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PURPOSE

The purpose of this course is to review the characteristics of Tuberculosis (TB); transmission, Describe symptoms of TB disease, TB infection control program, control measures, Administrative measures, Environmental controls, Use of respiratory protective equipment, treatment, discuss Individuals most likely to become infected/ high risk population, nursing care/ interventions and rationale. Infection control practices and regulations within the workplace, to educate and reinforce the knowledge of nurses; ARNP, RN, LPN, Therapist, CNA who are working in the health care environment, as well as other individuals, students, regarding Occupational Safety and Health Administration (OSHA) Standards/ regulations, the Centers for Disease Control and Prevention (CDC) the Association for Professionals in Infection Control and Epidemiology (APIC) and National Institute of Occupational Safety and Health (NIOSH) recommendations, handling and proper disposal and the appropriate use of Personal protective equipment (PPE) and other standards that relates to infection control. The prevalence of TB in the United States; Georgia, Alabama, Florida, District of Columbia and New York.

Objectives/ Goals:

After successful completion of this course the students will be able to:

1. Describe the importance of infection control practices and regulations in the workplace
2. Describe Occupational Safety and Health Administration (OSHA) Regulations
3. Describe the General Duty Clause
4. Describe appropriate use of Personal protective equipment (PPE)
5. Describe appropriate removal and /or disposal of Personal protective equipment (PPE)
6. Define infection control and appropriate precautions
7. Describe methods of transmission of infection
8. Discuss the Process of Infection
9. Discuss Tuberculosis (TB) Transmission
10. Describe six symptoms of TB disease
11. Identify at risk population
12. Describe procedures for administering and reading the tuberculin skin test
13. Describe Tuberculosis (TB) treatment
14. Discuss latent TB Infection medication treatment regimens

INTRODUCTION

TUBERCULOSIS

Tuberculosis is an acute or chronic infection caused by Mycobacterium tuberculosis.

TB is characterized by;
Pulmonary infiltrates,
Formation of granulomas (with caseation),
Fibrosis,
Cavitation.

Individuals most likely to become infected include:

Those living in crowded, poorly ventilated conditions
People who are immunocompromised
Homeless,
Drug-addicted,
Impoverished populations
Immigrants from countries in which Tuberculosis (TB) is endemic.

General signs and symptoms of TB include:

- Cough of more than 2 weeks' duration,
- shortness of breath,
- Fever,
- Night sweats,
- Weight loss and
- Fatigue.

In addition, co-morbidities such as alcohol or substance abuse, HIV and diabetes may warrant including TB in the differential diagnosis. Children with TB, especially those less than 5 years of age, may not present with classic pulmonary symptoms and may have lethargy and failure to thrive including poor developmental milestones and failure to gain weight.

WHEN THE NURSE IS CARING FOR THE PATIENT WITH PULMONARY TB:
Plan of care / nursing priorities

Prevent spread of the infection
Achieve adequate ventilation (oxygenation)
Maintain adequate ventilation (oxygenation)
Promote effective coping measures/ strategies
Support behaviors to maintain health
Educate and provide information about disease process
Educate and provide info about the prognosis & treatment needs.

Some expected outcomes/ Goals

Respiratory function adequate to meet patient's need
Lifestyle changes adopted to prevent spread of infection
Behavior changes adopted to prevent spread of infection
Complications prevented
Understand disease process
Understand prognosis
Understand therapeutic regimen.

Some Diagnostic Studies/ Lab Tests:

Skin tests - Purified protein derivative (PPD) or Old tuberculin (OT) administered by intradermal injection -Mantoux:

- A positive reaction (interdermal injection of the antigen) resulting in an area of induration 10 mm or greater, occurring 48–72 hr after.

May also indicate past infection and the presence of antibodies but is not necessarily active disease; some individuals have received the BCG immunization and should not be given the PPD (because results will show induration 10mm or greater).

Sputum culture:
Positive for Mycobacterium tuberculosis in the active stage of the disease.

Ziehl-Neelsen (acid-fast stain applied to a smear of body fluid):
Positive for acid-fast bacilli (AFB).

Enzyme-linked immunosorbent assay (ELISA) /Western blot:
May indicate the presence of HIV.

Chest x-ray: May reveal:
Small, patchy infiltrations of lesions in the lung field,
Calcium deposits of healed lesions,
Fluid of an effusion.

Changes which indicates more advanced TB may include:
Cavitation,
Scar tissue
Fibrotic areas.

Bronchoscopy:
Shows inflammation / altered lung tissue. May be done to obtain sputum if patient is not able to produce a specimen.

CT or MRI scan:
Determine degree of lung damage and confirm the diagnosis.

Arterial Blood Gas (ABGs):
May be abnormal depending on severity, location, and residual damage to the lungs.

Needle biopsy of lung tissue:
Positive for granulomas of TB. (presence of large cells indicating necrosis).

Electrolytes:
May be abnormal; depends on the severity and location of infection, for example decrease sodium (hyponatremia) caused by abnormal water retention may be found in chronic pulmonary TB.

Pulmonary function studies:
Decreased vital capacity,
Increased dead space,
Increased ratio of residual air to total lung capacity,
Decreased oxygen saturation
are all secondary to parenchymal infiltration or fibrosis, loss of lung tissue, and pleural disease (chronic pulmonary Tuberculosis).

Respiratory Hygiene

To prevent the transmission of respiratory infections in a facility, the following infection prevention measures are implemented for all potentially infected persons at the point of entry and continuing throughout the duration of the visit. This applies to any person for example patients, visitors, family members, and caregivers with signs and

symptoms of respiratory illness, which includes cough, congestion, rhinorrhea, or increased production of respiratory secretions.

Identifying Persons with Potential Respiratory Infection

Healthcare workers should remain alert for any individuals visiting/ arriving with symptoms of a respiratory infection. Encourage individuals including staff to self-report symptoms of a respiratory infection. Practice respiratory hygiene / cough etiquette and wear facemask as needed.

Respiratory Hygiene and Cough Etiquette

All individuals with signs and symptoms of a respiratory infection, including employees should be instructed to:

- Cover the mouth and nose with a tissue when coughing or sneezing
- Dispose of the used tissue in the nearest waste receptacle
- Perform hand hygiene after contact with respiratory secretions and contaminated objects/materials
- Healthcare workers with a respiratory infection should avoid direct patient contact; if this is not possible, then a facemask should be worn while providing patient care and frequent hand hygiene should be reinforced.

INFECTION CONTROL

Infection control refers to guidelines / regulations that are designed for educating, reporting, monitoring, managing and isolating healthcare related and/or community acquired infections. Therefore, infection control measures are important to control, eliminate or minimize employee exposure to bloodborne pathogens and communicable diseases.

Infection

The invasion, multiplication and growth of microorganisms such as Viruses, bacteria and parasites that are not normally present in the body. Microorganisms that live naturally within the body are not considered infections such as bacteria that normally live in the mouth or intestine are not infections.

An infection may remain localized (in a specific body part) or it may spread throughout the entire body; spread to the blood and /or lymphatic vessels and become systemic. An infection may not cause symptoms and remain subclinical, or it may lead to symptoms such as fatigue, fever, pain, tenderness, rash, loss of appetite, nausea, vomiting, diarrhea, redness, swelling of parts of the body, and drainage or discharge from the infected area.

The Process of Infection

For an infection to develop there has to be a source. The source is a pathogen that is capable of causing a disease. The pathogen needs a reservoir where it is able to grow and multiply. Humans and animals are reservoirs for pathogens (microbes). When the individual does have signs and symptoms of the infection, he /she is referred to as a carrier. Carriers are capable of passing the pathogen to others. The pathogen has to be able to leave the reservoir, it leaves through an exit. The exits within the human body include breaks in the skin and in the blood, the gastrointestinal, respiratory, urinary and reproductive tracts. When the pathogen leaves the reservoir it may be transmitted to another individual or host.

Methods of transmission

Methods of transmission include:

- Air
- direct contact,
- food,
- water,
- animals, and
- Insects.

Microbes may also be transmitted by equipment for personal care, hygiene, dressings etc. The pathogen then has to enter the body through a portal of entry. The portals of entry within the human body include breaks in the skin and in the blood, the gastrointestinal, respiratory, urinary and reproductive tracts.

TIPS

- Avoid patient contact when you have open skin wounds and/or lesions.
- Always wash your hands after contact with the patient.
- Wash immediately if hands and other body parts make contact with blood or body fluids.
- When providing assistance with personal care try to avoid cuts or nicks when shaving a patient.
- When using sharp objects, take caution to avoid injuring yourself or the patient.
- Always use resuscitation devices when you need to perform mouth-to-mouth resuscitation.

