

# "Can't Stop Coughing (But I Need to Get Back to the Shelter by 6)"

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#### Glossary

Latent tuberculosis (TB) infection - Refers to a state in which a person has been exposed to *Mycobacterium tuberculosis*, as demonstrated by an immune response, but has no evidence of disease. People with latent tuberculosis (TB) infection cannot transmit TB.

TB disease (also referred to as "active TB") - Refers to a state in which a person has clinical evidence of TB. While TB disease most often affects the lungs, TB can also affect other parts of the body, such as the brain, spine, and kidneys.

Infectious TB disease - Refers to a state in which a person has clinical evidence of TB that is considered communicable. Pulmonary and laryngeal TB are communicable (infectious TB disease), whereas TB disease of the brain, spine, and kidneys is generally not considered to be communicable.

#### **Learning Objectives**

- 1. Apply the socioecological model to transmission of tuberculosis.
- 2. Analyze an infectious disease outbreak.
- Describe the balance between autonomy (including confidentiality) and justice with respect to disease reporting, communicable disease investigations, and mandated treatment for communicable diseases.

#### **Case Background**

You are a medical student working in the emergency department when a 45-year-old man, James Butler, presents with a cough and fever. Following protocol, the staff placed him in a room by himself. On review of symptoms, Mr. Butler states that he has had night sweats for the past month. He also reports some weight loss, but he attributes this to being homeless and not always having food available to eat.

# 4.1 Background Questions

- 1. Define an epidemic and describe essential elements of an outbreak. What is a contact case investigation?
- 2. What is "directly observed therapy" for tuberculosis?
- 3. What are known risk factors for tuberculosis (TB) infection and active disease?
- 4. What are risk factors for becoming homeless?

- S. What policies/procedures should hospitals have in place to prevent TB transmission in the hospital?
- 6. What legal authority, if any, is there to address non-compliance if a person with active pulmonary TB refuses to take medication?
- 7. Are there public health exemptions to the Health Insurance Portability and Accountability Act (HIPAA) for contagious diseases? Why?

# 4.2 Additional Case Information and Questions for Discussion

*Mr.* Butler's symptoms and history lead you to consider TB in your differential diagnosis. In order to complete a thorough history, you apply the socioecological model to review known risk factors for TB.

- 1. Intrapersonal: Considering what you should ask Mr. Butler, what individual factors would you take into account for this case?
- 2. Interpersonal: What role, if any, do family, friends, and social networks play in the transmission of tuberculosis? How would you assess this with Mr. Butler?
- 3. Organizational: How do organizational factors impact the risk of tuberculosis within a community?

You learn that Mr. Butler was born in the United States and has not travelled outside of the country. He is a smoker and states that in the past he was a heavy drinker and occasionally used intravenous drugs. He recalls being told that he had "a positive TB test" at a shelter in a different city but he did not take any medications. He denies any other pertinent past medical history.

Mr. Butler does not have any contact with family members. He "hangs out" with a few guys he knows from the local shelters. He usually, but not always, spends nights at one of two local homeless shelters. He shares that he has not been there for the past few weeks. He works day jobs when he can find them but that is not often. Based on his clinical presentation and his history, you are concerned that Mr. Butler may have tuberculosis. You recommend a chest X-ray (CXR) and that he be placed in isolation. Your attending physician agrees. The CXR shows right upper lobe consolidation with mediastinal and hilar lymphadenopathy, suggestive of TB.

The patient is admitted to an airborne infection isolation room in the hospital. Sputum samples are sent to the lab. Your attending physician suggests that your fellow medical student also examine the patient, as a learning opportunity. However, when the student hears the complaint and suspicion of TB, he anxiously states, "I have young children at home, and my dad is getting chemotherapy. I don't want to go in there."

- 4. How would you respond to your colleague's concerns?
- Consider a more likely scenario in which a patient with acquired immunodeficiency syndrome (AIDS) is admitted for treatment of disseminated cytomegalovirus (CMV). Standard precautions are typically used for patients with CMV who are hospitalized. However, CMV infection in pregnancy can cause devastating birth defects; therefore, it is not unusual for pregnant healthcare practitioners to avoid providing direct patient care, if other providers are available.
  - (a) Self-reflection: In this scenario, how would you feel about the examination if you or your colleague were pregnant?
  - (b) Do you have the right as a medical or health professions student or trainees to refuse to examine, or be present during the examination of, a patient?
  - (c) How does the prevalence of disease affect our risk perception and risk tolerance? What about the lack of knowledge about an emerging disease?
  - (d) Is there a situation in which you feel the educational benefit does not outweigh the risks? If so, should students or other trainees be barred from patient contact in those situations?

- 6. When can physicians—ethically and legally—refuse to treat a patient? When are they obligated to treat patients?
- 7. Do physicians have special responsibilities in emergency situations?

Your attending physician resolves your colleague's concerns about nosocomial transmission of TB and asks you to partner with the infection control nurse to report this suspected case of tuberculosis to the health department. You learn that there have been three other people, all men, diagnosed with tuberculosis in the past month.

