INTRODUCTION

This module is a discussion of patients suffering from asthma, mycobacterium tuberculosis, some common forms of chest trauma, and patients who have chest tubes. It offers a brief review of common, selected respiratory complaints and includes a description of some of the causes, signs and symptoms, and in some cases, specific diagnostic studies, treatments, and broad nursing interventions associated with these disorders. It is not intended as a replacement for a medical/surgical textbook. For a more detailed discussion, refer to a current text.

OBJECTIVES

Upon completion of this module, you will be able to

- Describe the etiology, signs and symptoms, diagnostic procedures, treatments, and nursing measures in the care of patients with asthma and mycobacterium tuberculosis.
- Describe common injuries to the chest and how they may be treated.
- Identify the purpose of chest tubes.
- Describe the principles related to chest tube function.
- Describe nursing management of patients with chest tubes.

ASTHMA

One in 20 Americans is affected by asthma, with 14 to 15 million people carrying the diagnosis. Since the 1980’s the incidence of asthma has increased by 60%. Although childhood asthma frequently disappears in adulthood, it can recur at any time. Moreover, many people develop the disease for the first time as adults. Asthma can be classified in three forms: allergic, non-allergic, and a mixed variety of allergic and non-allergic.

The onset of the allergic forms of asthma is most common in childhood and adolescence; there is often a family history of allergies. Attacks are generally precipitated by allergens that are inhaled such as pollens, dust mold, and danders. Occasionally, episodes are precipitated by food allergies. Skin tests with precipitating allergens are usually positive and Serum Ig E is elevated.

The onset of non-allergic asthma, on the other hand, generally occurs in adulthood. Attacks can be precipitated by a variety of stimuli, for example, exercise, cold air, environmental pollutants, respiratory infections, emotional stress, or medication such as aspirin or some non-steroidal anti-inflammatory drugs. Skin tests to allergens are often negative and Ig E levels are normal. With continued exposure to stimuli attacks
generally worsen and frequently this kind of asthma may lead to chronic bronchitis or emphysema.

**Signs/symptoms.** Attacks may be sudden but often are gradual in onset. They are characterized by dyspnea, inspiratory and/or expiratory wheezing, use of accessory muscles for breathing, and increased mucous secretions with mucosal edema and constriction of bronchial smooth muscles. Attacks often cause anxiety and patients may report some of the symptoms of hyperventilation such as tingling, numbness and dizziness. Attacks may be accompanied by coughing episodes, diaphoresis, increased blood pressure, feelings of choking, and a tightening chest. These symptoms are all reversible and usually disappear fairly rapidly at the conclusion of an attack. However, for some people, symptoms may linger resulting in an almost continuous asthmatic state.

**Status asthmaticus.** Status asthmaticus is a complication of asthma that presents an emergent life-threatening situation. It occurs when the asthmatic attack persists and continues to worsen despite usual treatment measures. If allowed to progress the condition can lead to severe hypoxemia, respiratory arrest, or cardiac failure.

**Diagnosis.** History and physical finding, chest X-rays, blood gases, and pulmonary function studies may be performed. Also, if indicated, sputum cultures and/or allergy testing may be done.

**Treatment.** In acute episodes, beta adrenergic drugs such as epinephrine 1:1000 are given subcutaneously. The theophyllines, such as Aminophylline, are also given intravenously, or both theophylline and beta adrenergics by nebulizers. Status asthmaticus may not respond to either beta adrenergic drugs or theophyllines, in which case steroids may be ordered. Humidified oxygen is frequently used, dependent on blood gas volumes. Because persons suffering asthmatic attacks are often dehydrated due to hyperventilation and diaphoresis, hydration is important with oral fluids, if the patient is able to drink, and with IV fluids if he/she is not. If the patient is in danger or respiratory failure it may be necessary to intubate and provide mechanical ventilation.

**Nursing measures.** Provide emotional support and encourage the patient to bend forward over a bedside table to facilitate breathing. Obtain detailed history of precipitating events from a family member. Teach the patient to avoid strenuous exercises, people with respiratory infections, and other precipitating factors. Also teach stress management, the importance of rest, and information related to the patient’s medication. Monitor intake and output, and nutritional intake. Perform frequent respiratory and cardiac assessments.

**TUBERCULOSIS**

Even though the advent of chemical preparations effective against mycobacterium tuberculosis has had the effect of dramatically reducing the incidence of this disease in the United States, in some areas of the country tuberculosis still presents a significant
health problem. Among high risk groups for this disease are the elderly, the socio-
economically disadvantaged, and people who reside in the inner cities.