Susceptibility of the host

The growth of the pathogen and its ability to multiply within the host, depends on the susceptibility of the host. Human beings have the natural ability and are able to protect itself from infections, but the ability to resist an infection may be related to various factors including but not limited to:

- general health condition,
- age of the individual,
- presence of other illnesses,
- absence of other illnesses,
- sex of the individual,
- fatigue,
- nutritional status, and
- Medications.

Regulations

Infection control standards and policies published by Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC) the Association for Professionals in Infection Control and Epidemiology (APIC) and National Institute of Occupational Safety and Health (NIOSH) have made recommendations.

These guidelines are designed to reduce the transmission of bloodborne and other pathogens and apply to every patient regardless of their diagnosis. These guidelines reinforce the idea that body substances such as oral and body secretions; blood, breast milk, urine, feces, airborne spray from coughing or droplet, vomits, tissue, wound, or any other drainage; can be a source of infection. These guidelines also explain that the environment can also be a source of infection.

Some of the functions of Occupational Safety and Health Administration (OSHA) include:

- Writing the regulations or standards for workplace safety,
- conducting reviews to ensure compliance, and
- Prosecute Violations of standards.

National Institute of Occupational Safety and Health (NIOSH) is responsible for research into best practices for workplace safety and making recommendations regarding proper procedures and equipment.

The need for Occupational Safety and Health Administration (OSHA) in the healthcare environment came to light with the emergence of the Human Immunodeficiency Virus (HIV) and concerns regarding the possibility of healthcare workers acquiring the virus through patient contact.

Healthcare workers are occupationally exposed to a several types of infectious diseases while they are on the job performing their duties. During the process of delivering healthcare services, there are a wide variety of workers involve, such as:

- Physicians,
- Nurses,
- CNA/HHA,
- Therapist (Physical, Occupational and Speech)
- Technicians,
- Transporters
- clinical laboratory workers,
- First responders; EMS, Fire Department, Police Officers,
- building maintenance personnel,

- security staff and administrative personnel,
- social workers,
- food service,
- volunteers
- housekeeping,
- Mortuary personnel and so much more.

Several of the healthcare workers can also be found in a variety of workplace environment such as,

- Hospitals,
- nursing care facilities,
- outpatient clinics (medical office, dental offices, and occupational health clinics),
- ambulatory care centers,
- Home Health Care and
- Emergency response settings.

Primary routes of infectious disease transmission in the United States healthcare settings include:

- Contact,
- Droplet, and
- Airborne.

Contact transmission

Contact transmission (sub-divided into direct and indirect contact).

Direct contact transmission

Direct contact transmission involves the transfer of infectious agents to the susceptible individual through physical contact with an infected individual such as, direct skin-to-skin contact.

Indirect contact transmission

Indirect contact transmission occurs whenever infectious agents are transferred to the susceptible individual when the individual makes physical contact with the contaminated items and surfaces such as:

- Contaminated blood draw equipment,
- Door knobs,
- patient-care instruments or equipment,
- bed rails,
- Examination table, etc.

Examples of contact transmissible infectious agents include:

- Methicillin-Resistant *Staphylococcus Aureus* (MRSA) and
- Vancomycin-Resistant Enterococcus (VRE).

Droplets

Droplets containing infectious agents are generated when:

- When an infected individual talks,
- When an infected individual sneezes,
- When an infected individual coughs,
- During certain medical procedures, for example suctioning or while performing an endotracheal intubation.

Transmission occurs when the droplets generated as mentioned above; come into direct contact with the healthcare worker or other individuals' (a susceptible individual) mucosal surfaces of the nose, mouth or eyes. Droplets are too large to be airborne for a long period of time; therefore droplet transmission does not occur through the air over long distances.

Examples of droplet transmissible infectious agents are the:

- Influenza virus which causes the seasonal flu and
- *Bordetella Pertussis* which causes Pertussis (whooping cough).

Airborne transmission

Airborne transmission occurs through very small droplet nuclei or small particles that contain infectious agents and can remain suspended in air for extended periods of time. When the infectious droplet nuclei or small particles are inhaled by the susceptible individual, they enter the respiratory tract and can cause infection. Because air currents can disperse these droplet nuclei or particles over long distances; airborne transmission does not require face-to-face contact with the infected individual.

Airborne transmission only occurs with an infectious agent that is capable of surviving and retaining infectivity for relatively long periods of time in droplet nuclei or airborne particles.

There are a limited number of diseases that are transmissible via the airborne route. Two examples of airborne transmissible agents include:

- *Mycobacterium tuberculosis* which causes tuberculosis (TB) and
- Rubella virus which causes measles.

OSHA standards

There are several OSHA standards and directives that are directly applicable to protecting workers against transmission of infectious agents. These include:

- OSHA's Bloodborne Pathogens standard which provides protection of workers from exposures to blood and body fluids that may contain bloodborne infectious agents;
- OSHA's Personal Protective Equipment standard and Respiratory Protection standard which provide protection for workers when exposed to contact, droplet and airborne transmissible infectious agents and
- OSHA's TB compliance directive which protects workers against exposure to TB through enforcement of existing applicable OSHA standards and the General Duty Clause of the OSH Act.

Employers

It is mandatory for employers to implement an Exposure Control Plan that makes Universal Precautions mandatory and treats all body fluids and blood as infectious with the exception of sweat. This plan focuses on hand hygiene and the use of Personal Protective Equipment (PPE) as protection against blood and body fluid infection.

PPE includes gowns, gloves, masks, goggles and resuscitation bags. These materials must be available to the employee at no charge. Hypoallergenic gloves, powderless gloves glove liners, or other alternatives must be provided for the employee who is allergic to the gloves that are usually provided. The employer must also launder, clean or dispose of PPE at no cost to the employee. A review of available Personal Protective Equipment should be completed periodically for example annually, due to new product developments and other improvements.

Under the General Duty Clause, Section 5(a)(1) of the Occupational Safety and Health Act (OSHA) of 1970, employers are required to provide their employees with a place of employment that "is free from recognizable hazards that are causing or likely to cause death or serious harm to employees." The courts have interpreted OSHA's general duty clause to mean that an employer has a legal obligation to provide a workplace free of conditions or activities that either the employer or industry recognizes as hazardous and that cause, or are likely to cause, death or serious physical harm to employees when there is a feasible method to abate the hazard.

Each employer shall:

- Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
- shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees; shall comply with occupational safety and health standards promulgated under this Act.
- Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

An employer can be found to be in violation of the general duty clause if it can be shown that:

- A hazard exist
- Workers / staff were exposed to the hazard
- The hazard is likely to cause death or serious physical harm.
- Employer had knowledge of the hazard or should have had knowledge because the hazard had been recognized by the employer, the industry, or common sense.
- The hazard was foreseeable.

Universal Precaution

Universal Precaution is an infection control principle that treats all human blood and other potentially infectious materials (OPIM) as infectious (29 CFR1910.1030(d)(1). OSHA regulation for preventing any exposure to HBV, HIV, and HCV in the workplace and requires the proper use of Personal protective equipment (PPE).

Standard Precautions

Standard Precautions: recommendations from the Centers for Disease Control and Prevention (CDC) which focuses on all body fluids; whether or not blood is present. Body fluids from excretion, secretion (except sweat), and contact with non-intact skin or mucus membranes.

Hand Hygiene

Hand hygiene procedures include the use of alcohol-based hand rubs (containing 60% -95% alcohol) and handwashing with soap and water. Alcohol-based hand rub is the preferred method for decontaminating hands, except when hands are visibly soiled for example with dirt, blood, body fluids, or after caring for patients with known or suspected infectious diarrhea such as with Clostridium difficile and norovirus, in such case soap and water should be used. Hand hygiene stations should be placed to ensure there is easy access.

Tuberculosis (TB) transmission

Tuberculosis (TB) transmission has been documented in health care settings where health care workers and patients come in contact with individuals who have TB disease.

People who work or receive care in health care settings are at higher risk for becoming infected with TB; therefore, it is necessary to have a TB infection control plan as part of a general infection control program designed to ensure the following:

- prompt detection of infectious patients,
- airborne precautions, and
- Treatment of people who have suspected or confirmed TB disease.

In order to be effective, the primary emphasis of a TB infection control program should be on achieving these three goals.

In all health care settings, particularly those in which people are at high risk for exposure to TB, policies and procedures for TB control should be developed, reviewed periodically, and evaluated for effectiveness to determine the actions necessary to minimize the risk for transmission of TB.

The TB infection control program should be based on a three-level hierarchy of control measures and include:

1. Administrative measures
2. Environmental controls
3. Use of respiratory protective equipment

The first and most important level of the hierarchy, administrative measures, impacts the largest number of people. It is intended primarily to reduce the risk of uninfected people who are exposed to people who have TB disease.

The second level of the hierarchy is the use of environmental controls to reduce the amount of TB in the air. The first two control levels of the hierarchy also minimize the number of areas in the health care setting where exposure to TB may occur.

