-RPT treatment where he left off.
Rationale: Completion of 3HP is defined as taking twelve doses within a sixteen week preriod.[10]

5) **What should be done to finish out management and care of this patient(you may select more than one)?**
Answer: Both A and B.
Rationale: An LTBI card with information that indicates he completed TB infection treatment. The completion card will communicate to future public health workers that he has a previous positive TST and has already undergone successful TB infection treatment. Instruct patient of potential signs and symptoms of TB disease and give him information on where to go if he develops signs and symptoms.[18]

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CASE STUDY #12

Tuberculosis Infection & HIV

HEARTLAND
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Tuberculosis Infection and HIV

A 42 year-old male living with HIV was identified as a close contact to his girlfriend who was recently diagnosed with TB disease. He was contacted by the local health department for TB screening.

1) Which TB screening test should he initially be evaluated with?
   A. TST
   B. IGRA
   C. A and B
   D. A or B

The local health department nurse decided to place a TST that resulted in a 6 mm induration.

2) What action should be taken next?
   A. Repeat the TST because it is not reliable in this population.
   B. Confirm the TST with an IGRA test.
   C. Send patient for CXR.
   D. Nothing, because the TST result is negative and TB infection can be ruled out.

The nurse assessment revealed a medical history of HIV, hypertension, a peptic ulcer, and occassional alcohol consumption. His physical exam was unremarkable. A symptom screen and a CXR were performed to rule out active TB disease and the results indicated no evidence of active TB.

3) How should this patient be classified?
   A. Class 0 - No TB exposure, not infected.
   B. Class 1 - TB exposure, no evidence of infection.
   C. Class 2 - TB infection, no TB disease.
   D. Class 5 - TB suspected.

The patient was diagnosed with TB infection. The local health department nurse provided education about the risk of progression to active TB disease for individuals living with HIV. The HIV clinic was contacted to exchange information about HIV and TB treatment regimen to check for drug-drug interactions.

Based on the patient's HIV treatment, the health department decided to treat with rifabutin for four months.

4) What should be done prior to initiating TB infection treatment?
   A) Place the patient in respiratory isolation.
   B) Baseline hearing screening.
   C) Obtain baseline laboratory testing for liver function tests (LFTs).
   D) Baseline visual acuity.

His baseline liver enzyme results came back:

- AST (SGOT) - 104 units/L (normal 0-37 units/L)
- ALT (SGPT) - 127 units/L (normal 0-40 units/L)
- Total Bilirubin - 1.0 mg/dL (normal 0.3-1.0 mg/dL)

5) Due the patient's elevated liver enzymes at baseline, what is the next step?

A) Encourage patient to abstain from alcohol use and recheck LFTs in one week.
B) Give patient prescription for 1 month supply of RFB.
C) Immediately refer the patient to an alcohol treatment program.
D) Give patient prescription for 1 month supply of INH.

The patient returned to the clinic for a follow-up visit after 2 weeks. The LFTs were within normal limits and he was started on RFB daily. After one month of treatment a follow-up nurse assessment indicated no side effects. Follow-up lab monitoring was obtained and the results showed slightly elevated values. The patient reported that he had been drinking alcohol again. His test results were:

- AST (SGOT) - 52 units/L (normal 0-37 units/L)
- ALT (SGPT) - 59 units/L (normal 0-40 units/L)
- Total Bilirubin - 0.7 mg/dL (normal 0.3-1.0 mg/dL)

The local health department nurse continued the RFB and re-educated for signs and symptoms of hepatotoxicity. The lab monitoring initially showed elevated values, however the patient had no complaints and his LFTs improved over time. He appeared to be in good health and reported no problems adhering to treatment. He said he had stopped drinking alcohol and had joined a survivor's support group. He completed four months of treatment for TB infection successfully and continued his HIV treatment with monitoring by the HIV clinic.

REFLECTION

In this scenario, the patient's TST resulted in a 6 mm induration which is classified as positive for those who are identified as contacts to a person diagnosed with a contagious form of tuberculosis as well as a person with an immunocompromising condition such as HIV. However, a negative TST (induration < 5 mm) does not exclude the diagnosis of TB (especially for patients with severe TB illness or infection with HIV). Patients with HIV who may not react to testing by TST or IGRA should have a chest x-ray and medical evaluation if TB is suspected or if exposed to active TB disease. If abnormalities are noted, or the client has symptoms suggestive of extrapulmonary TB, additional diagnostic tests should be conducted. In HIV-infected individuals, almost any abnormality on CXR may be indicative of TB.

Completion rates with INH for 9 months are much lower than shorter regimens such as rifabutin for four months which show higher completion rates. When using rifampin or rifabutin, it is important to remember to check for potential drug-drug interactions. INH is a treatment option in persons who have medication interactions that do not allow use of a rifamycin. Patients who are taking INH with their other medications prescribed on a long-term basis or who use alcohol regularly should be monitored closely.

