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Tuberculosis

Section 1: Introduction

According to the World Health Organization (WHO) 1.3 million people died from tuberculosis in 2022, despite it being a preventable and curable disease. Tuberculosis (TB) is the leading cause of death from an infectious disease and continues to overwhelm healthcare systems around the world. Nurses around the world play a major role in the prevention and treatment of TB. Patient education is essential in preventing the spread of TB and ensuring adherence to treatment. It is crucial that nurses are informed about TB to provide the best patient care and education for those being treated for TB. This course will cover basic information about tuberculosis, signs and symptoms, risk factors, diagnostic criteria, and available treatment options.

Section 2: What is Tuberculosis

References: 1, 2, 3, 6, 7, 8

Tuberculosis (TB) is a preventable and curable infectious disease that is caused by bacteria and mostly affects the lungs. Mycobacterium tuberculosis is the bacteria that causes TB. TB is spread through the air through droplets spread by infected people and can spread easily in crowded conditions. TB affects many people and, according to the World Health Organization, is the leading cause of death from infectious disease. Many people are infected with TB but do not have any symptoms and are not contagious. 5 to 10% of people infected with TB develop active TB disease with symptoms.

There are three stages of a TB infection:

- Primary TB infection
- Latent TB infection
- Active TB disease

A primary TB infection occurs when the mycobacterium tuberculosis enters the body and the immune system attempts to kill that bacteria. Most patients do not have symptoms with a primary TB infection. If the immune system destroys all of the bacteria, the patient will not experience other stages of TB. However, if the immune system is not able to destroy all of the bacteria, the patient may move into a latent TB infection.

A latent TB infection occurs when the immune system is not able to kill all of the bacteria, but is able to prevent the bacteria from causing more harm in the body. A latent TB infection is often asymptomatic. People with a latent TB infection are not contagious, but can eventually progress to active TB disease. Latent TB can last for many years after initial infection. 5 to 10% of people with a latent TB infection develop active TB disease with most people experiencing symptoms within two years of initial infection. Even though a latent TB infection is asymptomatic and is not contagious, it is important to treat the infection. Research shows that without treatment, patients can progress to active TB disease.

Active TB disease occurs when the immune system can no longer control the bacteria. Active TB disease can occur right after the primary infection, but usually occurs months or years later. According to the World Health Organization, around 8 million people develop active TB disease each year which causes about 2 million deaths per year. Patients with active TB disease will have symptoms that begin gradually and worsen over a few weeks. Active TB disease can also occur in other parts of the body outside of the lungs, which is called extrapulmonary TB. Common areas of extrapulmonary TB include:

- Kidneys
- Liver
- Spinal fluid
- Heart

- Genitals
- Lymph nodes
- Skin
- Joints
- Blood vessels
- Larynx

Drug-resistant Tuberculosis

Drug-resistant TB is when medications do not effectively treat active TB disease. Drug-resistant TB can be caused by many different things including:

- Patients not following recommended treatment plans
- Patients stopping the use of medications early
- Poor quality of medications
- Healthcare providers prescribing ineffective medications
- Malabsorption of medications
- Natural genetic changes in bacteria

There are three different types of drug-resistant TB:

- Multidrug-resistant TB (MDR TB)
- Pre-extensively drug-resistant TB (pre-XDR TB)
- Extensively drug-resistant TB (XDR TB)

MDR TB is caused by bacteria that is resistant to isoniazid and rifampin medications which are two of the most powerful medications used to treat TB.

Pre-XDR TB is caused by bacteria that is resistant to isoniazid, rifampin, and fluoroquinolone medications or resistant to isoniazid, rifampin, and second line medications.

XDR TB is rare and is caused by bacteria that is resistant to isoniazid, rifampin, fluoroquinolone, and second line medications or isoniazid, rifampin, fluoroquinolone, and bedaquiline or linezolid.