The third level of the hierarchy is the use of respiratory protective equipment in situations that pose a high risk of exposure to TB. Use of respiratory protection equipment can further reduce the risk for exposure of health care workers.

What to Do If You Have Been Exposed to TB

If you think you have been exposed to someone with TB disease, contact your health care provider or local health department to see if you should be tested for TB. Be sure to tell the doctor or nurse when you spent time with someone who has TB disease.

Preventing Latent TB Infection from Progressing to TB Disease
Many people who have latent TB infection never develop TB disease. But some people who have latent TB infection are more likely to develop TB disease than others.

Those at high risk for developing TB disease include:

- People with HIV infection
- People who became infected with TB bacteria in the last 2 years
- Babies and young children
- People who inject illegal drugs
- People who are sick with other diseases that weaken the immune system
- Elderly people
- People who were not treated correctly for TB in the past

If the patients have latent TB infection and they are in one of these high-risk groups, they should take medication to keep from developing TB disease. There are several treatment options for latent TB infection. The patients and the health care provider / physician must decide which treatment is best for them. If they take the medication as instructed, it can keep them from developing TB disease. Because there are less bacteria, treatment for latent TB infection is much easier than treatment for TB disease. An individual with TB disease has a large amount of TB bacteria in the body. Several drugs are needed to treat TB disease.

In all health-care settings, particularly those in which persons who are at high risk for exposure to Mycobacterium tuberculosis work or receive care, policies and procedures for TB control should be developed, reviewed periodically, and evaluated for effectiveness to determine the actions necessary to minimize the risk for transmission of Mycobacterium tuberculosis.

Overview of TB Infection-Control Measures

The TB infection-control program should be based on a three-level hierarchy of control measures and include:

1. Administrative controls
2. Environmental controls
3. Use of respiratory protective equipment

The first and most important level of the hierarchy, administrative controls, impacts the largest number of individuals and is intended primarily to reduce the risk of uninfected people exposed to people who have TB disease. These control measures include the following activities:

- Assigning responsibility for TB infection control in the setting;
- Conducting a TB risk assessment of the setting;
- Developing and instituting a written TB infection-control plan to ensure prompt detection, airborne precautions, and treatment of persons who have suspected or confirmed TB disease;
- Ensuring the timely availability of recommended laboratory processing, testing, and reporting of results to the ordering physician;
- Implementing effective work practices for the management of patients with suspected or confirmed TB disease;
- Ensuring proper cleaning and sterilization or disinfection of potentially contaminated equipment for example endoscopes, bronchoscopes;
- Training and educating health-care workers regarding TB, with specific focus on prevention, transmission, and symptoms;
- Screening and evaluating who are at risk for TB disease or who might be exposed to M. tuberculosis;
- Applying epidemiologic-based prevention principles, including the use of setting-related infection-control data;
- Using appropriate signage advising respiratory hygiene and cough etiquette; and
- Coordinating efforts with the local or state health department.

Environmental controls

The second level of the hierarchy is the use of environmental controls to prevent the spread and reduce the concentration of infectious droplet nuclei in ambient air. Primary environmental controls control the source of infection by using local exhaust ventilation (hoods, tents, or booths) and dilute and remove contaminated air by using general ventilation.

Secondary environmental controls control the airflow to prevent contamination of air in areas adjacent to the source (airborne infection isolation [AII] rooms) and clean the air by using high efficiency particulate air (HEPA) filtration, or ultraviolet germicidal irradiation.

The first two control levels of the hierarchy minimize the number of areas in the health-care setting where exposure to M. tuberculosis may occur. They reduce, but do not eliminate, the risk in those few areas where exposure to M. tuberculosis can still occur (for example, aII rooms housing TB patients and treatment rooms in which cough-inducing or aerosol-generating procedures are performed on TB patients). Therefore, the third level of the hierarchy is the use of respiratory protective equipment in situations that pose a high risk of exposure to M. tuberculosis.

Use of respiratory protective equipment

Use of respiratory protection equipment can further reduce risk for exposure of healthcare workers to infectious droplet nuclei that have been expelled into the air from a patient with infectious TB disease. The following measures can be taken to reduce the risk for exposure:

- Implementing a respiratory protection program;
- Training healthcare workers on respiratory protection; and
- Training patients on respiratory hygiene and cough etiquette procedures.

Determining the Infectiousness of TB Patients

In general, patients who have suspected or confirmed TB disease should be considered infectious if:

a. They are coughing, undergoing cough-inducing procedures, or have positive sputum smear results for Acid-Fast Bacilli (AFB); and

b. They are not receiving adequate anti-tuberculosis therapy, have just started therapy, or have a poor clinical or bacteriologic response to therapy.

For patients placed under airborne precautions because of suspected infectious TB disease of the lungs, airway, or larynx, airborne precautions can be discontinued when infectious TB disease is considered unlikely and either:

- Another diagnosis is made that explains the clinical syndrome; or
- The patient produces three consecutive negative sputum smears collected in 8 to 24-hour intervals (one needs to be an early morning specimen).

Patients for whom the suspicion of infectious TB disease remains after the collection of three negative sputum smear results should not be released from airborne precautions until they:

- Receive standard multidrug antituberculosis treatment (minimum of 2 weeks); and
- Demonstrate clinical improvement.

For these patients, additional diagnostic approaches for example, sputum induction and after sufficient time on treatment, bronchoscopy may need to be considered.

Patients who have drug-susceptible TB of the lung, airway, or larynx, should remain under airborne precautions until they:

- Produce three consecutive negative sputum smears collected in 8 to 24-hour intervals (one should be an early morning specimen)
- Receive the standard multidrug anti-tuberculosis treatment (minimum of 2 weeks);
- Demonstrate clinical improvement.

Tuberculin Skin Testing

The Mantoux tuberculin skin test (TST) is the standard method of determining whether an individual is infected with Mycobacterium tuberculosis. Reliable administration and

reading of the tuberculin skin test requires training, standardized procedures, practice and supervision.

Administering the tuberculin skin test

The tuberculin skin test is performed by injecting 0.1 ml of tuberculin purified protein derivative (PPD) into the inner surface of the forearm. The injection should be made with a tuberculin syringe, with the bevel of the needle facing up. The tuberculin skin test is an intradermal injection. When injection is administered correctly, the injection should produce a wheal (pale elevation of the skin) 6 to 10 mm in diameter.

Reading the tuberculin skin test

The skin test reaction should be read between 48 and 72 hours after administration. If the patient who does not return within 72 hours, he / she has to be rescheduled for another skin test.

The reaction should be measured in millimeters of the induration; a raised, palpable, swelling or hardened area. The reader should not measure redness/ erythema. Measure only the induration.The diameter of the indurated area should be measured across the forearm.

Tuberculin skin test Interpretation

Skin test interpretation depends on two factors:

- Measurement in millimeters (mm) of the induration
- The individual's risk of being infected with TB

If You Have Been Exposed To TB

As a health care worker, you may have been exposed to TB bacteria if you worked with or spent time near someone with TB disease. The TB bacteria are put into the air when the individual with active TB disease of the throat or lungs sneeze, coughs, sings or speaks.

You cannot get TB from

- Clothing
- Drinking glass
- Eating utensils
- Handshake
- Toilet
- Other surfaces

Risk Factors

Some individuals develop TB disease soon after they become infected (within weeks) before their immune system can fight the TB bacteria. Other people may become sick years later, when their immune system becomes weak for other reasons.

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

Individuals who are at high risk for developing TB disease fall into two categories:

- Individuals who have been recently infected with TB bacteria
- Individuals with medical diagnosis/ conditions that weakens the immune system

Individuals who have been recently Infected with TB Bacteria

This includes but not limited to:

- Close contacts of an individual with infectious TB disease
- Groups with high rates of TB transmission, for example homeless individuals, injection drug users, and persons with Human Immunodeficiency Virus (HIV) infection
- Individuals who have immigrated from areas of the world with high rates of TB
- individuals who work or lives with people who are at high risk for TB in institutions or facilities such as hospitals, nursing homes, homeless shelters, correctional facilities and residential homes for those with Human Immunodeficiency Virus (HIV).

- Children less than 5 years of age who have a positive TB test

Persons with Medical Conditions that Weaken the Immune System

Young children and babies often have weak immune systems. Other individuals can also have weakened immune systems too, especially individuals with conditions such as:

- HIV infection
- Substance abuse
- Diabetes mellitus (DM)
- kidney disease
- Organ transplants
- Low body weight
- cancer of head and neck
- Medical treatment for example corticosteroids
- Specialized treatment for Crohn's disease

EXPOSURE

If you think you have been exposed to someone with TB disease, you should contact your physician or your local health department about getting a TB skin test or a special TB blood test. The physician will need to know who you spent time with that had the TB disease.

