

I learned that tuberculosis is a disease of the lung that is caused by *Mycobacterium tuberculosis* entering the respiratory system and reaching the subpleural spaces in the lower lung. TB can become systemic (disseminated TB) and spread to other organ systems like the bones, kidneys, and brain via the blood stream and lymphatic system. It is thought to be the oldest known disease to humans, and is the leading cause of infection and death in adults, with 1/3 of the world population infected despite the fact that there has been a vaccine for prevention since the 1950s. The majority of these infections occur in countries like India, Indonesia, China, and Sub-Saharan Africa. It presents as either a latent or active infection. Active tuberculosis is highly contagious, and is spread via airborne droplets when a person infected with it coughs, speaks, sneezes, or sings. Signs and symptoms of an active TB infection are a productive cough for more than three weeks, hemoptysis, fever, chills, and swollen lymph nodes. A person who has a latent case of TB is not contagious, will not present with signs and symptoms, and can carry the disease for long periods without knowing, but the infection can become active when the person's immune system becomes weakened. There are several factors that increase the risk of one contracting TB: exposure to an infected person (usually a family member or friend), working in TB infected areas like the countries listed above, overpopulated areas, nursing homes, and poverty-stricken areas, and those with weakened immune systems. Diagnosis of TB consists of chest X-ray, sputum culture, IGRA test, and TST test. The sputum culture can take between 4-8 weeks, and the TST skin test a day or two. In the TST false positives can occur in those who have previously had the TB vaccine, and false negatives can occur if the infection is recent, the patient has AIDS, and due to age. Treatment of latent TB is focused on preventing the inactive bacteria from becoming active with meds like RIF, INF, and PZA. Active infections are treated with one of ten different meds including PZA, RIF, and EMB. These medications are heavily hepatotoxic, so the patient should be monitored for N/V, jaundice, and fever for more than three days. It is important for the patient to finish the entire course of medications, so DOT meds are usually given by healthcare workers so that it is ensured that no doses are missed and the drug is completed. Healthcare workers and caregivers should follow airborne PPE protocol to avoid transmission of the disease.

Chronic obstructive pulmonary disease, or COPD, is the fourth leading cause of death, and 24 million people live with the disease. COPD is caused by inhaling pollutants like smoke, chemical fumes, and dusts. The number one risk factor to developing COPD is smoking, followed by prolonged exposure to irritants that cause irritation and destruction of the passages of the lungs, and Alpha-1 antitrypsin deficiency, a rare genetic condition. There are two classes of COPD, emphysema, and chronic bronchitis, and a person can have either one or both. Emphysema is characterized by damage to the alveolar walls that causes them to lose their shape, resulting in larger and fewer air sacs that reduces the surface area for gas exchange. Chronic bronchitis occurs when the passageways become clogged with mucus from swelling and inflammation, hindering breathing. The signs and symptoms of COPD are progressive. In the early stages of the disease, the patient will show no, or mild symptoms. With moderate COPD. The patient may present with a persistent productive cough that is worse early in the morning, dyspnea, frequent respiratory infections, tightness of chest, wheezing, and fatigue. Advanced stage COPD is heralded by difficulty catching a breath, difficulty breathing and talking, fever, headache due to increased CO₂ levels, cyanosis, barrel chest, edema of the feet and ankles, decreased mental awareness, clubbing of finger/toe nails, and weight loss. Diagnosis is made by a specialist with tests like chest CT/X-ray, ABG levels, spirometry and health history. COPD is irreversible, but disease progression can be managed with medications like bronchodilators, steroids, combination inhalers, oral steroids, antibiotics for acute respiratory infections, supplemental oxygen, and phosphodiesterase-4 to reduce inflammation in severe cases. Lifestyle changes, such as smoking cessation, exercise, and a healthy diet,

along with counseling are non-medication therapies as well. Surgery is utilized in acute emphysema patients where medications are not helping. COPD can be prevented by not smoking and avoiding inhaling lung irritants.