8. Is this an epidemic? How do you make that determination?

## 9. What is the role of the health department in this situation?

The infection control nurse and the attending physician then share an advisory from the health department that they had received earlier that month. In it, the health department details the results of an investigation of recent cases of tuberculosis. The investigation revealed that all of the men who had tuberculosis had been in homeless shelters over that past couple of months; two of them were known to be positive for human immunodeficiency virus (HIV). The advisory provided recommendations for healthcare facilities to help manage cases of tuberculosis, including a reminder for healthcare facilities to ensure that they have the capacity to rapidly identify and isolate any cases of suspected TB, as was accomplished in this case.

- 10. What is the difference between isolation and quarantine? Are either of these strategies likely to be useful in this case?
- 11. Would quarantine be an *ethical* tool in the case of tuberculosis, given what you know about its transmission?
- 12. How do you weigh individual autonomy against public protection when making decisions about quarantine or isolation? What diseases would you consider as requiring such interventions?

Contact case investigations play a critical role in controlling tuberculosis. Staff at the local health

department (LHD) and the local shelters were able to compile a master list of individuals who were at risk for tuberculosis infection based on dates of possible exposure to tuberculosis. The list of individuals at risk consisted primarily of other homeless men who stayed at the shelters as well as staff who worked during this time period. Although the team worked diligently to identify and locate these individuals, not all were found.

- 13. During contact case investigations, despite efforts to protect privacy, it is common for contacts to figure out the identity of the case patient. How do you balance protecting the individual's confidentiality and protecting the public's health?
- 14. What factors should be taken into account when considering the target population in this particular contact investigation? What strategies would you employ to increase testing and screening in this vulnerable population?

All individuals who were determined to be at risk for tuberculosis were offered screening including an initial tuberculin skin test (TST), 3-month followup TST for those with an initial negative TST, chest X-ray, and clinical assessment. Any individual identified with active TB was isolated and treated under directly observed therapy (DOT).

- 15. Why do you think directly observed therapy (DOT) is recommended for active TB?
- 16. If a patient with active tuberculosis refuses DOT, legal action may be pursued. What are the potential risks and benefits of legal action, such as a court order, to mandate treatment?
- 17. Do you think court orders are an *ethical* tool? Why or why not?
- 18. Do you think court orders are an effective tool?

During this contact investigation, the health department also recommended DOT for many of the individuals identified with TB infection.

19. Do you agree with the health department's decision to provide DOT to individuals with latent TB infection? Why or why not?

Unfortunately, even though DOT was ordered for almost 90 men, very few individuals actually completed therapy. Over the following year, several more homeless men from this community were diagnosed with active TB. DNA fingerprinting demonstrated that the majority of cases were caused by an identical strain of Mycobacterium tuberculosis, indicating a common source. An isolate from one case was closely related and felt to be a variant of the same strain. Almost half of the men diagnosed with active TB had a history of a prior positive TST and had initiated therapy at some point in the past, but none was known to have completed a full course of therapy. It was determined that concurrent HIV infections had contributed to the epidemic. Over the ensuing years, the same strain of Mycobacterium tuberculosis was found in homeless individuals living in shelters in other states.

- 20. As a future physician or other healthcare practitioner practicing in this community, what public health policies would you recommend to address the prevention of tuberculosis in high-risk settings?
- 21. Do you think that physicians or other healthcare practitioners have a responsibility to advocate for such policies? If so, how would they do so and whom would they enlist to help?

# 4.3 Answers to Background Questions

1. Define an epidemic and describe essential elements of an outbreak. What is a contact case investigation? "Epidemic" refers to an increase in the number of cases of a disease above what is normally expected in a given population and geographic area (any activity above baseline). Typically, this implies a rapid increase above baseline; however, "epidemic" has also been used to describe a slower but consistent increase in baseline, such as the changes seen in prevalence of obesity or type 2 diabetes over the past several decades. If an epidemic spans several countries or continents and impacts a large number of people, it is often referred to as a "pandemic" [1].

> "Outbreak" is also defined as an increase in disease activity but is usually reserved

to describe infectious disease activity that occurs over a limited geographic area and over a shorter timeframe [1].

With respect to infectious diseases, epidemics or outbreaks can occur when there are adequate numbers of people who are susceptible to the agent. This can happen if the agent is new to the environment, if there is a change in the way it is transmitted, or if it becomes more virulent [1].

A contact case investigation involves a systematic approach to identify persons who may have been exposed to an infectious agent. According to the World Health Organization (WHO), "[c]ontacts are commonly investigated in highincome countries with low TB burdens and in settings in which a TB elimination policy is implemented, in order to identify persons with early active TB or who have recently been infected" [2]. Comprehensive guidelines for contact investigations for tuberculosis are published by the Centers for Disease Control and Prevention (CDC) and include detailed information about who should be screened for exposure to TB and how they should be screened [3].