The individual who is exposed to TB bacteria is not able to spread the bacteria to others right away. Only individuals with active TB disease can spread TB bacteria to others. Before you become capable of spreading TB to other individuals, you would have to breathe in the TB bacteria and become infected.

Then the active TB bacteria begin to multiply in the body and cause active TB disease. At this time, you could possibly spread TB bacteria to other persons. Individuals with TB disease are most likely to spread the bacteria to the people they spend time with daily, for example family members, co-workers, friends and schoolmates.

Some individuals develop TB disease within weeks, after becoming infected, before their immune system can fight the TB bacteria. Other individuals may get sick years later, when their immune system becomes weakened for other reasons. Many individuals with TB infection never develop TB disease.

Symptoms of TB disease include:

- Night sweats
- Chills
- coughing up blood or sputum
- Fever
- fatigue or weakness
- No appetite

Treatment for Latent TB Infection

Treatment of latent TB Infection greatly decreases the risk that TB infection will progress to the TB disease. As mentioned earlier some groups of people are at very high risk of developing TB disease once infected. Therefore, every effort should be made to start the appropriate treatment and to ensure the patient completes the entire course of the treatment for latent TB infection.

DIAGNOSIS

Once the diagnosis of latent TB infection has been made, health care providers must choose the most appropriate and effective treatment regimen.

Treatment regimens that are used include:

- Isoniazid (INH),
- Rifapentine (RPT), or
- Rifampin (RIF).

Treatment must be modified if the patient is a contact of an individual with drug-resistant TB. Consultation with a TB expert is advised if the known source of TB infection has drug-resistant TB.

Table 1.Latent TB Infection Treatment Regimens

Drugs	Duration	Interval	Minimum doses
Isoniazid	9 months	Daily	270
		Twice weekly	76
Isoniazid	6 months	Daily	180
		Twice weekly	52
Isoniazid and Rifapentine	3 months	Once weekly	12
Rifampin	4 months	Daily	120

ALERT!!!
Due to the reports of severe liver injury and deaths, the Centers for Disease Control and Prevention (CDC) recommends that the combination of Rifampin (RIF) and Pyrazinamide (PZA) should generally not be offered for the treatment of latent TB infection.

Table 2 - A person with latent TB infection

Usually has a skin test or blood test result indicating TB infection
Has a normal chest x-ray and a negative sputum test
Has TB bacteria in his/her body that are alive, but inactive
Does not feel sick
Cannot spread TB bacteria to others
Needs treatment for latent TB infection to prevent TB disease; however, if exposed and infected by a person with multidrug-resistant TB (MDR TB) or extensively drug-resistant TB (XDR TB), preventive treatment may not be an option

Table 3- A person with TB disease

Usually has a skin test or blood test result indicating TB infection
May have an abnormal chest x-ray, or positive sputum smear or culture
Has active TB bacteria in his/her body
Usually feels sick and may have symptoms such as coughing, fever, and weight loss
May spread TB bacteria to others
Needs treatment to treat TB disease

N95 disposable respirator

- The N95 respirator is the most common of the seven types of particulate filtering facepiece respirators. This product filters at least 95% of airborne particles but is not resistant to oil.

- Occupational Safety and Health Administration (OSHA) allows for the use of the N95 disposable respirator for employees for protection against Tuberculosis in the health care environment.

- The N95 disposable respirator has to be fit tested. A fit test is a test protocol conducted to verify that a respirator is both comfortable and correctly fits the user. Fit testing uses a test agent, either qualitatively detected by the user's sense of smell, taste or involuntary cough (irritant smoke) or quantitatively measured by an instrument, to verify the respirator's fit.

- Fit testing each model of respirator the employee is to use in workplace tasks before their use is important to assure the expected level of protection is provided by minimizing the total amount of contaminant leakage into the face piece.

- The benefits of this testing include better protection for the employee and verification that the employee is wearing a correctly-fitting model and size of respirator. Higher than expected exposures to a contaminate may occur if users have poor face seals with the respirator, which can result in excessive leakage.

SOME NURSING DIAGNOSIS:

Risk for Infection
•Infection, risk for spread
•Infection, risk for reactivation

Some risk factors may include:
•Inadequate primary defenses, decreased ciliary action (stasis of secretions)
•Malnutrition
•Tissue destruction (extension of infection)
•Lowered resistance (suppressed inflammatory process)
•Environmental exposure
•Insufficient or lack of knowledge to avoid exposure to the pathogens

Some Desired Outcomes
•Identify interventions to prevent risk of spread of the infection
•Identify interventions to reduce risk of spread of the infection
•Demonstrate techniques for changes to promote safe environment.
•Demonstrate techniques to initiate lifestyle changes to promote safe environment.

INTERVENTIONS/RATIONALES

INTERVENTIONS
Review the need for infection control measures.
Place patient in temporary respiratory isolation as indicated.

RATIONALE
Will help patient understand the need for protecting others.
AFB can pass through standard masks; particulate respirators are required.

INTERVENTION
Review pathology of disease; active and inactive phases and potential spread of infection by airborne droplets (sneezing, coughing, spitting, singing, talking, and laughing and review of medication /treatment regimen.

RATIONALE
Helps patient understand disease, treatment regimen to prevent reactivation, spreading the infection and preventing complications. Understanding of how the disease is passed and awareness of transmission possibilities help patient take steps to prevent spreading infection to others.

INTERVENTIONS
Identify other people at risk such as family, household members, close friends and associates.

RATIONALE
Those exposed may require a course of drug therapy to prevent development of infection or spread of the infection.

INTERVENTIONS
Instruct patients to sneeze or cough and expectorate into tissue
To avoid spitting
Review proper disposal of tissue
Review good hand hygiene /hand washing techniques with return demonstration.

RATIONALE
Sneezing or coughing and expectorate into tissue, avoid spitting, proper disposal of tissue, implementing good hand hygiene /hand washing technique are all behaviors necessary to prevent the spread of infection.

INTERVENTIONS
Monitor vital signs (temperature) as indicated.

RATIONALE
Elevated body temperature /febrile reactions are indicators that there is presence of infection.

INTERVENTIONS
Administer anti-infective agents as indicated

RATIONALE
Initial therapy of uncomplicated pulmonary disease usually includes 4 drugs;
(four primary drugs or combination of primary and secondary drugs).

Primary drugs:

isoniazid (INH),
ethambutol (Myambutol),
rifampin (RMP/Rifadin),
rifampin with isoniazid (Rifamate),
pyrazinamide (PZA),
streptomycin ,
rifapentine (Priftin)

RATIONALE
Isoniazid (INH) is usually drug of choice for infected patient and those at risk for developing TB.

Short-course chemotherapy, including;
INH, rifampin (for 6 months),
PZA, and ethambutol or streptomycin, is given for at least 2 months (or until sensitivities are known or until serial sputums are clear) followed by 3 more months of therapy with INH.

Ethambutol should be given if central nervous system (CNS) or disseminated disease is present or if isoniazid (INH) resistance is suspected.

Second-line drugs:
Ethionamide (Trecator-SC),
Para-aminosalicylate (PAS),
cycloserine (Seromycin),

capreomycin (Capastat).

Extended therapy (up to 24 months) is indicated for reactivation cases, extrapulmonary reactivated TB, or in the presence of other medical problems, for example silicosis and diabetes mellitus etc.

Prophylaxis with isoniazid (INH) for 12 months should be considered in HIV-positive patients with positive PPD test.

INTERVENTIONS
Identify patient's risk factors for reactivation of tuberculosis, such as lowered resistance associated with;
use of immunosuppressive drugs,
presence of cancer,
presence of diabetes mellitus,
-alcoholism,
-postpartum,
-malnutrition,
-intestinal bypass surgery,
-use of corticosteroids.

RATIONALE
When the patients know about these factors it will help to change their lifestyle and avoid incidence of exacerbation.

INTERVENTIONS
Stress the importance of taking the medication exactly as ordered (uninterrupted drug therapy). Evaluate the patient’s potential for compliance (cooperation).

RATIONALE
Contagious period may last only 2–3 days after initiation of chemotherapy, but in presence of moderately advanced disease or cavitation, the risk of spread of infection may continue up to 3 months. Often compliance with multidrug regimens for prolonged period of time is difficult, so directly observed therapy (DOT) is considered (directly observe patient swallow medications).

INTERVENTIONS
Review the importance of following up and rechecking sputum (culture sputum) for the duration of therapy.

RATIONALE
Patient who have 3 consecutive negative sputum smears (takes 3–5 months), is adhering to drug regimen, and is asymptomatic will be classified a non transmitter.

Second-line drugs may be needed when infection is resistant to primary drugs or may be used in combination with primary anti tubercular drugs.

MDR-TB requires minimum of 18–24 months therapy with at least three drugs in the regimen known to be effective against the specific infectious organism and which patient has not previously taken.

Treatment is often extended to 24 months in the patients with severe symptoms or HIV infection.