ANSWERS

1) **Which TB screening test should he initially be evaluated with?**
Answer: A or D
Rationale: Individuals with high risk factors (HIV infection and close contacts to a person diagnosed with active TB) should be tested for TB using a TST or IGRA.[4]

2) **What action should be taken next?**
Answer: Send patient for CXR.
Rationale: A CXR is indicated for close contacts with HIV regardless of TST result.[19]
LTBI guidelines primary HCP

3) **How would you classify this patient?**
Answer: Class 2 - TB infection, no TB disease.
Rationale: His CXR revealed no evidence of active TB disease however, his TST result was positive.[4]

4) **Before initiating TB infection treatment, what should you do?**
Answer: Obtain baseline laboratory testing for liver function tests (LFTs).
Rationale: Although baseline labs are not generally indicated at initiation of treatment, it is recommended for persons living with HIV infection or who have risk factors for hepatotoxicity. If baseline laboratory testing is abnormal, LFTs should be monitored monthly.[4]

5) **Due to the patient's elevated liver enzymes at baseline, what is the next step?**
Answer: Encourage patient to abstain from alcohol use and recheck LFTs in one week
Rationale: During concurrent treatment with hepatotoxic drugs, regular alcohol consumption can greatly increase the risk of hepatotoxicity.[19]

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APPENDICES

HEARTLAND
NATIONAL TB CENTER
A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

Smear Classification Results

Smear Result (Number of AFB observed at 1000X magnification)	Smear Interpretation	Infectiousness of Patient
4+ (>9/field)	Strongly positive	Probably very infectious
3+ (1-9/field)	Strongly positive	Probably very infectious
2+ (1-9/10 fields)	Moderately positive	Probably infectious
1+ (1-9/100 fields)	Moderately positive	Probably infectious
+/- (1-2/300 fields)*	Weakly positive†	Probably infectious
No acid-fast bacilli seen	Negative	Probably not infectious**

* There are variations on labeling for this result, and include listing the number of AFB counted.

† Laboratories may report these smear results as "doubtful" or "inconclusive" based on CDC guidelines.

** The criteria for determining whether a patient may be considered noninfectious are discussed in Chapter 7 on TB Infection Control.

Centers for Disease Control and Prevention. (2013). Smear Classification Results [Table]. In Centers for Disease Control and Prevention *Core curriculum on Tuberculosis: What the clinician should know*, 5th ed. Atlanta, GA: US Department of Health and Human Services, CDC.

Criteria for Patients to Be Considered Noninfectious

Criteria
Patients can be considered noninfectious when they meet all of the following three criteria: 1. They have three consecutive negative AFB sputum smears collected in 8- to 24-hour intervals (at least one being an early morning specimen); 2. Their symptoms have improved clinically (for example, they are coughing less and they **no longer** have a fever); **and** 3. They are compliant with an adequate treatment regimen for 2 weeks or longer.

Centers for Disease Control and Prevention. (2013). Criteria for Patients to Be Considered Noninfectious [Table]. In Centers for Disease Control and Prevention *Core curriculum on Tuberculosis: What the clinician should know*, 5th ed. Atlanta, GA: US Department of Health and Human Services, CDC.

GUIDELINES FOR HOME AND HOSPITAL ISOLATION OF INFECTIOUS TUBERCULOSIS PATIENTS[a,b]

Patient Characteristics at Diagnosis	Hospitalized under AII and being released to:	Discharge Criteria for Release from AII for Adults and Children with Pulmonary Disease
AFB smear positive NAA test positive Patient is suspected of having active TB	• General hospitalization • Outpatient congregate setting • Home or setting with high-risk contacts	1) Received the standard four drug regimen for at least 2 weeks if original AFB smear positive OR is on therapy for 5-7 days if original AFB smear was negative; **AND** 2) Demonstrates clinical improvement and adherence to DOT; **AND** 3) Three consecutive negative AFB smears collected at least 8 hours apart with at least 1 early morning specimen; **AND** 4) No risk factors for drug resistance.
AFB smear negative, TB is not suspected NAA test is negative and/or another diagnosis is likely	• General hospitalization • Returning to school • Returning to work • Use of public transportation	1) Three consecutive negative AFB smears collected at least 8 hours apart with at least 1 early morning specimen; **AND** 2) TB is not likely and another diagnosis has been identified.
AFB smear negative **AND** *TB is suspected or confirmed through NAA testing*	Return to normal activities including: • General hospitalization • Returning to school • Returning to work • Use of public transportation	1) Received the standard four drug regimen for at least 5-7 days; **AND** 2) Demonstrates clinical improvement and adherence to DOT; **AND** 3) Three consecutive negative AFB smears collected at least 8 hours apart with at least one early morning specimen; **AND** 4) No risk factors for drug resistance.
Confirmed MDR- or XDR-TB infection	Return to normal activities including: • Returning to school • Returning to work • Use of public transportation	1) Receiving and tolerating appropriate MDR-TB regimen; **AND** 2) Demonstrates clinical improvement and adherence to DOT; **AND** 3) Three consecutive negative AFB cultures*. **Expert opinion varies; some experts satisfied with negative smears*

[a] Individuals who are returning to work or live in environments with immunocompromised individuals (neonates, HIV+, transplant recipients, etc.) should be considered individually; more conservative measures should be considered

[b] A person suspected of/confirmed of TB may be released from hospital to home setting if there are no high risk individuals in the home, even if they do not meet the criteria for release from isolation. Clinical judgement and consultation with public health is recommended.