### 2. What is "directly observed therapy" for tuberculosis?

All individuals with active TB should receive case management services because adherence to treatment for active TB can be challenging for many reasons, including the number of medications needed (multiple drugs are needed to improve cure rates and decrease likelihood of drug resistance), the side effects of these multiple drugs, the length of required treatment (minimum 6 months), and the fact that symptoms often resolve within a few weeks which can decrease motivation to continue medications. According to the CDC: "Directly observed therapy (DOT) may be defined as a course of treatment, or preventive treatment, for TB in which the prescribed course of medication is administered to the person or taken by the person under direct observation by a trained healthcare worker. DOT increases cure rates among patients

with TB and is also effective in decreasing drug resistance, treatment failure, relapse, and mortality" [4]. The trained healthcare worker should then ideally record all of the treatment data into the health information system to optimize management of the case.

The CDC recommends that DOT be used for all patients with active TB [5]. In addition to recommending DOT as part of the treatment protocol for patients with active TB, DOT may be recommended as part of the treatment protocol for latent TB depending on the person being treated (e.g., children) or the treatment plan (e.g., once/twice weekly regimens) [6].

- 3. What are known risk factors for tuberculosis infection and active disease? Most people who are exposed to infectious TB disease do not develop active TB disease. The most important risk factor for someone to have latent TB is to be exposed to someone with infectious TB disease. The following list of risk factors for exposure is from the CDC [7]:
  - Close contacts of a person with infectious TB disease
  - Persons who have lived in an area of the world with high rates of TB
  - Persons who work or reside with people who are at high risk for TB in facilities or institutions such as hospitals, homeless shelters, correctional facilities, nursing homes, and residential homes for those with HIV

Some people develop active TB disease soon after becoming infected (within weeks) before their immune system can fight the TB bacteria. Other people may get sick years later, when their immune system becomes weak for another reason.

Overall, about 5% to 10% of infected persons who do not receive treatment for latent TB infection will develop active TB disease at some time in their lives. For persons whose immune systems are weak, especially those with HIV infection, the risk of developing TB disease is much higher than for persons with normal immune systems. 4

Generally, persons at high risk for developing TB disease fall into two categories [7]:

- Persons, particularly young children, who have been *recently* infected with TB bacteria (see aforementioned risk factors for latent TB)
- Persons with medical conditions that weaken the immune system, including HIV infection, substance use disorders, silicosis, diabetes mellitus, severe kidney disease, or malnutrition, or conditions that require immunosuppressive treatments such as corticosteroids or chemotherapy (e.g., cancer or autoimmune diseases such as rheumatoid arthritis or Crohn disease)

## 4. What are risk factors for becoming homeless?

There are many known risk factors for being homeless including poverty or financial stress, mental health problems, substance use disorders, involvement with the criminal justice system, poor family functioning, low educational achievement, and poor housing conditions. Being young, gay, transgender, male, a veteran, and/or African-American are also independent risk factors for homelessness [8–10].

# 5. What policies/procedures should hospitals have in place to prevent TB transmission in the hospital?

Hospitals should have a comprehensive overarching policy, likely with many associated procedures, in place to prevent nosocomial transmission of TB. The policy should cover [11]:

- Risk assessment, including:
  - Early identification of individuals with infectious TB disease, for example, emergency department procedures for patients presenting with signs/symptoms of TB
  - Surveillance of hospital staff with annual testing and treatment for latent TB as indicated
- Exposure control with procedures to immediately place an individual with suspected infectious TB disease in an airborne infection isolation room

- Communication protocol for appropriate notification to local public health officials
- Personal protective equipment for all personnel involved in direct patient care of individuals with TB
- Appropriate laboratory safety precautions in place to ensure safe handling of patients' clinical specimens
- 6. What legal authority, if any, is there to address non-compliance if a person with active pulmonary TB refuses to take medication?

Laws authorize and obligate the government to protect the public's health within limits; for example, due process, equal protection, protection of privacy, and bodily integrity. The U.S. Supreme Court has repeatedly affirmed that the government may, again within limits, curtail individuals' rights to protect the public's health. School vaccination laws are a classic example of this. The balance of individual rights versus public protection should have a sound scientific basis.

With respect to communicable diseases, there are extensive laws addressing both surveillance (mandatory reporting of certain communicable diseases) and protection of those data. In most states, there are also laws that require testing for certain communicable diseases as a condition of employment or other privileges and benefits. In many jurisdictions, public health officials may require physical examinations and/or treatment of individuals who have or who are suspected of having select communicable diseases.

