

ASPIRATION: RISKS, RECOGNITION, AND PREVENTION

Abstract:

Aspiration events can be sudden and dramatic, and can cause significant complications or even death. Some episodes of aspiration can be very minor and the patient may remain asymptomatic. Common causes of aspiration include stroke, drug or alcohol overdose, dysphagia, neurologic diseases, prolonged vomiting, and traumatic brain injury (TBI). The signs and symptoms of aspiration can significantly vary from one individual to the next. Screening for aspiration is a vital part of preventative patient care and the evaluation of patients for their risk for aspiration should be done during an initial patient assessment and repeated as necessary.

Learning Objectives:

1. Identify the definition and causes of aspiration.
2. Explain complications associated with aspiration.
3. Discuss a health care professional's role in recognizing and preventing aspiration.

Introduction

Aspiration is a common condition that can cause significant and serious complications. A health care professional will often care for a patient who is at risk of aspiration. It is vital that the health care professional be well-rehearsed in the identification of aspiration, be able to react appropriately, and be proactive in the prevention of aspiration through reviewing patient records, alerts, and paying special attention to ensuring patients who are at risk for aspiration receive the prescribed meals and fluids. The following sections discuss the factors that increase the risk for aspiration and identify those patients that are most likely to aspirate.

Swallowing and the Gag Reflex

Aspiration is defined as *the inhalation of a foreign substance into the lungs*. Aspiration is closely related to swallowing and the gag reflex. Because of this relationship, a health care professional must be familiar with these physiological functions to understand how aspiration occurs which will help in the prevention of aspiration. The cough reflex is also involved in aspiration and is an added safeguard in the prevention of aspiration.

Upper Gastrointestinal Tract

Swallowing is the coordinated movement of saliva, food, or liquids from the mouth to the stomach and it can best be understood by dividing it into two phases, voluntary and involuntary. Swallowing will be explained in terms of solid food but the process is essentially the same for liquids. Prior to outlining the process of swallowing, the basic anatomy of the structures of the upper gastrointestinal tract and structures involved in the process of swallowing and aspiration prevention will be reviewed.

Oral Cavity

The gastrointestinal tract starts with the mouth, which is also called the oral cavity. The oral cavity is the beginning of both the respiratory tract and the gastrointestinal tract. In terms of swallowing the primary function of the oral cavity is to begin the digestion of food and to break down food into manageable sizes for swallowing.

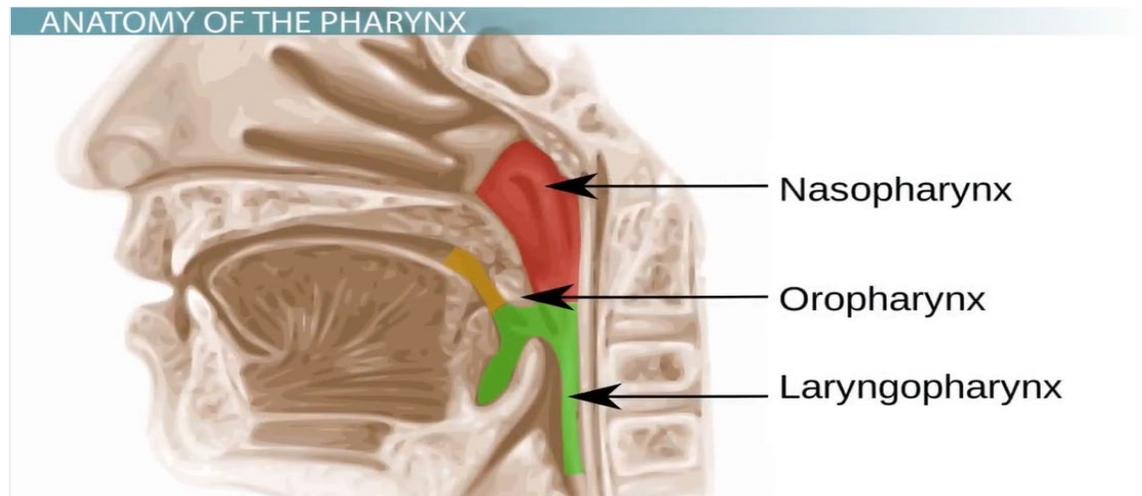
The digestive process starts in your mouth when you chew, this process is called mastication. When we eat food a digestive enzyme in saliva called amylase starts to break down some of the carbohydrates (starches and sugars) in the food even before it leaves the mouth.