Obstructive sleep apnea is a condition that causes a person to momentarily stop breathing when asleep more than five times per hour. Obstructive sleep apnea syndrome is diagnosed when this occurs more than five times per hour and the patient experiences daytime sleepiness. The tissue in the back of the throat becomes enlarged due to fat storage, and when a person is asleep, the muscles become relaxed and the tongue falls back into the throat and the airway becomes obstructed. This in turn causes the oxygen levels in the blood to drop and an increase in resistance that signals the brain to arouse and tighten the muscles back up. This sympathetic response signals the brain to go back to sleep, the muscles relax again and the obstruction returns and the pattern repeats. Supine sleeping position and REM sleep can make the obstruction worse. There are several risk factors to developing obstructive sleep apnea. In the general population, being male increases the chance of obstructive sleep apnea by 24%, and female 9%, and obstructive sleep apnea syndrome by 4% vs 2% in females. This is due to the fact that men store more fat in their neck than women do. Obesity increases risk by 10-14 times, and a recent weight gain of 10% increases it 6 times that in four years. BMI, neck size and waist to hip ratio are used to assess risk. Race also is a factor. Non-whites are at a 16.3% higher risk and whites 4.9%. Having a first degree relative with the condition increases chances to 22-86%. Nasal obstruction like allergic rhinitis and being 50-59 years old also increase likelihood of developing the condition.

Pneumonia is the inflammation of the alveoli causing them to fill with pus and mucus. It is more prevalent in newborns, children under two, the elderly and immunocompromised. Pneumonia can be classified by location (bronchial/lobar) and /or how it was acquired (community, hospital, aspiration ventilated). Bronchial pneumonia is inflammation of the bronchial tubes, lobar is when one or more lobes are infected. The infection can be bacterial, viral, fungal or mycoplasmatic. Signs and symptoms differ by the cause. If the infection is bacterial, the person will have a cough with red, green, or brownish sputum from fluid in the lungs, and if it is viral the cough will produce a thin and whitish phlegm from the inflammation. Sweat, fever, chills, shortness of breath, increased respirations, pleuritic pain, D/N/V and cyanosis may also present. Pneumonia is diagnosed by hearing crackles and wheezes upon auscultation of the lungs, sputum/blood tests, chest x-ray, CT scan, and pulse oximetry. Treatments include blood cultures to determine antibiotic course to be given within 6 hours of diagnosis for bacterial and fungal derived infections, and antivirals for viral derived infections. If left untreated, lung abscesses can develop, as well as bacteremia. Hand hygiene, IS, flu and pneumococcal vaccines can help prevent pneumonia.

The purpose of placing chest tubes into the pleural space is to remove air or fluid that is preventing the lung from expanding. The pleural space is negative pressure and if it becomes filled with air or fluid it can cause the lung to collapse. Air can enter the pleural space when a pneumothorax occurs either spontaneously or from trauma. Pleural effusion is when fluid enters the pleural space. If the fluid is blood, that is hemothorax, and can be due to trauma, TB, or clotting issues. Empyema is infection, and chylothorax is lymphatic fluid in the pleural space. A mediastinal tube is placed under the sternum to drain fluid from around the heart after surgery. The chest tube system consists of a tube inserted into the patient, water seal chamber, suction control chamber, and air leak monitor area. The system can be wet or dry suction. Wet suction is regulated by the height of the water in the suction control chamber, and dry suction is controlled by a suction control bellows with a regulator. Nursing interventions for a chest tube include monitoring respirator stats, drain system for excessive bubbling, kinks in the tubing and placement of the tube and the insertion site. If the tube becomes dislodged, the nurse should cover with sterile gauze taped on three sides to allow for air/fluid drainage, and call the

provider asap. Before removal by the doctor, the nurse will gather all supplies, teach the patient to Valsalva when its removed, have them placed in semi-fowlers and monitor their respiratory stats.