***AFB** - Acid-fast bacilli*   ***AII** - airborne infection isolation*   ***DOT** - Directly Observed Therapy*   ***MDR** - Multi-drug resistant*   ***NAA** - Nucleic Acid Amplification*
***TB** - Tuberculosis*   ***XDR** - Extensively-drug resistant*

GUIDELINES FOR HOME AND HOSPITAL ISOLATION OF INFECTIOUS TUBERCULOSIS PATIENTS^{a,b}

Factors that Predict Transmission

Susceptibility	Immune status of the exposed individual; ie. HIV infection, organ transplant, immunosuppressive therapy, diabetes, kidney disease, IV drug use, etc.)
Infectiousness	A patient who expels many tubercle bacilli are more infectious than a patient who expel few or no bacilli
Exposure	The longer, more frequent and close in proximity an individual is to an infectious person, the higher the chance for transmission
Clinical Factors	Presence of cough, failure to cover mouth and nose when coughing, respiratory tract disease, inappropriate or inadequate treatment (drugs, duration), high sociability of a patient. **This list is not all-inclusive*
Anatomical site	The following are the most infectious: pulmonary TB disease, extrapulmonary TB in addition to pulmonary tb, disease located in the oral cavity or the larynx or disease in an open abscess or lesion
Radiographic	Most infectious: cavitation (vs. noncavitary disease) on chest radiograph, positive AFB sputum smear and positive culture
Age	Transmission from children <10 years is unusual unless the chest radiograph is similar to adult pulmonary disease and/or shows cavitary changes
Adherence	Inadequate treatment can prolong the period of infectiousness and put the patient at risk for drug-resistant TB disease. Some patients with severe disease will remain smear and culture positive after several weeks of treatment however, isoniazid and rifampin are associated with a more rapid conversion.

Frequently Asked Questions

Is an AII room the same as a negative-pressure isolation room?

An AII room is a special negative-pressure room for the specific purpose of isolating persons who might have suspected or confirmed infectious TB disease from other parts of the setting. Not all negative-pressure rooms are AII rooms because they might not have the required air flow or differential pressure.

When can airborne precautions in a healthcare or congregate setting be discontinued?

When a patient has been on adequate therapy for 2 weeks or longer, symptoms improve, and there have been three consecutive, negative AFB sputum smear results with at least one being an early morning specimen.

Can a patient on home isolation go out as long as he wears a mask?

Patients with infectious disease should stay in the home unless travelling to a necessary medical appointment. A patient may engage in outdoor activities while avoiding close face-to-face contact.

What if the patient remains smear positive but cultures come back negative?

Negative cultures contain nonviable organisms. The mycobacteria are dead and not capable of spreading disease. HCW's may consider this patient for release from isolation when accompanied with other factors.

References

1. *Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC.* Centers for Disease Control and Prevention. MMWR: December 16, 2005; Volume 54 (RR-15); p1-37.
2. *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Settings*. Centers for Disease Control and Prevention. MMWR: December 30, 2005; Volume 54 (RR17).
3. *Controlling Tuberculosis in the United States*. Centers for Disease Control and Prevention. MMWR: November 4, 2005; Volume 54 (RR12s).
4. *Introduction to the Core Curriculum on Tuberculosis: What the Clinician Should Know.* Centers for Disease Control and Prevention. 6th Edition, 2013.

HEARTLAND
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A PARTNERSHIP OF UT HEALTH NORTHEAST AND TCID

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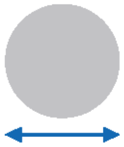
Interpreting the TST Reaction

		
5 or more millimeters	**10 or more millimeters**	**15 or more millimeters**
An induration of **5 or more millimeters** is considered positive for • HIV-infected persons • Recent contacts of persons with infectious TB • People who have fibrotic changes on a chest radiograph • Patients with organ transplants and other immunosuppressed patients (including patients taking a prolonged course of oral or intravenous corticosteroids or TNF-*α* antagonists)	An induration of **10 or more millimeters** is considered positive for • People who have come to the United States within the last 5 years from areas of the world where TB is common (for example, Asia, Africa, Eastern Europe, Russia, or Latin America) • Injection drug users • Mycobacteriology lab workers • People who live or work in high-risk congregate settings • People with certain medical conditions that place them at high risk for TB (silicosis, diabetes mellitus, severe kidney disease, certain types of cancer, and certain intestinal conditions) • Children younger than 5 years of age • Infants, children, and adolescents exposed to adults in high-risk categories	An induration of **15 or more millimeters** is considered positive for • People with no known risk factors for TB

Centers for Disease Control and Prevention. (2013). Interpreting the TST Reaction [Table]. In Centers for Disease Control and Prevention *Core curriculum on Tuberculosis: What the clinician should know*, 5th ed. Atlanta, GA: US Department of Health and Human Services, CDC.