Once food has been broken down into manageable pieces through mastication and the process of digestion has begun with the enzyme amylase, the food or "bolus" is then swallowed. Once swallowed the bolus is moved into the pharynx and the process of moving the food through the gastrointestinal tract has begun.

Pharynx

The next section of the gastrointestinal tract is the pharynx, a relatively short tube made of muscle and connective tissue that is located behind the larynx. The pharynx connects the oral cavity to the esophagus and the pharynx is composed of the nasopharynx, the oropharynx, and the laryngopharynx. The primary functions of the pharynx are to allow the passage of food and liquid into the esophagus and air into and out of the trachea. The image below will help with visualization.

IMAGE 1: PHARYNX



Esophagus

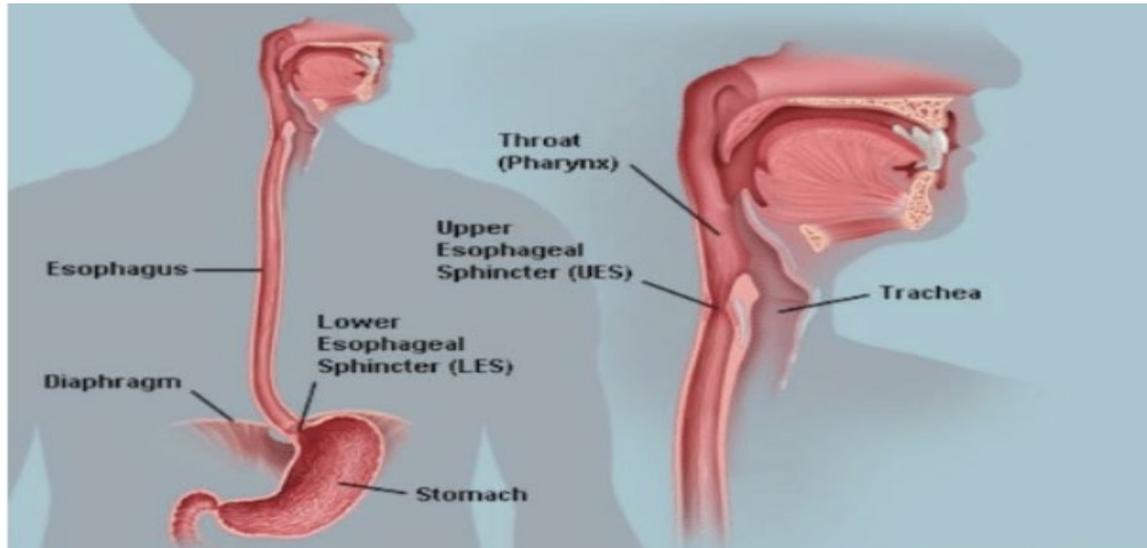
The esophagus is a thick-walled tube of muscle and cartilage that is located behind the larynx and the trachea. The esophagus connects the pharynx to the stomach and like the pharynx, its primary function is to allow for the passage of food and liquids.

The esophagus has two sphincters, the upper and lower esophageal sphincters. A sphincter is a ring of muscle that can open and close. The upper esophageal sphincter is located at the junction of the pharynx and the esophagus; the lower esophageal sphincter is located at the juncture of the esophagus and the stomach. The esophageal sphincters are *not* under voluntary control and they are normally closed except during swallowing or when the body is expelling stomach contents; vomiting (emesis) during such times as illness.

When food or liquid enters the esophagus gravity plays a large role in the movement of the food and liquid (bolus) to the stomach. Another mechanism or movement is called peristalsis. Peristalsis is an involuntary squeezing action within the esophagus where the esophageal muscles squeeze from top to bottom. This squeezing action aids in pushing food and liquid along. If you could visually see peristalsis, it would look like a wave starting at the top of your

esophagus and passing down your esophagus to your stomach. Peristalsis continues throughout your digestive tract to continue the movement of stomach contents for absorption until they are eliminated from the body.

IMAGE 2: ESOPHAGUS TO THE STOMACH



Epiglottis

The epiglottis is a flap of cartilage that is attached to the upper part of the larynx. The epiglottis is located above the glottis, which is the opening between the vocal cords. One end of the epiglottis is attached to the larynx, this attachment can be thought of as a hinge. The other end projects backward, up, and behind the tongue. The epiglottis has a vital role in normal swallowing and the prevention of aspiration. During the action of swallowing the larynx is moving upward to close the glottis and at the same time, the epiglottis swings down and covers the opening of the larynx, acting as a cover. This prevents food or liquid from entering the trachea.