With respect to TB, three "fundamental interests support a state's use of compulsory examination or treatment in cases involving TB disease: (1) preserving an individual's own health or life, (2) preventing harm to others, and (3) avoiding the possible development of drug resistance", especially multidrug-resistant (MDR) TB and extensively drug-resistant (XDR) TB [12]. Persons with TB cannot be forced to undergo an exam or to take medication ("protection of bodily integrity"); however, they may be ordered by a court to remain isolated until no longer considered a threat to public health. Furthermore, "[p] ublic health laws may also authorize public health authorities to confine persons with contagious diseases to protect the community. Through detention laws, authorities may confine an individual to a health or other facility appropriate for his or her medical condition. Since detention presents a significant restriction on individual liberty, courts may generally require that procedural due process be satisfied regardless of whether existing detention statutes specifically delineate such due process" [12].

7. Are there public health exemptions to HIPAA for contagious diseases? Why? Yes. "The Health Insurance Portability and Accountability Act's privacy rule recognizes the legitimate need for public health authorities and others responsible for ensuring public health and safety to have access to protected health information to carry out their public health mission" [13]. Essentially, even sensitive health information that can be readily linked to an individual may be shared by health and public health workers and even with schools, employers, and others if necessary to protect the public's health. Any such sharing of information must be limited to only pertinent health information and must be handled with the greatest care to protect the individual's privacy to the extent possible. Other laws are in place to protect that individual from unwarranted discrimination [13].

# 4.4 Responses to Discussion Questions

*Mr.* Butler's symptoms and history lead you to consider TB in your differential diagnosis. In order to complete a thorough history, you apply the socioecological model to review known risk factors for TB.

I. Intrapersonal: Considering what you should ask Mr. Butler, what individual factors would you take into account for this case?

The following topics should be explored as part of the history.

- TB:
  - Prior history of TB
  - Known exposure to TB
  - TST (past and present)
  - CXR consistent with TB
- Social history including alcohol, drug, and tobacco use:
  - Excessive alcohol use affects the immune system and increases risk of TB [14].
  - Drug use increases the likelihood of having a positive sputum smear and increases the length of contagiosity; this is likely due to treatment failure, possibly related to associated exposures (people who use drugs are more likely to experience incarceration and homelessness) [15].
  - Smoking increases risk of TB [16].
- Medical history:
  - Other underlying medical problems, such as HIV positivity, diabetes, malnutrition, certain gastrointestinal (GI) conditions, certain malignancies, chronic steroid use, and general stress or poor health, are risk factors for reactivation.
- Other risk factors:
  - Born in high-endemic country
  - Low socioeconomic status (especially in the urban population)
  - Age > 65
  - Occupation: healthcare workers

2. Interpersonal: What role, if any, do family, friends, and social networks play in the transmission of tuberculosis? How would you assess this with Mr. Butler? Family and friends may have been exposed to active tuberculosis; therefore, a full contact investigation is necessary. Consider that even though Mr. Butler is homeless, he may very well spend time with family members or friends outside the shelter.

Who else is at risk? Include questions about:

- Employment history.
- Participation in religious organizations or other social organizations.

- Food insecurity (e.g., does he participate in meal programs?)
- Medical treatment (e.g., is he in any treatment programs?)

# 3. Organizational: How do organizational factors impact the risk of tuberculosis within a community? What would you want to know about your community in this case?

- Organizational structures such as homeless shelters with strong TB prevention policies in place may decrease the likelihood of TB in a community.
- Access to care for any individual at increased risk for TB infection can also impact the risk of TB. What role does the local health department play in the community? Is there a strong component of outreach? Does the health department provide comprehensive, free TB case management?
- What are the support systems in place for persons with substance abuse?

You learn that Mr. Butler was born in the United States and has not travelled outside of the country. He is a smoker and states that in the past he was a heavy drinker and occasionally used intravenous drugs. He recalls being told that he had "a positive TB test" at a shelter in a different city but he did not take any medications. He denies any other pertinent past medical history.

Mr. Butler does not have any contact with family members. He "hangs out" with a few guys he knows from the local shelters. He usually, but not always, spends nights at one of two local homeless shelters. He shares that he has not been there for the past few weeks. He works day jobs when he can find them but that is not often.

Based on his clinical presentation and his history, you are concerned that Mr. Butler may have tuberculosis. You recommend a chest X-ray (CXR) and that he be placed in isolation. Your attending physician agrees. The CXR shows right upper lobe consolidation with mediastinal and hilar lymphadenopathy, suggestive of TB.

The patient is admitted to an airborne infection isolation room in the hospital. Sputum samples are sent to the lab. Your attending physician suggests that your fellow medical student also examine the patient, as a learning opportunity. However, when the student hears the complaint and suspicion of TB, he anxiously states, "I have young children at home, and my dad is getting chemotherapy. I don't want to go in there."

# 4. How would you respond to your colleague's concerns?

As long as the patient is in an appropriate isolation room and the student adheres to airborne precautions (such as wearing the appropriate personal protection equipment), there is no significant risk to the student. This is an opportunity to educate the fellow student about some of the myths about the transmission of tuberculosis.