INTERVENTIONS
Encourage intake of nutritious well-balanced meals.
Provide frequent small snacks instead of large meals as appropriate.

RATIONALE
Nutritious well-balanced meals are need to support health and well being.

INTERVENTIONS
Monitor Liver function studies (AST/ALT).

RATIONALE
Monitors adverse effects of drug therapy such as hepatitis.

INTERVENTIONS
Notify local health department.

RATIONALE
Notifying the local health department is required by law and is helpful in identifying contacts to reduce spread of infection. Treatment course is very long and usually handled in the community by public health nurse monitoring.

Other Nursing Diagnosis

Ineffective Airway Clearance may be related to:
•Thick, viscous and or bloody secretions
•Tracheal edema
•Pharyngeal edema
•Fatigue -poor cough effort

Evidenced by:
•Abnormal respiratory rate
•Abnormal respiratory rhythm
•Abnormal respiratory depth

•Dyspnea
•Abnormal breath sounds such as wheezes, rhonchi, stridor

Some Desired Outcomes
•Maintain patent airway
•Demonstrate behaviors to improve airway clearance
•Able to expectorate secretions
•Demonstrate behaviors to maintain airway clearance.
•Participate in treatment regimen, within patient's level of ability
•Identify potential complications and initiate appropriate interventions.

INTERVENTIONS/RATIONALES

Monitor and assess respiratory functions; note breath sounds, respiratory rate, rhythm, depth and use of accessory muscles to assist with respiration.

RATIONALE
If patient has diminished breath sounds this may indicate atelectasis. Wheezes, Rhonchi indicate accumulation of secretions and the inability to clear the airways which contributes to the use of accessory muscles and increased work of breathing.

INTERVENTIONS
Clear drainage /secretions from the mouth and trachea (suction as needed).

RATIONALE
Clearing drainage /secretions from mouth and trachea helps to prevent obstruction and aspiration. Suctioning is needed if the patient is not able to expectorate secretions.

INTERVENTIONS
Note the patient's ability to expectorate mucus and cough effectively,
Document character of the sputum
The amount of sputum,
The presence of hemoptysis (blood)

RATIONALE
Expectoration of sputum may be difficult when the secretion is very thick due to the infection, fever may contribute to dehydration or the patient may not be drinking adequate fluid intake. Blood in sputum results from cavitation (tissue breakdown) in the lungs or from bronchial ulceration.

INTERVENTION
Assist patient to semi or high-Fowler's position.
Encourage cough and deep breathing exercises.

RATIONALE
Semi or high-Fowler's positioning helps to maximize lung expansion and reduces respiratory effort. Coughing and deep breathing exercises maximizes ventilation which will help to open atelectatic areas and promote and assist movement of secretions into larger airways for expectoration.

INTERVENTIONS
Encourage adequate fluid intake - at least 2500 ml/day (unless contraindicated).

RATIONALE
Adequate fluid intake will help to thin the secretions and make it easier to expectorate.

INTERVENTIONS
Humidify oxygen and inspired air.

RATIONALE
Helps to thin secretions and prevent drying of the mucous membranes.

INTERVENTIONS
Be prepared to assist with emergency intubation.

RATIONALE
Intubation may be needed in emergency; when airway is compromised (acute pulmonary bleeding or laryngeal edema).

INTERVENTIONS
Administer medications as ordered.
Mucolytic agents such as Acetylcysteine (Mucomyst).

RATIONALE
Mucolytic agents decreases the stickiness /thickness of pulmonary secretions and make it easier to expectorate.

Administer corticosteroids (prednisone) as ordered.
RATIONALE
Corticosteroids is needed when the inflammatory response is severe (used when response is life threatening).

Administer Bronchodilators such as theophylline (Theo-Dur), Oxtriphylline (Choledyl)

RATIONALE
Dilates /widens size of lumen of tracheobronchial tree, improving oxygen deliveryas the resistance to airflow is reduced.

Nursing Diagnosis (cont)

Impaired Gas Exchange
• Risk for impaired gas exchange

Some Risk factors include:

•Viscous,Thick secretions
•Reduction in effective lung surface (atelectasis)
•Alveolar capillary membrane damaged/destroyed
•Bronchial edema

Some Desired Outcomes

•Patient reports decreased dyspnea
•Reports of absence of dyspnea
•Patient free of symptoms of respiratory distress
•Demonstrate improved ventilation
•Demonstrate good/adequate oxygenation of the tissues by Arterial Blood Gases (ABGs) within acceptable levels.

INTERVENTIONS/RATIONALES

Monitor for dyspnea and assess dyspnea use 0–10 scale.
Assess for tachypnea, diminished or abnormal breath sounds, limited chest wall expansion, increased respiratory effort, fatigue.

RATIONALE
Pulmonary Tuberculosis can cause a variety of effects/ changes in the lungs bronchopneumonia, diffuse and intense inflammation, pleural effusion, fibrosis and caseous necrosis. Respiratory effects experienced may be mild dyspnea or severe respiratory distress. Use of a scale to evaluate dyspnea helps clarify changes in condition and the degree of difficulty patient is experiencing.

INTERVENTIONS
Evaluate change in level of alertness /mentation. Monitor for cyanosis, changes in mucous membranes, nail beds and skin color.

RATIONALE
Accumulation of secretions and airway compromise may impair oxygenation of vital tissues and organs.

INTERVENTIONS
Monitor Arterial Blood Gases (ABGs), Monitor pulse oximetry.

RATIONALE
Arterial Blood Gases (ABGs) indicates oxygen content; reduced oxygen content (PaO2) and saturation or increased PaCO2 indicate the need for interventions/ changes in treatment.

INTERVENTIONS
Instruct the patients regarding pursed lip breathing technique.
Encourage pursed lip breathing during exhalation (especially with parenchymal destruction and fibrosis.

RATIONALE
Pursed lip breathing during exhalation helps to create resistance against outflowing air to prevent airway collapse or narrowing of the airways,
which helps to distribute air through the lungs, relieving shortness of breath.

INTERVENTIONS
Promote bed rest, assist with self-care activities as needed.

RATIONALE
Reduce oxygen demand and consumption during periods of respiratory compromise (reduce severity of symptoms).

INTERVENTIONS
Provide supplemental oxygen as ordered.

RATIONALE
Oxygen helps to correct hypoxemia that may occur due to reduced ventilation and decreased alveolar lung surface.

Nursing Diagnosis (Cont'd)

Imbalanced Nutrition

Nutrition: Imbalanced, less than body requirements
Related to;

•Frequent dyspnea
•Frequent coughing
•Fatigue
•Anorexia
•Frequent sputum production
•Economical factors; Insufficient financial resources

Evidenced by;
•Reports of altered taste sensation
•Weight 10%–20% below ideal for frame & height
•Reports lack of interest in food
•Muscle tone poor

Some Desired Outcomes
•Demonstrate progressive weight gain toward goal
•Maintain appropriate weight.
•Demonstrate normal laboratory values
•Free of signs of malnutrition
•Initiate behaviors changes or lifestyle changes to regain weight

INTERVENTIONS/RATIONALES
Document patient’s nutritional status on admission.
Document current weight, note degree of weight loss.
Assess skin turgor.
Assess integrity of oral mucosa
Assess patient's ability to swallow.
Assess presence of bowel sounds.

Note history of nausea/ vomiting and /or diarrhea.

RATIONALE
Useful in defining extent of problem and appropriate implementation of interventions.

INTERVENTIONS
Gather data regarding patient's usual dietary pattern.

RATIONALE
Helps to identify patients strengths and /or needs. Incorporating the patient's preferences may encourage and improve dietary/ meal intake.

INTERVENTION
Monitor I&O
Monitor weight

RATIONALE
Monitoring weight and I&O is helpful in measuring the effectiveness of fluid and nutritional support.

INTERVENTIONS
Provide and encourage frequent rest periods.

INTERVENTIONS
Administer antipyretics as indicated for elevations in body temperature/ fever.

RATIONALE
Fever increases metabolic needs and increases consumption of calories.

RATIONALE
Rest periods will help to conserve energy (for example when metabolic needs are increased by fever and excess coughing /dyspnea).

INTERVENTIONS
Provide oral hygiene /care before respiratory treatments and after respiratory treatments.

RATIONALE
Decreases the bad /strange taste that is left in the mouth after some medications used for the respiratory treatments or from sputum (may aggravate the vomiting center).

INTERVENTIONS
Respiratory therapy consult to schedule treatments (one to two hours) before or after meals.

RATIONALE
Respiratory therapy may help to reduce the episodes of nausea/ vomiting that is associated with some medications.

INTERVENTIONS
Encourage frequent, small meals high in carbohydrates and protein.

RATIONALE
Frequent small meals help to maximizes nutritional intake without leading to fatigue. Too much energy expenditure when eating large meals.