Drug-resistant TB can be complicated and expensive to treat due to the limited treatment options. Patients who are resistant to multiple TB medications have less effective options and potential life threatening side effects. In the United States, the average cost to treat drug-resistant TB is estimated to be $20,000 to $568,000. Patients may also experience side effects from medications used to treat drug-resistant TB including:

- Depression or psychosis
- Hearing loss
- Hepatitis
- Kidney damage

It is important for healthcare providers to be aware of the potential causes of drug-resistant TB. The most common cause is patients not adhering to their prescribed treatment plan. Nurses can help provide patient education about the importance of taking the full course of TB medications to prevent drug-resistant TB from occurring.

Section 2 Personal Reflection

What education would be important for nurses to provide patients in order to decrease the incidence of drug-resistant tuberculosis?

Section 2 Key Words

Tuberculosis (TB) - A preventable and curable infectious disease that is caused by airborne bacteria and mostly affects the lungs.

Mycobacterium tuberculosis - The type of bacteria that causes tuberculosis.

Primary tuberculosis infection - The first stage of tuberculosis that occurs when the mycobacterium tuberculosis enters the body and is usually asymptomatic.

Latent tuberculosis infection - The second stage of tuberculosis that occurs when the immune system is not able to kill all of the bacteria but is able to prevent adverse effects and symptoms.

Active tuberculosis disease - The third stage of tuberculosis that occurs when the immune system can no longer control the bacteria and can cause life threatening symptoms.

Extrapulmonary tuberculosis - Active tuberculosis disease that occurs in other parts of the body outside of the lungs and can cause various symptoms based on the location of the disease in the body.

Drug-resistant tuberculosis - A type of active tuberculosis that occurs when medications do not effectively treat active TB disease.

Multidrug-resistant tuberculosis (MDR TB) - A type of drug-resistant tuberculosis that is resistant to isoniazid and rifampin medications.

Pre-extensively drug-resistant tuberculosis (pre-XDR TB) - A type of drug-resistant tuberculosis that is resistant to isoniazid, rifampin, and fluoroquinolone medications or resistant to isoniazid, rifampin, and second line medications.

Extensively drug-resistant tuberculosis (XDR TB) - A type of drug-resistant tuberculosis that is resistant to isoniazid, rifampin, fluoroquinolone, and second line medications or isoniazid, rifampin, fluoroquinolone, and bedaquiline or linezolid.

Section 3: Risk Factors for Tuberculosis

References: 1, 2, 3, 6, 9, 10

There are many risk factors that can put people at a higher likelihood of acquiring TB. Certain populations at higher risk for acquiring active TB disease include:

- People who are immunocompromised
- People diagnosed with human immunodeficiency virus (HIV)
- People who are malnourished
- People who have a primary TB infection within the last two years
- Infants and young children
- Elderly people
- People who use tobacco and illicit drugs
- People who were not treated correctly for TB
- People with chronic conditions such as diabetes and chronic kidney disease

Research shows that people with HIV are 16 times more likely to acquire TB and it is shown to be the leading cause of death among those diagnosed with HIV. People with HIV are more susceptible to TB due to their weakened immune system. Research shows that an untreated latent TB infection is more likely to advance to active TB disease in people with HIV.

Many of the countries who have high rates of TB also have high rates of HIV. The Centers of Disease Control and Prevention (CDC) have a Global HIV and TB division that is working towards combating both HIV and TB in these countries. 80% of TB cases and deaths are from low and middle income countries. Research shows that India, Africa, Micronesia, and Southeast Asia have the highest rates of TB cases. China, Eastern Europe, Central America, and South America also have

high rates of TB cases. The United States, Canada, Japan, Western Europe, and Australia have the lowest rates of TB cases.