5. Consider a more likely scenario in which a patient with AIDS is admitted for treatment of disseminated cytomegalovirus (CMV). Standard precautions are typically used for patients with CMV who are hospitalized. However, CMV infection in pregnancy can cause devastating birth defects; therefore, it is not unusual for pregnant healthcare practitioners to avoid providing direct patient care, if other providers are available.

#### Box 4.1 Teaching Tip

The following questions (5a and 5b) should prompt an open-ended discussion with self-reflection. It would be helpful for facilitators to know if their teaching institutions have policies that (1) address students' or trainees' rights to refuse to be involved in a particular aspect of patient care, including the care of specific patients, and (2) address the role and protection of students and trainees during an outbreak of an emerging infectious disease.

- (a) Self-reflection: In this scenario, how would you feel about the examination if you or your colleague were pregnant?
- (b) Do you have the right, as a medical or health professions student or trainee, to refuse to examine, or be present during the examination of, a patient?

While medical and health professions students do not have the same legal obligations that physicians have with respect to treating patients without discrimination, they are still bound by the same ethical principles. Students should not be allowed to refuse to examine a patient or be present during the examination of a patient based on the patient's gender, race, ethnicity, income, education, sexuality, and so forth.

The discussion becomes more controversial when the key concern is about communicable disease transmission. There is an inherent risk of exposure to communicable diseases in health care. Do healthcare professionals assume that risk when they choose to enter the field? Primacy of patient welfare is a core principle for healthcare officials; however, it must be balanced with personal risk to the healthcare professional. The risk can and should be mitigated by strong infection control policies and procedure to minimize the risks. However, in situations of uncertainty, particularly with emerging infectious diseases, a common-sense risk reduction approach should be taken into account. For example, during the severe acute respiratory syndromes (SARS) epidemic in Toronto, Canada, 90% of the reported cases of SARS were associated with exposure at a single hospital. Healthcare workers, including students, comprised almost 40% of the cases. In a situation in which students have very little to offer with respect to patient welfare but are at significant personal risk, it is reasonable to question whether it is ethical to expose them to the risk [17].

(c) How does lack of knowledge about an emerging disease affect our risk perception and risk tolerance? Lack of knowledge about an emerging disease can contribute to public fear. The perception that medical experts have a lack of knowledge about an emerging disease can exacerbate that fear. Recent examples of this fear include the 2009 H1N1 pandemic, the 2014 Ebola outbreaks, and more recently the Zika virus epidemic. In reference to the Ebola crisis, Lisa Rosenbaum states "when we face an uncertain prospect that we deeply fear, we evince what Cass Sunstein calls 'probability neglect': we tend to conflate the horror of what might happen with the likelihood that it will. Unless we can prove there's zero risk, the dreaded event feels exceedingly likely, and thus making probabilistic comparisons may not feel reassuring" [18]. Healthcare professionals, including medical students, are not immune to this phenomenon, which likely impacts both their risk perception and their risk tolerance [19].

#### Box 4.2 Teaching Tip

Consider sharing the following with learners to facilitate the discussion. In the early 1980s, when HIV and AIDS were first becoming recognized, it took more than 2 years for scientists to understand that a virus was the source of the disease. Many physicians refused to treat patients suspected of having the disease. One example taken from a *New York Times* article from 1987 is from the chief heart surgeon at Milwaukee hospital: "I've got to be selfish. I've got to think about myself; I've got to think about my family. That responsibility is greater than to the patient" [19].

(d) Is there a situation in which you feel the educational benefit does not outweigh the risks? If so, should students or other trainees be barred from patient contact in those situations?

Some factors to consider are:

- What are the specific educational benefits from seeing patients with these diseases?
- Is proper personal protective equipment (PPE) available for all members of the medical team?
- Are accepting these risks and seeing the patient part of the maturation process of a growing physician? Practicing physicians play a pivotal role as healthcare providers. Are these types of experiences necessary for that development?

6. When can physicians—ethically and legally—refuse to treat a patient? When are they obligated to treat patients? In general, federal laws have protections to prevent discrimination, which prohibit physicians from refusing to treat patients for racial or religious reason. Furthermore, "[m]any states prohibit places of "public accommodation," including doctors' offices and hospitals, from discriminating on the basis of characteristics such as race, color, national origin, nationality, ancestry, religion, creed, age, marital status, familial status, sex, sexual orientation, gender identity, medical condition, disability, or other personal features — although, beyond the baseline federal protections, the grounds that are included vary by jurisdiction. Title VI of the federal Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, and national origin in programs and activities that receive federal financial assistance, including Medicaid and Medicare. The Rehabilitation Act of 1973 adds disability to that list" [20].