INTERVENTIONS
Assess nausea/vomiting and anorexia and monitor possible correlation to the medications. Monitor the stools; frequency, amount and the consistency.

RATIONALE
Nausea and vomiting may affect dietary/meal choices and identify areas for solving problems to maximize intake of adequate nutrition.

INTERVENTIONS
Refer to dietary consult for adjustments/ nutritional interventions.

RATIONALES
Dietitian will provide assistance in implementing nutritional meals /fluids to adequately meet the patient's metabolic requirements, dietary preferences, and financial resources (after patient is discharged).

INTERVENTIONS
Monitor laboratory values, such as: protein, prealbumin, albumin and BUN.

RATIONALE
If low laboratory values, this indicates malnutrition and the need for change/ intervention in the current regimen.

Florida

Tuberculosis Morbidity - Florida 2014

In 2014, 595 tuberculosis cases were reported in Florida. This represents an 8.7% decrease in cases since 2013 (652). The TB case rate in 2014 was 3.0 per 100,000 population.

Gender

o Men 63% (375/595)

o Women 37% (220/595)

Nationality

o U.S. Born 38% (224/595)

o Foreign-Born 62% (371/595)

Age Group*

o 0-4 3% (15/595)

o 5-14 1% (8/595)

o 15-24 11% (68/595)

o 25-44 28% (164/595)

o 45-64 39% (232/595)

o 65 and over 18% (108/595)

Ethnicity/Race

o Hispanic 33% (195/595)

o Non-Hispanic 67% (400/595)

o Black or African American 37% (218/595)

o White 49% (293/595)

o Asian 14% (83/595)

o Pacific Islander/Native Hawaiian 0% (0/595)

o Multiple Races 0% (0/595)

o American Indian/AK Native

Risk Factors

o Excess alcohol use within past year 15% (89/595)

o HIV Co-infection 11% (63/595)

o Illicit drug use within past year 12% (69/595)

o Homelessness 8% (47/595)

o Incarcerated at diagnosis 3% (19/595)

Drug Resistance

o Resistant to Isoniazid 6% (36/595)

o Resistant to Isoniazid 1.7% (10/595) and Rifampin (MDR)

Note: All Percentages have been rounded. *Age is at date suspected TB is reported to the health department Data as of 3/26/2015.

For more information please contact: Florida Department of Health Division of Disease Control, TB Control Program (850) 245-4350

2013 & 2014 TB Incidence Rates

FLORIDA

2014 Cases – 595

2013 Cases – 652

2014 Population - 19,552,248

(Source: TB Control Section as per 02-13-2015 Population data acquired from Florida's Community Health Resource Tool Set (CHARTS) is provisional as per 02-13-2015).

Alabama

Annual Tuberculosis Morbidity Report for 2015 By County and Case Rate

Alabama Population Totals - 4,849,377

Case Rate – 2.5

Reported Cases – 119

According to the state of Alabama, the ultimate goal for the Division of Tuberculosis (TB) Control is the elimination of tuberculosis in Alabama. Until the goal is reached, the Division strives to reduce the annual burden of disease, limit transmission and prevent future cases through the provision of diagnostic, treatment, and case management activities.

The Division of Tuberculosis Control provides these services to all individuals in Alabama, regardless of the ability to pay. This commitment to the citizens of Alabama has contributed to historic declines in TB morbidity and mortality.

Call (334) 206-5330 for information about tuberculosis (TB) concerning any of the following:

- reporting a case
- case management
- treatment of TB
- how and where to get medications
- testing for exposure to TB
- epidemiological investigation of TB
- educational materials
- questions concerning placing and reading a skin test
- consultation with TB physicians.

The Alabama Department of Public Health is conducting an intense screening and contact investigation in Marion, Perry County, Alabama, due to 26 total cases of tuberculosis (TB) disease reported to be linked to Perry County since 2014. Three adult deaths have been linked to Perry County. Four children have been treated for tuberculosis disease, are alive, and are doing well. Public health is trying to identify persons with latent tuberculosis infection (LTBI) who can benefit from preventive therapy as well as identify any new cases of TB disease.

Since 2014, 15 patients linked to Marion, Perry County, Alabama, have successfully completed therapy for TB disease. Nine patients (including one new patient identified as part of screening) are currently on TB therapy and have been rendered non infectious.

TB Outbreak in Marion, AL

Screening Update (As of February 2, 2016)

- Number of patients screened: 2,023
- Number of probable Latent TB infection (LTBI) (not contagious)

  in those screened: 151

- Number of chest X-rays read: 85
  (Other chest X-rays to follow)

Note: These numbers will change as screening continues. Patients with LTBI are being started on preventive medication.

News Releases

02-04-16	TB testing finds two additional patients in Perry County, treatment underway
01-21-16	ADPH confirms 1 new TB case in Perry County, emphasizes message that TB is treatable
01-18-16	Public Health confirms 47 people with TB infection in Perry County
01-15-16	Perry County Health Department to provide test results and preventive therapy to those testing positive for TB
01-14-16	Health Department held town hall meeting on TB Jan. 14 in Marion
01-07-16	Perry County Health Department to give money to people screened and treated for TB

Georgia

Georgia's Mission is:

- To control transmission,
- Prevent illness and
- Ensure treatment of disease due to TB.

This is accomplished by:

- Identifying and treating individuals who have active TB disease,
- finding, screening and treating contacts, and
- screening high-risk populations.

The Georgia TB Program has the legal responsibility for all TB clients in Georgia regardless of who provides the direct services. TB services are available to all who fall within the service criteria without regard to the client's ability to pay.

Georgia Statistics

According to the Georgia Department of Public Health, 2014 Georgia Tuberculosis Report, Atlanta, Georgia, October 2014:

Tuberculosis Surveillance in Georgia Tuberculosis (TB) is a reportable disease in Georgia. All Georgia physicians, laboratories and other health care providers are required by law to **immediately report** clinical and laboratory confirmed TB cases under their care to Georgia public health authorities.

Tuberculosis cases may be directly reported to a County Health Department, a District Health Office, or to the state TB Program and TB Epidemiology Section of the Georgia Department of Public Health (DPH), which is responsible for the systematic collection of all reported TB cases in the state.

Immediate reporting of TB cases enables appropriate public health follow-up of patients, including:

- Administration of directly observed therapy,
- monitoring TB treatment until completion,
- Evaluating and screening contacts exposed to a TB case, and
- outbreak investigation and control.

TB cases in Georgia can be reported:

- Electronically through the State Electronic Notifiable Disease Surveillance System (SendSS), a secure web-based surveillance software developed by DPH, or
- by calling,
- mailing or
- Faxing a report to public health authorities.

Hospital infection control preventionists also public health nurses, outreach staff, epidemiologists, and communicable disease specialists involved in disease surveillance are encouraged to report TB through SendSS and register to become a SendSS user by logging into the system's Web site at: https://sendss.state.ga.us then selecting TB from the list of reportable diseases.

Public health authorities collect data on reported TB cases that include:

Demographic, clinical, risk factor, and contact information, which are analyzed to describe the distribution of the disease among Georgia's population, identify high risk groups and TB clusters, describe trends in morbidity, mortality, drug resistance patterns, treatment outcomes, and infection rates among contacts to TB cases.

The data are used at state and local levels to:

- Guide policy and decision making,
- set priorities for program interventions,
- Evaluate program performance for the prevention and control of TB in Georgia, and educate key stakeholders and the general public on TB.

Georgia's TB surveillance data are transmitted electronically to the U.S. Centers for Disease Control and Prevention (CDC) and become part of the national TB surveillance database.

Epidemiology of Tuberculosis in Georgia

Georgia reported 335 new TB cases in 2014.

This represents a 1.1% decrease from 339 TB cases reported in 2013.

TB case numbers have decreased 63% since 1991 when the peak of a resurgent period of tuberculosis occurred in Georgia.

The TB case rate in Georgia decreased from 3.4 cases per 100,000 population during 2013 to 3.3 cases per 100,000 in 2014, slightly higher than the U.S.

TB case rate in 2014 of 3.0 cases per 100,000. Georgia ranked fifth highest in the United States for the number of newly reported TB cases in 2014 and had the seventh highest TB case rate among the 50 reporting states.

Geographic Distribution

Among the 159 counties in Georgia, four counties in the metropolitan Atlanta area that reported the highest number of TB cases in 2014 accounted for 59% of TB cases in Georgia: Fulton (76 cases), DeKalb (60), Gwinnett (35), and Cobb (25). Among Georgia's 18 Health Districts, which have oversight responsibility for public health in the state's 159 counties, DeKalb Health District had the highest TB case rate in 2014 (8.3 per 100,000), followed by Fulton (7.6 per 100,000) and Columbus (4.8 per 100,000).