Expert Resources for Drug-Resistant TB

Regional TB Training and Medical Consultation Centers (RTMCCs)

Curry International Tuberculosis Center (CITC)

Service area: Alaska, California, Colorado, Hawaii, Idaho, Nevada, Oregon, Utah, Washington, and the U.S. Affiliated Pacific Islands.

University of California, San Francisco
300 Frank H. Ogawa Plaza, Suite 520, Oakland, California 94612
Telephone: 510-238-5100 main office
TB Medical Consultation: 877-390-6682 (toll-free)
Website: www.Currytbcenter.ucsf.edu
Email: CurryTBcenter@ucsf.edu

Heartland National Tuberculosis Center (HNTC)

Service area: Arizona, Arkansas, Kansas, Louisiana, Missouri, Nebraska, New Mexico, Oklahoma, and Texas

The University of Texas Health Science Center at Tyler
2303 SE Military Drive, San Antonio, TX 78223
Telephone: 800-TEX-LUNG (800-839-5864) (toll free)
Website: www.heartlandntbc.org
Email: catalina.navarro@uthct.edu; debbie.onofre@uthct.edu

Mayo Clinic Center for Tuberculosis

Service area: Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming

200 First Street SW, Rochester, Minnesota 55905
Telephone: 855-360-1466 (toll-free)
Website: http://centerfortuberculosis.mayo.edu
Email: tbcenter@mayo.edu

New Jersey Medical School Global Tuberculosis Institute at Rutgers (GTBI)

Service area: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Washington, DC.

225 Warren Street 2nd floor, East Wing, Newark, New Jersey 07103
Telephone: 973-972-3270
TB Medical Consultation: 800-4TB-DOCS (toll free)
Website: http://globaltb.njms.rutgers.edu/
Email: globaltbinstitute@njms.rutgers.edu

Southeastern National Tuberculosis Center (SNTC)

Service area: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, Puerto Rico, and U.S. Virgin Islands

2055 Mowry Road, Gainesville, Florida 32611
Telephone: 352-273-SNTC; 888-265-SNTC (toll free)
TB Medical Consultation: 800-4TB-INFO (toll free)
Website: http://sntc.medicine.ufl.edu
Email: sntc@medicine.ufl.edu

California Department of Public Health, Center for Infectious Diseases, Division of Communicable Disease Control, TB Control Branch, MDR-TB Service

The TB Control Branch offers telephone and e-mail consultations for providers within California. Consultation can continue throughout treatment and includes assistance with clinical and public health management of MDR-TB patients.

850 Marina Bay Parkway, Richmond, California 94804
Telephone: 510-620-3000
Website: https://www.cdph.ca.gov/programs/tb/
E-mail: lisa.true@cdph.ca.gov

Centers for Disease Control and Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Division of Tuberculosis Elimination (DTBE)

CDC/DTBE provides programmatic consultation to local and state health departments including onsite assistance for outbreaks and medical consultation for management of individual patients. CDC/DTBE also provides information on current guidelines and their interpretation.

CDC/DTBE, Mailstop E-10
1600 Clifton Road, NE, Atlanta, Georgia 30333
Telephone: 800-CDC-INFO (toll free)
Website: www.cdc.gov/tb/
E-mail: cdcinfo@cdc.gov

National Jewish Health Mycobacterial Diseases Consult Line

The Mycobacterial Consult Service at National Jewish Health helps practitioners manage drug-resistant tuberculosis and other refractory mycobacterial and respiratory infections. The consult line provides telephone, email, and web-based consultations for health care professionals only.

1400 Jackson Street, Denver, Colorado 80206
Telephone: 800-652-9555 (toll free)
Website: https://my.njhealth.org/PatientPortal/Users/Common/Forms/MycobacterialConsultation.aspx
E-mail: physicianline@njhealth.org

New York City Department of Health and Mental Hygiene, Bureau of TB Control

The New York City Bureau of TB Control provides telephone and e-mail consultations, and can provide advice for drug-resistant TB cases outside the New York City area. Patients can be sent to New York City outpatient clinics, which provide free evaluation and treatment.

42-09 28th Street, Queens, NY 11101
Telephone: 347-396-7486
Website: http://www.nyc.gov/health/tb
Contact: Diana Nilsen, MD, RN
E-mail: dnilsen@health.nyc.gov

For contact information for laboratories that conduct molecular testing for drug resistance and therapeutic drug monitoring, see **Chapter 3, *Laboratory.***

Curry International Tuberculosis Center and California Department of Public Health. (2016). Expert Resources for Drug-Resistant TB. *Drug-Resistant Tuberculosis: A Survival Guide for Clinicians*, 3rd ed.