> Outside of the aforementioned parameters, it may not be illegal for a physician to refuse to treat a patient, but there are significant ethical concerns about a physician doing so. There is a complex balance between the physician's autonomy and the principles of beneficence, non-maleficence, and justice. For example, if another provider is not available to see the patient, a physician refusing to treat a patient for fear of contracting a communicable disease seems to be violating both non-maleficence and justice. The refusing physician may cause direct harm (by neglect) to the patient as well as to the community in which they live (by eroding trust). With respect to justice, consider justice both in relation to the patient who is not receiving timely care and the community to which the patient belongs. That community is now at risk if the case patient does not receive medical attention because there could be ongoing transmission of disease. In another scenario, in which a different provider is able and willing to see the patient, the patient is not directly harmed by a physician who refuses to treat. However, again, the physician's

behavior may cause distrust (harm) in the healthcare system. Furthermore, is the physician who refuses to see the patient acting unjustly to the other physician present? Not only might this impact the patient load of the physician who picks up the extra case but now that individual is exposed to the communicable disease.

It is important to consider that the Hippocratic Oath outlines a responsibility to society as well as to individual patients.

 7. Do physicians have special responsibilities in emergency situations? The Emergency Medical Treatment and Labor Act (EMTALA) is a federal law that requires that anyone coming to an emergency department be stabilized and treated, regardless of their insurance status or ability to pay. They can only be transferred to another facility with the patient's request or if appropriate treatment cannot be provided at the original hospital. Although this only applies to hospitals that receive payment from the Centers for Medicare and Medicaid, that is the great majority of hospitals [21].

Your attending physician resolves your colleague's concerns about nosocomial transmission of TB and asks you to partner with the infection control nurse to report this suspected case of tuberculosis to the health department. You learn that there have been three other people, all men, diagnosed with tuberculosis in the past month.

## 8. Is this an epidemic? How do you make that determination?

Because the definition of epidemic includes "activity above baseline" and the baseline data are not shared here, it is difficult to definitively state that this is an outbreak. However, the temporal and geographic clustering strongly suggest that this is an epidemic and, more specifically, an outbreak.

#### Box 4.3 Teaching Tip

The student responsible for Background Question 1 should have the definitions for epidemic and outbreak.

# 9. What is the role of the health department in this situation?

The local health department is responsible for establishing if there is a public health threat. Even a single case of infectious TB presents a potential public health threat and needs some level of intervention. In this case, there is an even more urgent concern given the consecutive appearance of cases, indicating the possibility of a larger outbreak. Every case of infectious TB should prompt a contact case investigation to identify other cases of latent or infectious TB. Rarely, a source case investigation is done to identify where the newly diagnosed person became infected. Since, in the United States, most cases of active TB are due to reactivation, years after initial infection, it is almost impossible to identify the source. A source case investigation may be indicated in a cluster of cases or in a young child who has primary TB.

In addition to starting contact case investigations, the health department will report the cases to the state health department, which will then report to the CDC. The health department should also consider notification of healthcare providers, and potentially the public, depending on the specifics of the case. In this scenario, with several new cases of TB linked to homeless shelters, the health department would ideally work closely with the shelters and with other involved service agencies to ensure good communication and a coordinated approach to managing the contact investigation.

The infection control nurse and the attending physician then share an advisory from the health department that they had received earlier that month. In it, the health department details the results of an investigation of recent cases of tuberculosis. The investigation revealed that all of the men who had tuberculosis had been in homeless shelters over that past couple of months; two of them were known to be positive for human immunodeficiency virus (HIV). The advisory provided recommendations for healthcare facilities to help manage cases of tuberculosis, including a reminder for healthcare facilities to ensure that they have the *capacity to rapidly identify and isolate any cases of suspected TB, as was accomplished in this case.* 

10. What is the difference between isolation and guarantine? Is either of these strategies useful in this case? When referring to the control of communicable diseases, the term "isolation" refers to the separation of ill persons from those who are not ill. In a hospital setting, this typically refers to placing a patient with a communicable disease, such as tuberculosis, in an appropriately equipped room. In the community setting, for an individual who is not ill enough to require hospitalization, this may refer to mandating restrictions of movement for the person with a communicable disease, often requiring that the individual stay in one place, removed from all others. For active infectious TB disease, the health department may consider random home visits or landline phone calls to ensure adherence to these requirements [22].

The term "quarantine" refers to the separation and/or movement restrictions of **well** persons who are thought to have been exposed to a communicable disease but who are not yet ill. The timing and the duration of quarantine are directly related to the incubation period of the particular communicable disease [22].

11. Would quarantine be an *ethical* tool in the case of tuberculosis, given what you know about its transmission?

> A patient with latent TB does not have infectious TB disease and is not able to spread the disease and therefore poses no threat to others. In this case, it would not be an ethical tool.

Only patients with untreated infectious TB disease are at risk of spreading TB. By definition, patients with untreated infectious TB are not considered "well"; therefore, quarantine is not applicable. The question then becomes whether isolation is an ethical tool. Most people argue that it is unethical *not* to isolate a person with infectious TB disease, as that individual is an imminent threat to others' health. 12. How do you weigh individual autonomy against public protection when making decisions about quarantine or isolation? What diseases would you consider as requiring such interventions? Individual autonomy must be respected to the extent possible; however, justicein this case, obligation to protect others from a communicable disease-must be considered when an individual poses such a threat. Because infectious tuberculosis is a disease that is characterized by airborne transmission, any individual with infectious TB poses a public threat. In the United States, "states have police power functions to protect the health, safety, and welfare of persons within their borders. To control the spread of disease within their borders, states have laws to enforce the use of isolation and guarantine. These laws can vary from state to state and can be specific or broad. In some states, local health authorities implement state law. In most states, breaking a quarantine order is a criminal misdemeanor" [22].