The causative organism is a gram positive acid fast bacillus that is airborne and carried in
fine droplet form when an infected person sneezes, coughs, speak, or even laughs. It
cannot be transmitted through touching dishes, personal articles, or the infected person
since inhalation is the only route of transmission. Also, because the organism is not
highly contagious, casual or brief contact will rarely infect an individual. It usually takes
repeated and prolonged close contact to transmit the disease. However, susceptibility is
greatly increased in individuals with a less effective immune system and when people
live together in crowded conditions.

Once the organism has been carried into the respiratory tract, it tends to implant in the
lower lung areas where it begins to multiply despite early immune response activation.
The organism may spread through the lymphatic system to virtually any body organ or
tissue. Eventually, the body mounts an effective immune response and encapsulates the
bacilli to form granulomatous tubercles characteristic of TB lesions. The central portion
of the lesion, known as Ghons tubercle, will necrose. The bacilli stop multiplying and the
lesions form fibrotic tissue and calcifies. The remaining bacilli may then lie dormant,
perhaps for years, before a granuloma breaks down and bacilli suddenly begin
multiplying again. At this time, the person becomes actively ill with tuberculosis.
Reactivation is thought to be related to a lower resistance on the part of the individual,
perhaps because of aging, a suppressed immune system, or other factors leading to a
debilitated vulnerable state. Because the bacilli favors a supply of high oxygen
concentration for growth, the lung is usually the area of the body where recurrence takes
place.

**Signs/symptoms.** Tuberculosis is asymptomatic, but with activation of the disease
process comes a gradual onset of fatigue, low-grade temperature in the late afternoon,
night sweats, anorexia, and weight loss. Some women may experience irregularity in the
menstrual cycle. A productive cough with purulent sputum is common and chest pain
may be experienced. Hemoptysis usually occurs only when the disease is significantly
advanced.

**Diagnosis.** A history of exposure to the organism may be significant but contact may
have occurred years ago or the person may have been unaware of the contact. A positive
intradermal skin test known as the Mantoux test or even a positive tine test may indicate
infection. However, both false positive and false negative skin tests have been known to
occur. The chest X-ray may demonstrate characteristic cavities in lung tissue or Ghon’s
tubercles. However, since the lung disease may present a picture that is not so markedly
different, interpretation and diagnosis may be difficult on X-ray alone. Therefore, a
positive culture from sputum samples or tissue specimens is the most definitive
diagnostic tool.
**Treatment.** Treatment of tuberculosis involves administration of medications over a long-term period, usually anywhere from eighteen months to two years. Because the mycobacterium tuberculosis organism readily develops strains resistant to specific medications, the usual course of treatment involves the use of multiple medications in combination with close monitoring of the individual’s response. The monitoring process includes periodic examination of chest X-rays, sputum specimens, and assessment of current symptoms. Failure to respond to medications or treatment or a recurrence of the disease previously treated requires a complete change in medications again because of the likelihood of development of resistant strains of the organism.

Medications for treatment are classified as primary, secondary, and tertiary. Primary medications are Rifampin and Isoniazid (INH). These medications are considered to be the most effective and cause the least side effects. Secondary and tertiary medications are less effective and have more side effects. Tertiary medications are the least dependable choice and are generally used only when all other medications have failed. It is important to note that both INH and Rifampin are generally used in combination and that both are potentially hepatotoxic. You should be aware of any other medications the patient may be taking since metabolism of some of these may be affected by the anti-tuberculosis medication. On occasion, for the individual whose skin test is positive but who demonstrates no other clinical symptoms, INH may be used alone for a period of about one year as a prophylactic means to prevent development of active symptomatology.

**Nursing measures.** Education is a top priority in treating tuberculosis. Patients and families need to understand the disease, how it is transmitted, and how it may be cured. Education is also the best method to reduce societal fear of a disease whose spread may be controlled usually after only a few weeks of treatment. It is also often the best method to achieve compliance with treatment. Place emphasis on the importance of faithful compliance with the medication regimen and follow-up care. Unfortunately, this disease often affects population groups who may see health care as a lesser priority and other basic needs. Transportation to health departments for follow-up and medication re-supply could present a problem for these patients. Be aware of the realities in the patient’s life that may affect treatment, and help the patient to identify solutions, perhaps through family or community resources.