Building a Treatment Regimen for MDR-TB

STEP 1

Begin with any **first-line** agents to which the isolate is susceptible

Add a fluoroquinolone and an injectable drug based on susceptibilities

Use any available **PLUS** One of these **PLUS** One of these

First-line drugs	Fluoroquinolones	Injectable agents
Pyrazinamide Ethambutol	Levofloxacin Moxifloxacin	Amikacin Capreomycin Kanamycin[1] Streptomycin[2]

STEP 2

Add **second-line** drugs until you have 4–6 drugs (optimally at least 5) to which the isolate is susceptible (and preferably which have not been used to treat the patient previously)

Pick one or more of these

Oral second-line drugs
Cycloserine
Ethionamide
PAS
Linezolid[3]

STEP 3

If there are not 4–6 drugs available in the above categories, consider **third-line** drugs in consultation with an MDR-TB expert

Consider use of these

Third-line drugs	
Bedaquiline	Meropenem/Clavulanate
Delamanid[4]	Amoxicillin/Clavulanate
Clofazimine	Clarithromycin
Imipenem	High-dose INH

---

1 Not available in U.S.

2 SM: use only if not previously used and if documented susceptibility

3 Although traditionally considered a third-line drug, many experts now use LZD as a second-line drug option

4 Awaiting FDA approval

Curry International Tuberculosis Center and California Department of Public Health. (2016). Building a Treatment Regimen for MDR-TB. *Drug-Resistant Tuberculosis: A Survival Guide for Clinicians*, 3rd ed.

ADMINISTRATION OF AMIKACIN INJECTION

SUPPLIES

- 5 mL syringe
- A 1-inch 22 or 23 gauge needle to draw medication
- A 1 ½ or 2-inch 23 gauge needle for injection
- Amikacin vial
- 1% Lidocaine vial
- Alcohol swabs
- Gloves, Band-Aid, cotton ball, dry gauze

PREPARE INJECTION

Procedure: Identify Patient ⟹ Select Site ⟹ Prepare Injection

- Draw the Amikacin into the 5 mL syringe using the 1-inch 22 or 23 gauge needle.
- Draw 0.5 mL of 1% lidocaine* into **the same** 5 ml syringe.
- Holding the syringe in an up right position, change the 1-inch needle to a 1 ½ or 2-inch 23 gauge needle.
- Discard the uncapped needle in a sharps container.

Preparing the injection

ADMINISTERING INJECTION USING Z-TRACK

- Wash your hands, put on gloves and select site (Figure 1).
- Position the patient so that the muscle at the injection site relaxes.
- Clean the site with an alcohol pad and let it dry thoroughly .
- Use your non-dominant hand to pull the skin downward or laterally to displace the tissue about 1 inch. (Figure 2)
- With the needle at a 90-degree angle to the site, pierce the skin using a smooth, steady motion. (Figure 3)
- Aspirate for 5 to 10 seconds to ensure that you haven't hit a blood vessel.
- Inject the drug slowly at a rate of 10 seconds/mL of medication.
- Ensuring that the needle is completely empty, withdraw the needle with a smooth, steady motion and release the skin to its original position. (Figure 4)
- Use dry gauze to apply very gentle pressure to the puncture site.
- Never massage a Z-track injection site. This may cause irritation or force the drug into subcutaneous tissue.

Figure 2

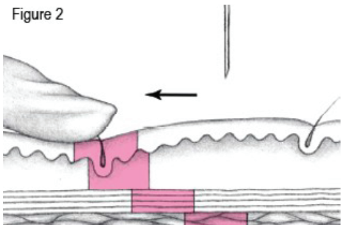


Figure 3

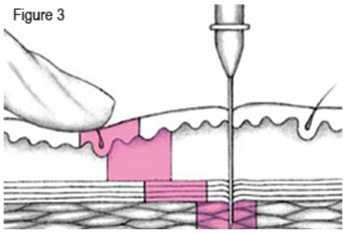
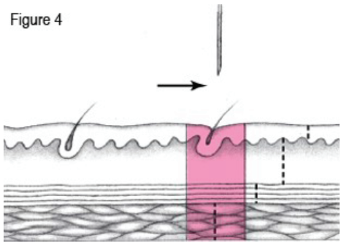


Figure 4



LIMITATIONS AND PRECAUTIONS

- Do not place injections into a disabled limb. If there is decreased circulation, the medication absorption will be affected and an abscess formation can occur.
- Never inject more than 5mL of medication at a time when using the Z-track method. If a larger dose is ordered, divide it and inject it into two separate sites.
- Do not give a Z-track injection into skin that is lumpy, reddened, irritated, bruised, stained, or hardened.
- Encourage the patient to walk about to enhance absorption of the medication.
- Rotate the injection sites from one buttock to the other.