Certain living or working conditions can increase the risk of a TB infection including:

- Crowded conditions such as prisons, nursing homes, and homeless shelters
- Healthcare settings
- Living with a person with active TB disease
- Living in or traveling to a country with a high prevalence of TB infections

The risk of active TB disease can change with age. Children under 5 years old are considered high risk for active TB disease, with an even greater risk for children under 2 years old. A TB infection can often lead to meningitis in young children. Meningitis is inflammation in the brain and spinal cord caused by an infection and can be life threatening. People 15 years to 25 years of age are at risk of developing a more severe case of active TB if infected. People 65 years and older are also at higher risk due to the immune system weakening with age.

Section 3 Personal Reflection

What might be some challenges to preventing the spread of TB in a low or middle income country versus a country with more resources?

Section 3 Key Words

Human immunodeficiency virus (HIV) - A virus that attacks the body's immune system and can be life threatening if left untreated.

Meningitis - The inflammation in the brain and spinal cord caused by an infection and can be life threatening.

Section 4: Signs and Symptoms of Tuberculosis

References: 1, 2, 3, 5, 14

The symptoms of TB can vary between the different stages. A primary TB infection usually does not present any symptoms. Patients may have flu-like symptoms such as a low fever, cough, diaphoresis, and fatigue. A latent TB infection does not cause symptoms.

Patients with active TB disease have symptoms that often worsen over a few weeks. Symptoms of active TB disease include:

- Prolonged cough
- Coughing up blood
- Chest pain
- Fatigue
- Weight loss
- Fever
- Dyspnea
- Night sweats
- Loss of appetite

Patients with extrapulmonary TB disease often have similar symptoms as well as pain near the site of the infection.

Symptoms of active TB disease in children can vary based on age. Teenagers have symptoms similar to adults. Children 1 year old to 12 years old typically have a fever and weight loss. Infants typically have symptoms including:

- Fatigue

- Fussiness
- Vomiting
- Poor feeding
- Bulging fontanel
- Poor reflexes
- Poor weight gain

Diagnostic Criteria

There are two types of testing for TB: skin tests or blood tests. The Mantoux tuberculin skin test (TST) tests if the immune system creates antibodies to fight TB. A nurse injects tuberculin just below the skin on the forearm. 48 to 72 hours after injection, a nurse assesses the forearm for redness and swelling at the injection site. The size of the raised skin around the injection site is used to determine if the test is positive or negative. A positive test only indicates that the person is infected with TB bacteria and does not indicate whether it is latent or active TB disease. It is important to be aware that the vaccination against TB, called Bacille Calmette-Guerin (BCG) can cause a positive result. A blood test is preferred for those who have received the BCG vaccine.

The blood test for TB can help determine between latent and active TB. There are two blood tests approved by the United States Food and Drug Administration (FDA): the QuantiFERON-TB Gold Plus (QFT-Plus) and the T-SPOT TB test (T-Spot). A positive blood test indicates that the person is infected with TB bacteria.

A chest x-ray can help diagnose TB by showing irregular patches in the lungs that can be present with active TB disease. Sputum tests can also help detect active TB disease by identifying the presence of mycobacterium tuberculosis bacteria.

A positive TB test result is not enough to diagnose active TB disease. Diagnostic

criteria for active TB disease must include:

- Skin or blood TB test
- Medical history including history of TB, demographic risk factors, and other medical conditions
- Physical exam
- Chest x-ray
- Sputum test

A bronchoscopy may be performed to better visualize the airway and lungs. A bronchoscopy is a minimally invasive procedure that allows direct visualization of the airway and lungs through a bronchoscope. A tissue biopsy may be performed if TB is suspected in other organs such as the lymph nodes or kidneys. Blood tests, sputum tests, and tissue biopsies can take days to months for results, so treatment may be recommended without definitive diagnosis for optimal outcomes. The World Health Organization recommends that preventative treatment for TB be started without a definitive diagnosis in patients with HIV and children under 5 years of age who are in contact with someone with active TB disease.

Section 4 Personal Reflection

What education could you provide as a nurse to encourage preventative testing for TB in vulnerable populations?