During the initial weeks of treatment, the patient may be especially frightened and isolated because of the common precaution of being placed on respiratory isolation with the use of masks to protect visitors and caregivers from the droplet spread of the organism. (Masks may in fact be of questionable effectiveness since they often fail to filter out fine droplets.) The patient who is hospitalized is placed in a room with negative air pressure or one that vents air to the outside of the building. Teach patients to cover the mouth and nose with tissue when sneezing or coughing. Be aware that the patient may perceive the disease as a social stigma. He/she may remember the time when individuals with tuberculosis were sent away from family and friends to isolated sanitariums for long periods of time. Be sure to provide opportunities for the patient and family to discuss their feelings, to reassure them that a cure is possible with compliance
to treatment. However, it should be remembered that even though contagion is unlikely after only a few weeks treatment with an effective medication, cultures may not demonstrate resistant organisms for as long as three months.

**CHEST TRAUMA**

One common injury to the chest resulting from trauma is rib fracture. One of your main concerns is that broken rib ends may be forced into soft tissue causing laceration to the lungs or other nearby structures.

**Signs/symptoms.** Some of the signs of rib fracture are pain, muscle spasm, and tenderness over the affected areas. Usually moving, coughing, and even breathing increase discomfort so that the person tends to breathe shallowly and is prone to pneumonia and atelectasis. Multiple rib fractures or sternal fracture can lead to instability of the chest wall. When a person has an unstable chest (flail chest) the affected side depresses during inspiration and bulges during expiration. In addition, the mediastinum may shift to the unaffected side on inspection and towards the affected side on expiration.

**Hemothorax** is blood in the pleural space; pneumothorax is air in the pleural space. These conditions are usually the result of severe trauma and may occur together. They may be treated, depending on the degree of severity, with a thoracentesis or chest tube to drain off fluid and air from the pleural space and reinflate lung tissue. Chest injuries can be closed or open. Open injuries pose the added problem that bacteria may be introduced into the surrounding tissues. If not treated promptly, an infection and possible empyema (abscess in the pleural cavity) may occur.

**Treatment.** For rib fracture, treatment is focused on maintaining adequate ventilation and reducing pain. (Chest binders are no longer used because it was found that they interfered with the person’s ability to breathe deeply.) When severe pain occurs, intercostals nerve blocks are sometimes used. Persons suffering from a flail chest or an unstable chest wall caused by a fractured sternum or multiple rib fracture may sometimes require mechanical ventilation if there is a danger of respiratory failure. Open sucking-type chest wounds require immediate sealing with an occlusive dressing to insure an airtight seal. As mentioned earlier, chest tubes may be inserted for either pneumothorax or hemothorax.

**CHEST TUBES**

When chest injuries or conditions require the use of the chest tubes, a small incision is made in the chest wall and one or more catheters are inserted into the pleural space, sutured to the chest wall, and covered with an airtight occlusive dressing. The catheter(s) are connected to tubing which in turn leads to a container, partially filled with water. The tube ends below the water level and creasest a seal with the water acting as a one-way valve. With inhalation, air and fluid trapped in the pleural cavity may enter the drainage system, but air from the surrounding atmosphere cannot enter the tubing because the water, due to its weight, cannot be carried up the tubing. Since drainage by gravity alone
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may not be enough, sometimes wall suction may be used as an adjunct to facilitate drainage. Most facilities today use disposable plastic collection systems (Pleurevac) which are less likely to break than the older glass bottles. They also allow the patient more mobility. The nurse may, for example, hook the plastic container onto a wheelchair back and allow the patient to walk, pushing the wheelchair ahead of him. The plastic receptacles are set up as three-bottle systems containing one chamber for drainage, one for maintenance of the water seal, and a third for use as a suction regulator.

**Nursing management.** In dealing with chest tubes, check connections for tightness, check tubing for straightness, eliminate kinks, and see that nothing such as the patient, bed linens, side rails, etc. is compressing the tubing. Keep water levels in the chambers filled to prescribed levels since water may be lost by evaporation. Keep containers below the level of the patient’s chest at all times. Tape the drainage container and mark the tape at least every shift at the level of fluid drainage. Document the amount and characteristics of drainage. Do not empty the container, change the container, or clamp the tubes without an order to do so. Routine milking or stripping of chest tubes may not be accepted protocol in all facilities since it momentarily increases the negative pressure applied to the pleural space and to tissues the catheter tip may be resting against.

**BIBLIOGRAPHY**