Sex and Age Distribution

In 2014, TB in Georgia occurred predominantly among males (66%), compared to females (34%); while the highest proportion of TB cases by age group occurred among persons 25-44 years old (36%). The highest TB case rate by age group occurred among persons 65 years old or older (4.5 per 100,000) while the lowest case rate was among children 5-14 years old (0.8 per 100,000). The TB case rate for children younger than 5 years of age, an age group at high risk for developing deadly forms of TB, increased from 1.5 per 100,000 in 2013 to 2.3 per 100,000 in Georgia during 2014.

Race/Ethnicity Distribution and TB Disparities

TB disproportionately affects racial/ethnic minorities in Georgia.

In 2014, nonHispanic blacks, Asians and Hispanics, accounted for 47%, 22% and 17% of TB cases in Georgia respectively, but only represented 30.7%, 3.7% and 9.3% of Georgia's population respectively. Non-Hispanic whites constituted 14% of TB cases in 2014. The highest TB case rate among race/ethnic groups was among Asians (19.3 per 100,000), followed by Hispanics (6.2 per 100,000) and non-Hispanic blacks (5.1 per 100,000). The black non-Hispanic TB case rate in 2014 represents an 83% decrease from the TB case rate in 1993 (30.6 per 100,000) in this population. The black non-Hispanic TB case rate, however, was still about six and a half times higher than the white non-Hispanic TB case rate (0.8 per 100,000) in Georgia during 2014.

High-Risk Populations

Foreign-Born TB cases among persons born outside of the United States accounted for 45% of TB cases in Georgia in 2014 compared to 51% in 2013.

Most foreign-born cases reported in 2014 came from Mexico (19%), Vietnam (16%), and India (10%) - countries where TB is an endemic disease. Among 150 foreign-born cases, 43 (29%) were diagnosed in the first five years of their arrival in the U.S.

In 2014, four Health Districts reported 67% of the total number of foreign-born TB cases in Georgia: DeKalb (37 cases), East Metro Atlanta (31), Fulton (18) and CobbDouglas (15). Among these Health Districts, foreign-born TB cases accounted for more than half of the TB cases in East Metro Atlanta (82%), DeKalb (62%), and Cobb-Douglas (60%). Foreign-born TB cases in the Fulton Health District accounted for 23% of reported TB cases.

HIV Co-Infection

All TB patients need to be tested for HIV infection because TB treatment may change when antiretroviral therapy for HIV is given, and active TB often accelerates the natural progression of HIV infection. Among 311 TB cases in Georgia with known HIV status in 2014, 37 (12%) were HIV-positive compared to 13% in 2013. Among 37 HIV co-infected TB cases in 2014, 76% were non-Hispanic blacks, 78% were male and 54% were 25-44 years old. HIV status was reported in 93% of TB cases in Georgia in 2014 compared to 92% in 2013. In the high-risk age group of adults 25-44 years of age, 98% reporting of HIV was achieved in 2014. Among 24 TB cases whose HIV status was not reported in 2014, HIV testing was not offered to 14 cases, eight refused testing, and the HIV test result was unknown in two cases. Among the 14 TB cases who were not offered the

HIV test, most were children 5 years old and younger (6 cases) and adults older than 70 years old (4 cases); two cases were 25-44 years old and two were in the 45-64 year old age group.

Congregate Settings and Substance Abuse

Individuals residing in crowded congregate settings such as:

- Homeless shelters, prisons, and nursing homes are at risk for acquiring TB.

From 2013-2014, the number of TB cases who were homeless in Georgia increased 140% from 26 to 62 cases due mainly to a TB outbreak among residents of homeless shelters in Atlanta. In 2014, 9 (3%) TB cases were residents of correctional facilities, and 8 (2%) were residents of long-term care facilities. Of the nine TB cases incarcerated in correctional facilities, three (33%) were inmates in state prisons, three (33%) in county jails, and two (22%) were detainees at the Immigration and Custom Enforcement (ICE) Detention Center in Stewart County. Substance abuse is the most commonly reported behavioral risk factor among patients with TB in the United States. TB patients who abuse substances often experience treatment failure and remain infectious longer because treatment failure presumably extends periods of infectiousness. In Georgia, abuse of either illicit drugs or alcohol was reported in 54 (16%) of TB cases in 2014.

Pediatric TB

TB in children is considered a sentinel public health event because it often indicates recent transmission from an infectious adult case. Additionally, potentially lethal forms of TB such as TB meningitis or disseminated TB can develop in very young children.

In 2014, children younger than 15 years old comprised 8% of Georgia TB cases; 15 cases were reported in children younger than 5 years old, 12 cases were reported in children 5-14 years old. Two children in the 5-14 years old age group developed TB meningitis but completed TB treatment and survived. Latent tuberculosis infection (LTBI) in children younger than five years old is also a reportable disease in Georgia. When LTBI in a child less than five years of age is reported, public health personnel will initiate contact investigations to identify the source of the infection, recommend treatment for latent TB infection, follow up with the child to ensure completion of treatment and monitor for development of active TB disease. Early identification of TB infection and treatment in children can prevent progression to active disease and identify a previously undiagnosed and untreated case of active TB.

In 2014, 42 children younger than five years old were reported to have LTBI in Georgia; Public health staff identified the source case of the child's infection in 14 (33%) of these children.

Drug Resistance

Among 244 culture-positive TB cases in Georgia during 2014, 100% were tested for initial drug susceptibility to the three first-line anti-TB medications: isoniazid (INH), rifampin (RIF), and ethambutol (EMB).

Of 232 tested isolates from Georgia cases with no previous history of TB, 50 (22%) had primary resistance to INH, three (1%) to RIF, and one (0.4%) to EMB (Table 4). Three (0.9%) cases in 2014 had multidrug-resistant TB case (MDR-TB, - TB resistant to at least INH and RIF).

The percentage of cases with primary INH resistance (INH-R) ranged from 7% to 22% in the past five years while an average of two MDR-TB cases per year was reported in Georgia over that same time period. .

Indicators of Infectiousness

Individuals with pulmonary or laryngeal TB have the potential to infect others with TB, and infectiousness is especially higher if their sputum smears are positive for acidfast bacilli (AFB) and their lungs have cavitary lesions as seen on chest radiography.

In 2014, 83% of all Georgia TB cases had pulmonary TB, of who 45% were sputum AFB smear-positive and 25% showed cavitary lesions on chest radiography.

Initial Diagnosis, Health Provider Data, and Directly Observed Therapy

In Georgia, the majority of TB patients are initially diagnosed in a hospital and patients are followed up by county health departments after discharge to continue their TB treatment.

In 2014, 184 (55%) of the 335 TB cases in Georgia were reported initially by a hospital.

Six hospitals in Georgia reported five or more TB cases in 2014 in SendSS:

Grady Memorial Hospital (39 cases),

Emory Midtown (12 cases),

Gwinnett Hospital (7 cases),

Emory University Hospital (6 cases), and the

Medical Center of Central GA and Medical College of Georgia Hospital and Clinic reported 5 cases each.

Among TB cases with available data on type of outpatient healthcare provider, county health departments provided case management for 85% of all Georgia TB cases, 8% of cases were treated by health department and private physician, correctional facilities treated 0.7%, 4% of cases were cared for solely by a private physician and only 2% were managed solely as in-patients.

County health department staff provides directly observed therapy (DOT) to TB patients, which entails watching a patient swallow every dose of their TB medications for at least 6 months.

Among 285 Georgia TB cases reported in 2014 with available case completion data, 88% received TB treatment entirely by DOT, 10% were treated by a combination of DOT and self-administered therapy, and 1% self-administered their medications for the entire duration of their treatment.

TB Mortality

Fourteen persons died of TB in Georgia in 2013, the most recent year with available mortality statistics. The age-adjusted TB mortality rate in 2013 was 0.1 per 100,000. From 2009 to 2013, an average of 15 people died of TB in Georgia each year, with the highest number of deaths from TB reported in 2012 with 20 deaths.

TB Treatment Completion

TB treatment completion was achieved in 296 (98%) of 302 TB cases reported in 2013 who did not die or leave the United States during TB treatment. Of those who did not complete treatment, four moved to another state and were lost to follow-up and two stopped treatment due to adverse reactions to TB medications. Among 280 TB cases in 2013 that were eligible to complete TB treatment within 12 months, 261 (93%) completed treatment within that time frame. Of the 13 TB cases who took more than 12 months to complete treatment, seven had information in the surveillance database on the reason for their longer treatment duration: four had clinical indications for extending

treatment, two were non-adherent and one had adverse reactions to the TB medications causing treatment interruptions.

TB Contact Investigations and Latent TB Infection

Public health authorities routinely conduct a contact investigation among persons exposed to a TB case to identify secondary TB cases and contacts with latent TB infection (LTBI). Index TB cases with positive acid-fast bacillus (AFB) sputum-smear results or pulmonary cavities have the highest priority for investigation.