> Diseases that are currently authorized for isolation or quarantine at the federal level based on an "Executive Order of the President" include cholera, diphtheria, infectious tuberculosis, plague, smallpox, yellow fever, viral hemorrhagic fevers, severe acute respiratory syndromes (SARS), and influenza that may cause a pandemic [22].

Contact case investigations play a critical role in controlling tuberculosis. Staff at the local health department (LHD) and the local shelters were able to compile a master list of individuals who were at risk for tuberculosis infection based on dates of possible exposure to tuberculosis. The list of individuals at risk consisted primarily of other homeless men who stayed at the shelters as well as staff who worked during this time period. Although the team worked diligently to identify and locate these individuals, not all were found.

13. During contact case investigations, despite efforts to protect privacy, it is common for contacts to figure out the identity of the case patient. How do you

# balance protecting the individual's confidentiality and protecting the public's health?

Local health authorities should make every effort possible to protect the individual's identity, including using language such as "We are currently investigating a case of tuberculosis and have reason to believe that you may have been exposed to the disease" rather than identifying the individual who has tuberculosis.

#### Box 4.4 Teaching Tip

This question is slightly different from Discussion Question 12. For this question, it may be helpful to provide a specific scenario. For example, imagine that a case of TB is identified in a high school and only students who share the same classes need to be tested. When the infected student is suddenly absent from school, it will be very easy for all of the student's classmates to determine who has TB. Consider asking learners how they would feel if other people found out if they had a communicable disease. Similarly, consider a case in which someone had infectious TB but fails to adhere to the isolation requirements. In such a case health authorities may release the individual's name to the workplace, church, school, etc. as a means to protect others. Ask learners how they feel in that scenario, since it appears to be a violation of HIPAA.

14. What factors should be taken into account when considering the target population (i.e., homeless individuals) in this particular contact investigation? What strategies would you employ to increase testing and screening in this vulnerable population?

Specific factors that should be considered when conducting a contact investigation in this situation include:

- Accessibility: It is likely that it will be challenging to locate individuals who are homeless. Consider that there are likely:
  - Individuals who frequently stay at the shelters and therefore are more likely to be available for testing

- Individuals who only occasionally stay at the shelters and are more likely going to be very difficult to reach for testing
- Individuals for whom little information is available
- Mobility of the population outside of the community
- Possible distrust of public health officials

In terms of strategies, ideally a number of people, including medical providers for homeless individuals and managers of social programs, should be involved in planning efforts to locate the persons at risk. The team can then determine patterns of utilization of services to try to prioritize where the individuals at risk are likely to be found (such as places providing free meals, places offering daily employment, etc.). Other strategies include:

- Going door-to-door to try to locate individuals
- Contacting other agencies to assist with finding persons at risk (which would require the identities of those who may have been exposed)
- Developing informational social media posts
- Placing informational flyers/posters in strategic locations
- Providing small incentives (e.g., bus tokens, snacks, etc.)

All individuals who were determined to be at risk for tuberculosis were offered screening including an initial tuberculin skin test (TST), 3-month followup TST for those with an initial negative TST, chest X-ray, and clinical assessment. Any individual identified with active TB was isolated and treated under directly observed therapy (DOT).

# 15. Why do you think directly observed therapy (DOT) is recommended for active TB?

Treatment for active TB requires a lot of medications over a long period of time. Typically, treatment for infectious TB includes four-drug therapy for at least 2 months followed by an additional 4 months of two-drug treatment. Adherence is a significant challenge, and poor adherence is associated with development of multidrug-resistant (MDR) TB. Significant barriers for patients to adhere to the treatment regimen include the number and duration of medications, particularly once the individual is asymptomatic, as well as side effects. Having a person facilitate scheduling and delivery of medications may increase adherence and decrease the risk of drug resistance.

16. If a patient with infectious tuberculosis refuses DOT, legal action may be pursued under some circumstances. What are the potential risks and benefits of legal action, such as a court order, to mandate treatment?

> Historically, court orders have been issued for involuntary detention/hospitalization if an individual with infectious tuberculosis does not comply with treatment recommendations. In many states, laws allow patients to be confined if they can be shown to be infectious (i.e., if they can be shown to be a present threat). In most states, this does not allow for future threat; in other words, a person cannot be forced to complete therapy once the sputa are negative. The key benefit for such legal action is increased adherence to the TB treatment protocol. In addition, such action may increase the public's trust of their local health authority. The key risk is that because there are typically limits on how long an individual can be detained or hospitalized, it is unlikely that treatment will be completed under these circumstances, and it is possible that the individual stops treatment and inadvertently contributes to drug resistance. Furthermore, on the part of the individual and the individual's family and friends, such aggressive tactics may increase distrust in the system and deter others from seeking care if they become ill.