Section 4 Key Words

Mantoux tuberculin skin test (TST) - A test used to diagnose tuberculosis using an intradermal injection of tuberculin.

Bacille Calmette-Guerin (BCG) - A vaccination against tuberculosis.

QuantiFERON-TB Gold Plus (QFT-Plus) - A blood test approved by the FDA to test for tuberculosis.

T-SPOT TB test (T-Spot) - A blood test approved by the FDA to test for tuberculosis.

Sputum test - A test that looks for bacteria in the lungs or airway by sampling mucus in the lungs.

Bronchoscopy - A minimally invasive procedure that allows direct visualization of the airway and lungs through a bronchoscope.

Section 5: Prevention and Treatment of Tuberculosis

References: 1, 2, 3, 11, 12, 13, 14

Prevention

The prevention of TB is key in combating the current global epidemic. Vaccinations play a key role in preventing the spread of TB. The BCG vaccination is a live vaccine developed in 1921. The BCG vaccine is the only vaccine against TB, but ongoing research hopes to develop more TB vaccines. The BCG vaccine has minimal side effects and is recommended for several populations. Newborns and infants greatly benefit from the BCG vaccine. Other populations recommended for vaccination include:

- Infants and children less than 5 years of age with high risk exposure to TB
- People exposed to drug-resistant TB
- Healthcare workers in countries with high risk exposure to TB

Vaccination of healthcare workers is not recommended in the United States due to the low prevalence of TB infections. The BCG vaccine is contraindicated in

immunocompromised patients due to it being a live vaccine.

Proactive testing for vulnerable patient populations can also help stop the spread of TB. The populations that are recommended to be proactively tested for TB include:

- Someone who is exposed to active TB disease
- People from common areas of TB
- People who live and work in high-risk settings
- Healthcare workers
- Children who are exposed to adults at increased risk for TB

Public health programs are essential to prevent the spread of TB. In the United States, it is required that anyone diagnosed with TB be reported to the health department. This allows assurance that the patient is receiving complete and effective treatment. Public health programs can be beneficial in many ways including:

- Identifying people with active TB disease
- Providing and monitoring treatment of TB to prevent the spread of TB

The World Health Organization has a Global Tuberculosis Program that is focused on providing TB care and prevention interventions to vulnerable populations. Countries with reduced resources to prevent TB can create high risk populations. The World Health Organization is focused on improving TB surveillance and continuing to survey TB prevalence in different populations. The program emphasizes the importance of analyzing data to improve policies and programs for decreasing the prevalence of TB.

World TB Day is another preventative initiative that occurs on March 24th each year. World TB Day honors the date in 1882 when Dr. Robert Koch discovered the

mycobacterium tuberculosis that causes TB. Today, World TB Day is used to provide public education about the prevention of and importance of treatment for TB.

It is important to educate patients with TB to seek treatment early if they are experiencing symptoms of TB . Early treatment can help stop the spread and improve the chances of recovery. Emphasizing the need to complete the full course of treatment is also key in fighting TB. Patients must understand the importance of taking medications exactly as prescribed and to follow up frequently with their healthcare providers. Patients should notify their healthcare providers if they are having any trouble accessing their prescribed medications. It is also important for healthcare providers to be up to date on the recommended treatment guidelines and ensure that they are helping their patients complete their recommended therapy.

Patients with active TB need to take precautions to not infect others, especially during the first 2 to 3 weeks of diagnosis when they are most contagious. Patients with active TB should take precautions including:

- Staying home and isolating
- Ventilating rooms
- Wearing masks
- Covering their mouth and nose when coughing or sneezing

The prevention of the spread of TB is especially important in healthcare settings. Every healthcare setting should have isolation precaution plans in place in accordance with United States Centers of Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA). The isolation precautions help keep patients and healthcare workers safe from infectious diseases including TB. TB is considered airborne transmission which means the infection spreads via droplets in the air over long distance and time. Airborne

isolation precautions include:

- Airborne infection isolation rooms
- Restricting healthcare workers who are immunocompromised
- Using appropriate personal protective equipment (PPE)
- Limiting transportation of patients outside their designated room unless absolutely necessary
- Appropriate PPE for airborne isolation includes:
- Approved N95 respirator masks or higher level respirators
- Fluid-resistant gown
- Face shield
- Gloves

N95 respirator masks are specially made to restrict the filter of airborne particles from penetrating the mask. These masks are recommended to reduce the risk of the spread of infectious diseases that are deemed airborne. Healthcare workers that use N95 respirator masks should be fit-tested to determine that they are wearing the appropriate type and size of mask. Ensuring that the N95 has a good seal is key for the mask to work properly. Fit-testing is recommended annually for healthcare workers using N95 respirator masks.

Treatment Options

There are different antibiotic combinations that are recommended for treating TB. Common antibiotics used to treat TB include:

- Isoniazid
- Rifampin

- Rifapentine
- Pyrazinamide
- Ethambutol
- Moxifloxacin
- Fluoroquinolone

It is recommended that patients take antibiotics daily for 4 to 9 months to be effective. Nurses must stress to patients that if they miss doses or stop the medications early, TB can become drug-resistant and much harder to treat. A latent TB infection is often treated for 3 to 4 months and active TB disease is often treated for 4 to 9 months. Patients must have regular appointments with their healthcare provider to gauge efficacy of the treatment plan and monitor for side effects. Side effects of TB medications can include:

- Nausea and vomiting
- Loss of appetite
- Severe diarrhea
- Light colored stool
- Dark colored urine
- Jaundice
- Vision changes
- Dizziness
- Tingling in hands and feet
- Abnormal bruising or bleeding
- Weight loss

- Fatigue
- Depression
- Joint pain
- Liver damage

It is important to educate patients that they should avoid alcohol and medications that can cause liver damage such as acetaminophen. Patients should be aware of signs of liver toxicity including fatigue, loss of appetite, nausea and vomiting, dark-colored urine, jaundice, and abdominal pain.

The CDC recommends a 4 month treatment plan and a 6 to 9 month treatment plan. Healthcare providers should individualize treatment plans based on drug susceptibility, coexisting medical conditions, and the potential for adverse reactions with other medications. Rifampin can interact with many other drugs such as hormonal birth control. It is important that patients are aware of how TB medications can interact with other medications they may be taking. The 4 month treatment plan consists of:

- Rifapentine
- Moxifloxacin
- Isoniazid
- Pyrazinamide

The 6 to 9 month treatment plan consists of:

- Rifampin
- Isoniazid
- Pyrazinamide
- Ethambutol

The CDC recommends directly observed therapy (DOT) for patients who have trouble keeping up with the medication regimen. DOT is when a healthcare worker visits the patient at home to visualize the consumption of the TB medications. Healthcare workers can also observe patients with virtual appointments. The CDC also has printable forms available to patients to track their daily medications. Patients should be evaluated by their healthcare provider at least once per month to monitor the effectiveness of the treatment.

Latent TB infections should be treated due to the risk of progressing to active TB disease. Certain population groups should be a high priority for latent TB treatment including:

- People with HIV
- People with recent contact with active TB disease
- Organ transplant recipients
- People who are immunocompromised
- People who are from areas with high rates of TB
- Healthcare workers
- People who use injection drugs
- Children under 4 years of age
- Children exposed to adults at high risk of acquiring TB

The CDC recommends four different treatment regimens for a latent TB infection. These treatments use isoniazid, rifapentine, and/or rifampin. It is recommended that healthcare providers prescribe the shorter regimens when possible as patients are more likely to complete shorter treatment plans.

Because people with HIV are much more likely to develop TB, collaborative treatment for TB and HIV is essential in preventing life threatening outcomes. The

World Health Organization recommends combining TB treatment with antiretroviral treatment for HIV. According to research, this combination treatment has prevented over 9 million deaths from TB in patients with HIV from 2005 to 2022.