PHARMACOKINETICS

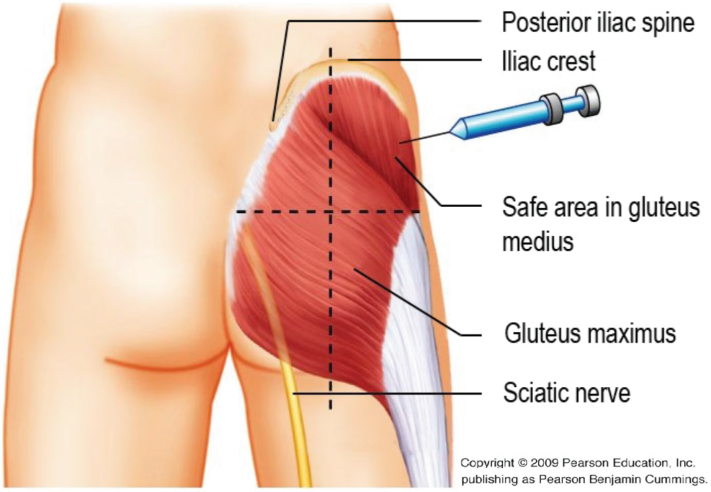
- Intramuscular absorption is complete within 4 hours.
- Peak concentrations are achieved at 1 - 2 hours.

Peak Concentrations for a 15 mg/kg dose are approx. 25 mcg/mL

STORAGE

- Solution is stable at room temperature and requires no refrigeration.

Figure 1 Identifying the site for injection



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***Note:** The use of Lidocaine to ease the pain at the injection site is recommended based upon 30 years of public health experience and practice in Texas. During this time, treatment outcomes have been excellent and no adverse events have been documented related to the combined use of Lidocaine with Amikacin, Streptomycin or Capreomycin.

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		Amikacin	Capreomycin	Streptomycin
Drug Information	**Drug Class**	Aminoglycoside	Cyclic polypeptide	Aminoglycoside
	Trade Name	Amikacin / Amikin	Capastat	Streptomycin sulfate
	Concentration	500 mg/2 mL *or* 1 gram/4 mL	1 gram capreomycin powder	1 gram streptomycin powder
	Storage	Prior to reconstitution, amikacin is stable at room temperature.	Prior to reconstitution, capreomycin is stable at room temperature. Reconstituted capreomycin can be stored up to 24 hours under refrigeration.	Prior to reconstitution, streptomycin can be stored under controlled room temperature.
Dosing	**Adults**	Initial dosing: 15 mg/kg daily, 5-7 days per week; After conversion: 20-25 mg/kg, 2-3 times per week.		
	Children	15-30 mg/kg daily (max 1 gram) 5-7 days per week or 2-3 days per week after initial period of daily administration.		
	>59 years	10 mg/kg/dose (max 750 mg) 5 times per week or 2-3 times per week after initial period.		
	Renal Failure	12-15 mg/kg/dose after dialysis 2-3 times weekly *(not daily)*.		
Side Effects		♦ Electrolyte Abnormalities* ♦ Nephrotoxicity - 9% ♦ Vestibular toxicity/Ototoxicity ♦ Local pain at injection site	♦ Electrolyte Abnormalities* ♦ Nephrotoxicity - 20-25% ♦ Vestibular toxicity/Ototoxicity ♦ Local pain at injection site ♦ LFT abnormalities when used with other TB drugs	♦ Electrolyte Abnormalities* ♦ Giddiness ♦ Hypersensitivity ♦ Lichenoid eruptions ♦ Nephrotoxicity - less nephrotoxic than amikacin ♦ Perioral numbness ♦ Vestibular toxicity/ Ototoxicity
Monitoring		An audiogram, vestibular testing, romberg testing, and serum creatinine should be performed at baseline and monthly. Document creatinine clearance if there is baseline renal impairment. Assessment of renal function, and questioning regarding auditory or vestibular symptoms should be performed monthly. Follow monthly electrolytes potassium, magnesium, and calcium.		
Contraindications		**Hypersensitivity to aminoglycosides** **Caution with renal, hepatic, vestibular, or auditory impairment** **Pregnancy - relative contraindication** due to congenital deafness seen with aminoglycosides	**Hypersensitivity to capreomycin** **Caution with renal, hepatic, vestibular, or auditory impairment** **Pregnancy - generally avoided** due to congenital deafness seen with aminoglycosides.	**Hypersensitivity to aminoglycosides** **Caution with renal, hepatic, vestibular, or auditory impairment.** **Pregnancy - contraindicated** due to congenital deafness seen with streptomycin use in pregnancy.
Use in renal disease		Use with caution. Concentrations should be monitored for patients with impaired renal function. Adjustment of dosing interval is recommended for renal impairment or dialysis. The drug is variably cleared by hemodialysis.		