During a contact investigation, public health staff evaluate recent contacts to a case for signs and symptoms suggestive of TB, administer a TB skin test (TST) or interferon gamma release assay (IGRA), repeat the TST or IGRA 8-10 weeks after the last exposure to the index case if the initial TST or IGRA is negative, and have a chest radiology exam performed if the TST or IGRA is positive. TB contacts are diagnosed with latent TB infection (LTBI) when they have a positive TST or IGRA but are asymptomatic and have a normal chest radiology exam. LTBI is not contagious but there is a 10% chance of developing TB disease later in life if LTBI is not treated.

Among 4,117 identified contacts of all Georgia TB cases reported in 2013 (the most recent year with completed contact investigation data), 3,156 (77%) were completely evaluated for TB. Of the contacts who completed their TB evaluation, 678 (22%) had LTBI and 12 (0.4%) had TB disease. Among the 678 contacts with LTBI, 452 (67%) started LTBI treatment. Among the 452 infected contacts who started LTBI treatment, 338 (75%) completed LTBI treatment , 48 (11%) chose to stop LTBI treatment, 32 (7%) were lost to follow-up, 13 (3%) had adverse side-effects, 6 (1%) stopped treatment due to a provider's decision, 2 (0.4%) moved, 1 (0.2%) developed active TB, and information on the reason for stopping treatment was missing in 12 (4%) contacts.

TB Genotyping

TB genotype clusters, which are comprised of two or more TB cases with identical genotypes, are routinely analyzed to:

- Identify recent TB transmission,
- To describe risk factors for recent transmission,
- To identify possible sources of transmission and to determine ways to stop transmission.

From 2010-2014, 100 small (2-3 cases), 25 medium (4-9 cases), and two large (≥ 10 cases) genotype clusters were identified. During this period, over 60% of the clustered TB cases were part of small genotype clusters.

A large genotype cluster in 2014 included 27 TB cases and represented a TB outbreak among residents of several homeless shelters in metropolitan Atlanta. Of these 27 cases, 100% were isoniazid-resistant (INH-R), 93% reported a history of homelessness, 41% had HIV infection and 37% reported a history of substance abuse. One other large genotype cluster that occurred in 2012 included 10 TB cases reported in 3 counties; of which 100% were INH-R, 50% had a history of illicit drug abuse, 40% had a history of alcohol abuse and 30% were homeless.

TB Outbreak among Homeless Persons

The state TB program, Fulton County and CDC are providing resources to control the aforementioned TB outbreak occurring among homeless persons in Atlanta. The Fulton County TB Program is conducting contact tracing, performing weekly screenings to find active cases and identify latent infection, and providing treatment to cases and infected contacts.

The state TB program is providing temporary housing for the homeless TB cases through a contract with the American Lung Association and assisting with shelter screening through a contract with Mercy Care.

A TB Task Force which includes homeless service providers, state and county TB program representatives and Emory University volunteers, developed guidelines and administrative practices to prevent and control TB in homeless shelters.

A memorandum of agreement between Fulton County and shelter administrators was signed to implement the guidelines which include a requirement for TB clearance by a health clinic before admission for overnight stay at a homeless shelter and TB symptom screening of clients admitted to a shelter.

Number of TB Cases and TB Case Rates* per 100,000 population by County, Georgia, 2013-2014

GEORGIA - Number of cases 2013 – 339

Number of cases 2014 – 335

Washington State

Tuberculosis Cases Statewide by Year

Washington State – 2013 CASE – 209

2014 CASE – 195

According to the World TB Day Fact Sheet:

A Glace at Tuberculosis in Washington State - 2014

Reported TB Cases Since 2005, incidence rates of Tuberculosis (TB) disease in Washington State (WA) have progressed downward overall. After rising slightly from a period low of 2.7 in 2012, the WA rate has again shown a decline from a rate of 3.0 in 2013 to 2.8 in 2014. The 195 WA cases counted in 2014 represent a 6.7% decrease from the 209 cases counted the previous year.

County-Level In 2014, only 5 of Washington's 39 counties reported 10 or more TB cases. Together, these five counties represented 61.3% of the state's overall population yet, they accounted for 81.5% of the 195 cases counted in WA. King County reported 101 cases, Snohomish (19), Clark (15), Pierce (13), and Yakima (11). From 2013 to 2014, three of these counties saw a decline in TB incidence rates, including Pierce (2.7 to 1.6), Snohomish (3.6 to 2.6), and King (5.8 to 5.0), while Yakima (0.8 to 4.4) and Clark (1.1 to 3.4) both saw an increase.

Race-Ethnicity Racial and ethnic minority groups continue to experience a disproportionate measure of TB disease burden in WA. In 2014, non-Hispanic Asian communities accounted for 43.6% of all TB cases counted in WA, followed by non-Hispanic Blacks (15.9), Hispanics (15.4), and non-Hispanic Whites (11.8). When relative population size is considered, data show that Native Hawaiian/Other Pacific Islanders in WA experienced the highest incidence of TB in the period 2012-2014, with an average rate of 27.7 cases per 100,000, followed by non-Hispanic Asians (17.8), non-Hispanic Blacks (12.5), and non-Hispanic American Indian/Alaska Natives (4.2)

Country of Origin The greatest proportion of TB disease burden in WA continues to be among our communities having origins outside of the U.S. In 2014, WA residents born somewhere other than the U.S. or any of its territories represented 72.8% of all TB

cases, while persons originating from within a U.S. territory accounted for an additional 8.2%.

Age and Gender Risk of TB in WA continues to be highest among residents 65 or older.

In 2014, this age group experienced a TB incidence rate of 3.7 cases per 100,000, followed by those 25-44 (3.6), 45-64 (2.8), and 15-24 (2.6).

Between 2013 and 2014, the greatest decline in risk was observed among those 65 or older (4.6 to 3.7), while the largest increase was seen among children less than five years of age (0.9 to 1.6).

In 2014, males accounted for a larger proportion of all TB cases compared to females (59.0% vs. 41.0%), while also experiencing greater risk of TB

Drug Resistance Initial drug-susceptibility testing performed on 150 specimens collected from cases counted in WA for 2014 found 22 (14.7%) resistant to one or more first-line drug, with two (1.3%) showing resistance to both Isoniazid and Rifampin (i.e. multi-drug resistant or MDR TB).

Of all specimens demonstrating any drug-resistance, 19 (86.4%) were collected from WA residents born outside of the U.S. or its territories.

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For people with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TDD/TTY call 711).

NEW YORK

SUMMARY

- Between 2012 and 2013, tuberculosis (TB) morbidity increased in New York State.

The 2013 total of 873 cases (656 cases in New York City, 217 cases in the remainder of New York State) represents less than a one percent increase from the 866 cases reported in 2012.

The nation as a whole experienced a 3.5 percent decline in morbidity. Since 1992, the recent peak epidemic year with 4,574 cases, New York State has experienced an 80.9 percent decrease compared to a national decline of 62.7 percent.

- In New York State (exclusive of New York City), the number of TB cases increased 0.9 percent from 215 cases in 2012 to 217 cases in 2013. The number of TB cases in New York City increased by 0.8 percent from 651 cases in 2012 to 656 cases in 2013.

In 2013, the nation as a whole reported 9,588 TB cases, down from the 9,945 cases reported in 2012.

- New York State ranked sixth nationally for TB morbidity with an incidence rate of 4.5 per 100,000 population in 2013. This rate is influenced by New York City, which had a TB case rate of 8.0/100,000. In contrast, New York State (exclusive of New York City) reported an incidence rate of 1.9/100,000. The national average for 2013 was 3.0/100,000.

- Three counties – Nassau, Suffolk, and Westchester - reported over 40 percent of the TB cases in New York State (exclusive of New York City) in 2013.

- Asians had the highest incidence rate of TB statewide (26.6 per 100,000), whereas white, non-Hispanics had the lowest rate (0.7 per 100,000).

- Among individuals with drug susceptibilities reported in 2013, the number of multidrug-resistant (MDR TB) cases in New York City was 7, a 56.3 percent decrease from the 16 cases seen in 2012. In New York State (exclusive of New York City), the number of MDR TB cases decreased 33.3 percent, from three cases in 2012 to two cases in 2013.

- Statewide, including New York City, the proportion of cases contributed by foreign-born individuals increased slightly from 80.5 percent in 2012 to 82.8 percent (723 cases) in 2013, with people born in China contributing the greatest number of foreign-born TB cases (118).

In New York State (exclusive of New York City), people born in India contributed the greatest number of TB cases (15).

- Since 1991, the number of TB cases among the New York State Department of Corrections and Community Supervision (DOCCS) inmate population had been continually declining until there were no cases in 2011 and 2012. However, in 2013, there were 3 DOCCS cases reported. For more information see: http://www.health.ny.gov/statistics/diseases/communicable/tuberculosis/docs/2013_annual_report.pdf

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