Section 5 Personal Reflection

What might be some barriers to TB treatment for countries with limited access to resources?

Section 5 Key Words

Isolation precautions - Measures used in healthcare facilities to reduce the transmission of infections amongst patients and healthcare workers.

Airborne transmission - The process in which infection spreads via droplets in the air over long distance and time.

Personal protective equipment (PPE) - Equipment worn to minimize the exposure to hazards that can cause harm and illness in the workplace.

N95 respirator masks - Specially made face masks to restrict the filter of airborne particles from penetrating and are recommended to reduce the risk of the spread of infectious diseases that are deemed airborne.

Directly observed therapy (DOT) - The process where a healthcare worker visits the patient at home or has a virtual appointment to visualize the consumption of medications.

Section 6: Case Study #1

A nurse is caring for a patient who is admitted for suspected TB. The patient presented to the hospital with a cough, fever, night sweats, and fatigue. The

patient states that they moved from Africa to the United States a few years ago and that they had been treated for TB while they lived in Africa. The patient states that they were not able to afford the TB medications, so they stopped taking them. The patient states they do not remember details about the medications. The patient states “I thought my TB was gone because I did not have any symptoms for so many years. Why did the doctor say that they suspect that it’s back?”

1. What stage of TB would the nurse suspect for this patient?
2. What education would the nurse provide to the patient to help them understand why they are having recurrent symptoms?

Section 7: Case Study #1 Review

This section will review the case studies that were previously presented in each section. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What stage of TB would the nurse suspect for this patient?

   The nurse may suspect drug-resistant TB for this patient. Drug-resistant TB is when medications do not effectively treat active TB disease and can be caused by many different things including patients not following recommended treatment plans, patients stopping the use of medications early, poor quality of medications, healthcare providers prescribing ineffective medications, malabsorption of medications, and natural genetic changes in bacteria. Active TB disease occurs when the immune system can no longer control the bacteria. Patients with active TB disease will have symptoms that begin gradually and worsen over a few weeks. A primary TB infection and a latent TB infection usually do not cause symptoms.

2. What education would the nurse provide to the patient to help them

understand why they are having recurrent symptoms?

The nurse should provide education about the stages of TB and about the risk factors for drug-resistant TB. A primary TB infection occurs when the immune system attempts to fight off the TB bacteria. Most patients do not have symptoms with a primary TB infection, but it could move into a latent TB infection where the bacteria is still present in the body. A latent TB infection is often asymptomatic. People with a latent TB infection are not contagious, but can eventually progress to active TB disease. Latent TB can last for many years after initial infection. Active TB disease occurs when the immune system can no longer control the bacteria. Active TB disease can occur right after the primary infection, but usually occurs months or years later. Patients with active TB disease will have symptoms that begin gradually and worsen over a few weeks. Drug-resistant TB can be caused by many different things including patients not following recommended treatment plans, patients stopping the use of medications early, poor quality of medications, healthcare providers prescribing ineffective medications, malabsorption of medications, and natural genetic changes in bacteria. Patients who are resistant to multiple TB medications have less effective options and potential life threatening side effects. The nurse should stress the importance of taking the full course of TB medications to prevent drug-resistant TB from occurring.

Section 8: Case Study #2

A 30-year-old patient is admitted from the emergency department for complaints of shortness of breath, fever, and prolonged cough for 3 months. The nurse asks if the patient is currently taking any medications at home. The patient states “I was taking antiretroviral medications for HIV about a year ago, but I couldn’t afford the medications, so I had to stop taking them after a few weeks.” The patient reports traveling around the world a few years ago and works full time as a

teacher. The physician informs the patient that they are beginning testing to rule out tuberculosis. The patient appears anxious and tells the nurse they are scared about this potential new diagnosis.