**Electrolyte abnormalities include hypocalcemia, hypokalemia and hypomagnesemia*

References: **Curry International Tuberculosis Center and California Department of Public Health, 2016:** ***Drug-Resistant Tuberculosis: A Survival Guide for Clinicians, Third Edition*** **p. 100-101; Lippincott Williams & Wilkins, 2013:** ***Take 5 – Z Track Injections.*** **Retrieved August 26, 2013 from http://www.nursingcenter.com/upload/static/592775/Take5_Ztrack.pdf ; Centers for Disease Control and Prevention, 2003:** ***Treatment of TB.***

Interjurisdictional TB Notification (IJN) Form

Type of Referral:
☐ **Active/Suspect TB** - See Section 1
☐ **TB Contact** - See Section 2
☐ **Class A/B** - See Section 3
☐ **TB Infection** - See Section 4

Date of Expected Arrival ☐

Online directory of state and big city TB programs:
www.tbcontrollers.org/community/statecityterritory/

Referring Jurisdiction Information:

City
County
State
Person Completing Form
Email
Phone
Fax

Form Sent to:

Date IJN Form Sent
Name
Phone
Fax
Location
Name
Phone
Fax
Location

Return Follow-Up Form To:

Follow Up Requested
Name
Jurisdiction
Location
Phone
Fax

Referred Person's Information:

Last Name
First Name
Middle Initial
AKA
DOB
Sex
Hispanic
Race/Ethnicity
Country of Birth
Primary Language
Interpreter Needed?

New Address:

#/St/Apt
City
State
Zip
Phone 1
Type
Phone 2
Type
Alternate Contact Name
Phone
Email

National Tuberculosis Nurse Coalition (NTNC)
National Tuberculosis Controllers Association (NTCA)

www.tbcontrollers.org/resources/interjurisdictional-transfers   Revision: May 2015

Referred Person's Name
DOB

SECTION 1: Active/Suspect TB Disease

RVCT Number
Site of Disease
Most Recent Respiratory Smear
Treatment Status
Most Recent Respiratory Culture

Results Attached: Please attach all applicable results

RVCT ☐ TST/IGRA ☐ Radiology ☐ Smear(s) ☐ NAAT ☐ Culture(s)/Pathology ☐

DST/Mutation Analysis
Submitted for Genotyping
Gentype

SECTION 2: TB Contact Investigation

Date of Last Exposure
Contact Priority
Initial TB test
Date
Results: attach results
TST mm
8-12 week post exposure
Date
Results: attach results
TST mm
Radiology
Treatment Status

SECTION 3: Immigrants & Refugees - Class A/B

Classification
Alien #
EDN Transfer Complete
TST/IGRA
US Radiology
Sputa
Treatment Status

SECTION 4: TB Infection - Non-Contact or Class A/B

Results Attached: TST/IGRA ☐ Radiology ☐ Sputa ☐ Treatment Status

Interjurisdictional TB Notification Form (IJN)

www.tbcontrollers.org/resources/interjurisdictional-transfers Revision: May 2015

Referred Person's Name		DOB	

SECTION 5: TB Treatment Summary

Current Treatment Summary for:

Drug		Dosage		Therapy Admin		Date Started	
Drug		Dosage		Therapy Admin		Date Started	
Drug		Dosage		Therapy Admin		Date Started	
Drug		Dosage		Therapy Admin		Date Started	
Drug		Dosage		Therapy Admin		Date Started	
Drug		Dosage		Therapy Admin		Date Started	

Estimated Date of Completion		Last DOT dose administered on:		# of doses given for travel	
Prescription Given		Side Effects or Adherence Problems		MAR/DOT Log Attached	

Comments:

Note: This form contains confidential patient information. Please comply with HIPAA regulations when sending this form.