#### Box 4.5 Teaching Tip

To encourage discussion, consider the following scenario as an alternative to the case with TB. If invasive group A strep (GAS) is identified in a patient shortly after a surgical procedure or if several patients in a facility develop GAS over a short period of time, healthcare workers (HCW) need to be considered as a potential source of the GAS. In this case, asymptomatic HCWs may need to provide their own swabs (throat, rectal, vaginal) for testing to ensure that they are not carriers. HCWs may be resistant but may be ordered to comply or risk their license. Ask learners how they would feel if asked to provide a rectal or vaginal swab.

### 17. Do you think court orders are an *ethical* tool? Why or why not?

Yes. It has been well established that there are reasonable limits to a person's autonomy, but there are several caveats important to consider when ensuring that a court order is implemented appropriately. Is the person whose rights are being infringed upon a threat to the public? (Does the person have infectious TB disease?) Have all other measures to have that individual comply with isolation been exhausted? Will the individual's needs for food/shelter/medical care be met in a humane manner?

# 18. Do you think court orders are an effective tool?

In the inpatient setting, adherence to isolation precautions for patients with communicable diseases can decrease nosocomial transmission of disease, but evidence for the impact of court orders is less well established. The effectiveness of court orders for containing the risk of tuberculosis is limited by the duration of treatment needed for tuberculosis and the interpretation of "a public health threat." For example, if a judge deems someone to be at risk only if he has positive sputa cultures, once the person is treated for 2 or more weeks, the sputa are likely to be negative, and the judge may deem that the individual no longer poses an imminent public health threat. If the individual is no longer compelled

to adhere to the treatment regimen and discontinues treatment, he may develop drug-resistant TB, which in turn may lead to an even greater public threat. Given different laws across different jurisdictions, it is unlikely that the judicial system can address this issue consistently and comprehensively. Furthermore, it is conceivable that issuing a court order for one person with TB could lead other people suspected of having TB disease to go "underground," thereby potentially increasing the threat of transmission of TB within the community.

During this contact investigation, the health department also recommended DOT for many of the individuals identified with TB infection.

19. Do you agree with the health department's decision to provide DOT to individuals with latent TB infection? Why or why not?

> Individuals with risk factors for poor adherence (homelessness, substance use disorders, prior history of poor adherence, etc.) may be considered for DOT for latent TB. In addition, DOT is often recommended for children with latent TB. In some jurisdictions, the local health department works with school nurses to have the medications administered at school in order to increase adherence.

Unfortunately, even though DOT was ordered for almost 90 men, very few individuals actually completed therapy. Over the following year, several more homeless men from this community were diagnosed with active TB. DNA fingerprinting demonstrated that the majority of cases were caused by an identical strain of Mycobacterium tuberculosis, indicating a common source. An isolate from one case was closely related and felt to be a variant of the same strain related. Almost half of the men diagnosed with active TB had a history of a prior positive TST and had initiated therapy at some point in the past, but none was known to have completed a full course of therapy. It was determined that concurrent HIV *infections had contributed to the epidemic. Over the* ensuing years, the same strain of Mycobacterium tuberculosis was found in homeless individuals living in shelters in other states.

20. As a future physician or other healthcare practitioner practicing in this community, what public health policies would you recommend to address the prevention of tuberculosis in high-risk settings?

Examples of potential policies to decrease the risk of TB in high-risk settings include:

- Policy for homeless shelters to ensure identification of infectious and latent TB, for example, requiring overnight visitors/residents to have a card that documents their TST results (and treatment status if applicable)
- Improved ventilation, ultraviolet (UV) lights in homeless shelters
- Improvement in housing policies that decrease the number of people in shelters
- Incentives for treatment of latent tuberculosis infection (LTBI) (fastfood coupons, transportation tokens, small gifts, drinks, pudding, etc. for the children)

#### Box 4.6 Teaching Tip

To encourage discussion, have learners consider the relative effectiveness, feasibility, social will, risks, etc. of the different strategies. For example, the personal incentives for testing are likely to be less effective than a strict policy requiring documented testing. However, the strict policy might have the adverse effect that some homeless people without documentation have nowhere to stay.

 21. Do you think that physicians or other healthcare practitioners have a responsibility to advocate for such policies? If so, how would they do so and whom would they enlist to help? One aspect of physicians' professional obligations is to society. Physicians and other healthcare practitioners are uniquely situated to understand the individual consequences of certain policies. In this case, they can ask the local health department what they are doing and advocate for them to get involved if they have not enacted all of these types of policies already. In most areas, the local health department will be the subject matter expert in this; physicians can work with the health department to understand barriers to implementation and identify ways that local physicians can better support the department.

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