1. What education would the nurse provide to the patient about HIV as a risk factor for TB?
2. What other risk factors, aside from HIV, can put people at a higher likelihood for TB?

Section 9: Case Study #2 Review

This section will review the case studies that were previously presented in each section. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What education would the nurse provide to the patient about HIV as a risk factor for TB?

   Research shows that people with HIV are 16 times more likely to acquire TB and it is shown to be the leading cause of death among those diagnosed with HIV. People with HIV are more susceptible to TB due to their weakened immune system. Research shows that an untreated latent TB infection is more likely to advance to active TB disease in people with HIV.

2. What other risk factors, aside from HIV, can put people at a higher likelihood for TB?

   People who are immunocompromised, people who are malnourished, people who have a primary TB infection within the last two years, infants and young children, elderly people, people who use tobacco and illicit drugs, people who were not treated correctly for TB, and people with chronic conditions such as diabetes and chronic kidney disease. 80% of TB cases and deaths are from low and middle income countries. Research

shows that India, Africa, Micronesia, and Southeast Asia have the highest rates of TB cases. China, Eastern Europe, Central America, and South America also have high rates of TB cases. The United States, Canada, Japan, Western Europe, and Australia have the lowest rates of TB cases. Certain living and working conditions such as crowded conditions (prisons, nursing homes, and homeless shelters), healthcare settings, living with a person with active TB disease, and living in or traveling to a country with a high prevalence of TB infections. The risk of active TB disease can change with age. Children under 5 years old are considered high risk for active TB disease, with an even greater risk for children under 2 years old. A TB infection can often lead to meningitis in young children. Meningitis is inflammation in the brain and spinal cord caused by an infection and can be life threatening. People 15 years to 25 years of age are at risk of developing a more severe case of active TB if infected. People 65 years and older are also at higher risk due to the immune system weakening with age.

Section 10: Case Study #3

A nurse is caring for a patient who has come into the emergency department complaining of shortness of breath and a bloody cough. The patient states they have had the bloody cough for two months along with fatigue and night sweats. The patient reports an unintentional weight loss of 20 pounds in the past month. The nurse asks about the patient's medical history and the patient reports a history of alcohol and tobacco use and that they travel frequently for work. Due to the patient's symptoms, the emergency department physician tells the nurse that they are concerned the patient has TB.

1. What other symptoms would the nurse need to be monitoring for in a patient with suspected TB?
2. What stage of TB would the nurse suspect this patient is in?

3. What type of TB testing would the nurse anticipate the physician ordering for this patient?

Section 11: Case Study #3 Review

This section will review the case studies that were previously presented in each section. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What other symptoms would the nurse need to be monitoring for in a patient with suspected TB?

   Patients with active TB disease have symptoms that often worsen over a few weeks. In addition to prolonged bloody cough, shortness of breath, night sweats, and weight loss, Symptoms of active TB disease include chest pain, fatigue, fever, and loss of appetite.

2. What stage of TB would the nurse suspect this patient is in?

   The patient is most likely in the stage of active TB disease due to the occurrence of symptoms such as the bloody cough, shortness of breath, night sweats, and weight loss. The symptoms of TB can vary between the different stages. A primary TB infection usually does not present any symptoms. Patients may have flu-like symptoms such as a low fever, cough, diaphoresis, and fatigue. A latent TB infection does not cause symptoms. Patients with active TB disease have symptoms that often worsen over a few weeks.

3. What type of TB testing would the nurse anticipate the physician ordering for this patient?

   There are two types of testing for TB: skin tests or blood tests. The Mantoux tuberculin skin test (TST) only determines if the patient is infected with TB bacteria and does not indicate whether it is latent or active TB

disease. The test is also not recommended for patients who have been vaccinated against TB, so the nurse should clarify if the patient has been vaccinated. The blood test for TB can help determine between latent and active TB. There are two blood tests approved by the United States Food and Drug Administration (FDA): the QuantiFERON-TB Gold Plus (QFT-Plus) and the T-SPOT TB test (T-Spot). A chest x-ray can help diagnose TB by showing irregular patches in the lungs that can be present with active TB disease. Sputum tests can also help detect active TB disease by identifying the presence of mycobacterium tuberculosis bacteria. Medical history including history of TB, demographic risk factors, and other medical conditions and a physical exam can provide additional information.