APPENDIX I

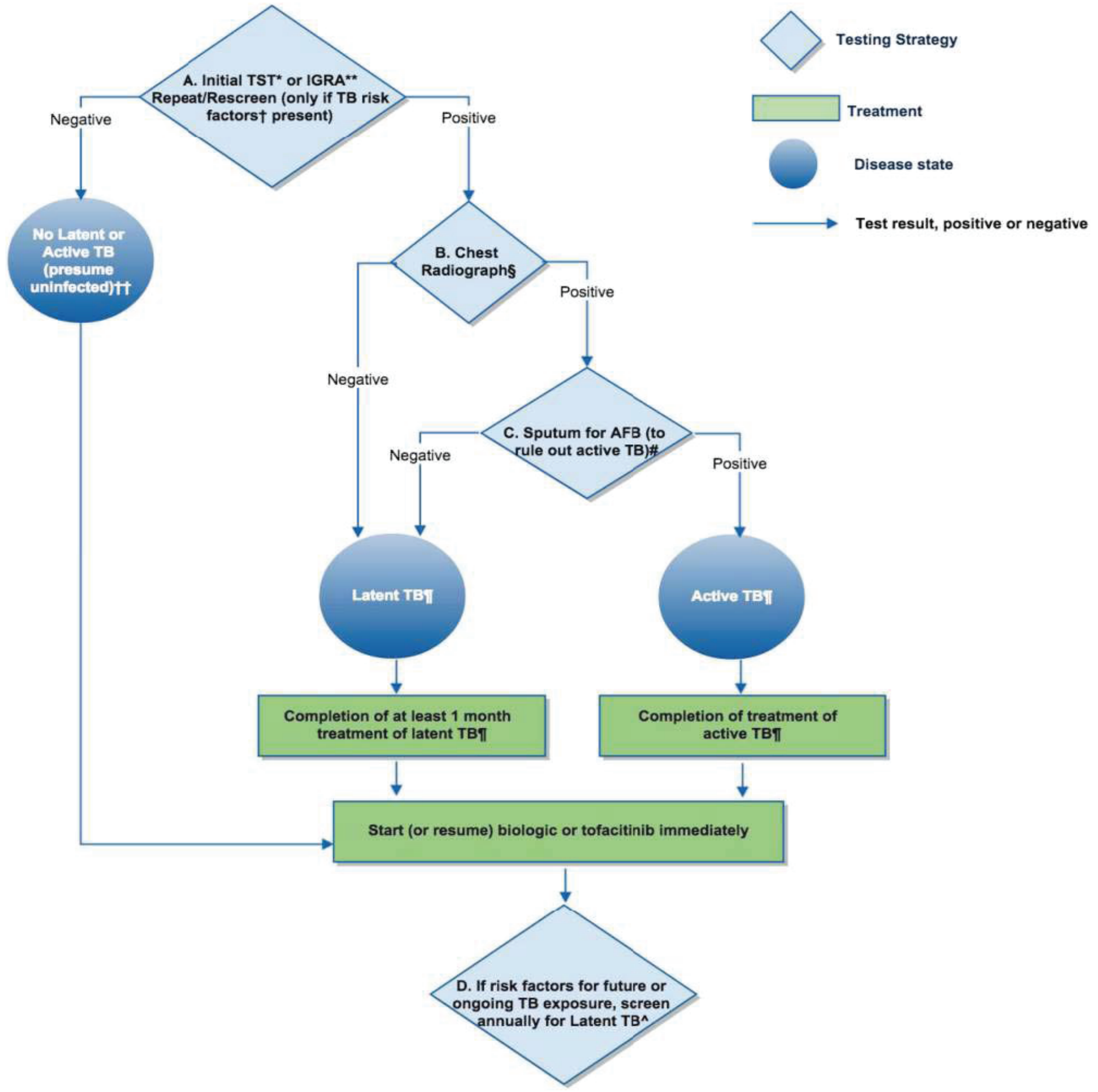

Figure 6. Tuberculosis (TB) screening algorithm for biologics or tofacitinib (endorsed and modified from the 2012 American College of Rheumatology RA treatment recommendations). The Voting Panel reviewed and endorsed the 2012 TB screening algorithm with 1 change, that tofacitinib should be included alongside biologics. * – anergy panel testing is not recommended. ** – interferon-gamma release assay (IGRA) is preferred if patient has a history of BCG vaccination. † – risk factors for TB exposure are defined based on a publication from the US Centers for Disease Control and Prevention as: close contacts of persons known or suspected to have active TB, foreign-born persons from areas that have a high incidence of active TB (e.g., Africa, Asia, Eastern Europe, Latin America, and Russia), persons who visit areas with a high prevalence of active TB, especially if visits are frequent or prolonged, residents and employees of congregate settings whose clients are at increased risk for active TB (e.g., correctional facilities, long-term care facilities, and homeless shelters), health care workers who serve clients who are at increased risk for active TB, populations defined locally as having an increased incidence of latent *Mycobacterium tuberculosis* infection or active TB, possibly including medically underserved, low-income populations, or persons who abuse drugs or alcohol, and infants, children, and adolescents exposed to adults who are at increased risk for latent *M tuberculosis* infection or active tuberculosis (159,160). †† – if patient is immunosuppressed and false-negative results more likely, consider repeating screening test(s) with tuberculin skin test (TST) or IGRA. § – chest radiography may also be considered when clinically indicated in patients with risk factors, even with a negative result on repeat TST or IGRA. # – obtain respiratory (e.g., sputum, bronchoalveolar lavage) or other samples as clinically appropriate for acid-fast bacilli (AFB) smear and culture. Consider referral to TB specialist for further evaluation and treatment. ¶ – in a patient diagnosed as having latent or active TB, consider referral to a specialist for the recommended treatment. ^ – patients who test positive for TST or IGRA at baseline (pretreatment) often remain positive for these tests even after successful treatment of TB. These patients need monitoring for clinical signs and symptoms of recurrent TB disease, since repeating tests will not allow help in diagnosis of recurrent TB. The level of evidence supporting each recommendation for TB reactivation was derived from consensus opinion of experts, case studies, or standards of care. The level of evidence for initiation of biologics in patients being treated for latent TB infection was higher, with data derived from a single randomized trial or nonrandomized studies. Adapted from ref. 5.

Akl, E.A., et al. (2015). Tuberculosis (TB) Screening Algorithm for Biologics or Tofacitinib. In *Guideline for the Treatment of Rheumatoid Arthritis*. American College of Rheumatology.

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