Section 12: Case Study #4

A nurse is developing a course on tuberculosis for nursing students. The students understand what TB is and how it is spread but have limited knowledge about the prevention and treatment options for TB. The students submitted questions prior to attending the course and have been asked to discuss the following: What is being done around the world to prevent TB in vulnerable populations? What medications are available to treat TB? How can healthcare workers be protected against TB?

1. What information would the nurse provide to the students about TB preventative measures to address vulnerable populations?
2. What information would the nurse provide to the students about medications used to treat TB?
3. What information would the nurse provide to the students to address TB preventative measures in healthcare facilities?

Section 13: Case Study #4 Review

This section will review the case studies that were previously presented in each section. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What information would the nurse provide to the students about TB preventative measures to address vulnerable populations?

   The prevention of TB is key in combating the current global epidemic. The World Health Organization has a Global Tuberculosis Program that is focused on providing TB care and prevention interventions to vulnerable populations. Vaccinations play a key role in preventing the spread of TB. The BCG vaccine is the only vaccine against TB, and newborns and infants greatly benefit from the vaccine. Proactive testing for vulnerable patient populations can also help stop the spread of TB.=

2. What information would the nurse provide to the students about medications used to treat TB?

   It is important to educate patients with TB to seek treatment early if they are experiencing symptoms of TB. Early treatment can help stop the spread and improve the chances of recovery. Emphasizing the need to complete the full course of treatment is also key in fighting TB. Patients must understand the importance of taking medications exactly as prescribed and to follow up frequently with their healthcare providers. There are different antibiotic combinations that are recommended for treating TB. Common antibiotics used to treat TB include isoniazid, rifampin, rifapentine, pyrazinamide, ethambutol, moxifloxacin, and fluoroquinolone. It is recommended that patients take antibiotics daily for 4 to 9 months to be effective. The CDC recommends directly observed therapy (DOT) for patients who have trouble keeping up with the medication regimen. DOT is when a healthcare worker visits the patient at home to visualize the

consumption of the TB medications. Healthcare workers can also observe patients with virtual appointments. The CDC also has printable forms available to patients to track their daily medications. The CDC recommends four different treatment regimens for a latent TB infection. These treatments use isoniazid, rifapentine, and/or rifampin. It is recommended that healthcare providers prescribe the shorter regimens when possible as patients are more likely to complete shorter treatment plans.

3. What information would the nurse provide to the students to address TB preventative measures in healthcare facilities?

Every healthcare setting should have isolation precaution plans in place in accordance with United States Centers of Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA). The isolation precautions help keep patients and healthcare workers safe from infectious diseases including TB. TB is considered airborne transmission which means the infection spreads via droplets in the air over long distance and time. Airborne isolation precautions include: airborne infection isolation rooms, restricting healthcare workers who are immunocompromised, using appropriate personal protective equipment (PPE), and limiting transportation of patients outside their designated room unless absolutely necessary. Appropriate PPE for airborne isolation include approved N95 respirator masks or higher level respirators, fluid-resistant gown, face shield, and gloves. N95 respirator masks are specially made to restrict the filter of airborne particles from penetrating the mask. These masks are recommended to reduce the risk of the spread of infectious diseases that are deemed airborne. Healthcare workers that use N95 respirator masks should be fit-tested to determine that they are wearing the appropriate type and size of mask. Ensuring that the N95 has a good seal is key for the mask to work properly. Fit-testing is recommended annually for healthcare workers using N95 respirator masks. Vaccination of healthcare workers is not recommended in the United States due to the low prevalence of TB infections.

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