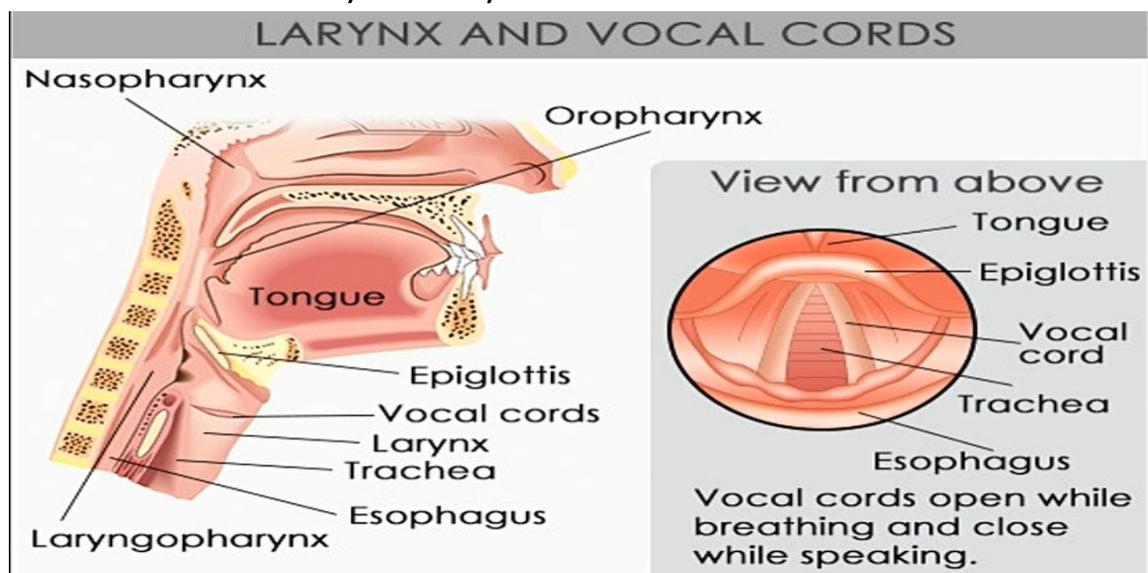
Larynx

The larynx is the initial section of the respiratory tract. It is a short tube of muscle and cartilage that begins in the oral cavity and connects to the trachea, commonly known as the windpipe. The larynx is where coughing is initiated and coughing is an important protective reflex that keeps foreign bodies from entering the lungs.

The most sensitive sites for initiating a cough are the larynx and tracheobronchial tree, especially the area of the carina. In anatomy, the carina is a ridge of cartilage in the trachea that occurs between the division of the two main bronchi. Other sensitive areas are points of the bronchial branching, these areas are richly innervated by cough-inducing receptors associated with vagal sensory nerve fibers.

A cough, also known as tussis, is a rapid, forceful expulsion of air from the lungs. This voluntary or involuntary act clears the throat and breathing passage of foreign particles, irritants, fluids, microbes, and mucus. Coughing can be done deliberately or as part of a reflex to protect the lungs and airways from obstruction.

IMAGE 3: EPIGLOTTIS, LARYNX, AND VOCAL CORDS



Phases of Swallowing

Swallowing is for the most part an automatic process. People do not think about swallowing as it happens; however, the initial phase of preparing the food for swallowing and the beginning of swallowing is under voluntary control.

Voluntary Phase

This phase is also called the oro-pharyngeal phase. The voluntary phase of swallowing begins in the oral cavity by lubrication of the food, saliva, digestive juices, and chewing, also called mastication. This process creates small pieces of food that can pass through the upper parts of the gastrointestinal tract. These small pieces of food are called *boluses*.

Involuntary Phase

After food has been chewed and lubricated, the lips close sealing the mouth and the tongue moves the bolus to the back of the oral cavity and into the oropharynx. Once the bolus reaches the back of the oral cavity the involuntary or esophageal phase of swallowing begins.

As the food bolus or liquid reaches the oropharynx a series of coordinated movements begin the movement of the food or liquid smoothly through the upper gastrointestinal tract. Gravity and the involuntary action of peristalsis aids in pushing food and liquid along and into the stomach. When examined in detail this process has many steps but it can be explained quite simply. Although the swallowing process is presented here step-by-step, all of these actions happen essentially at the same time in a precise manner.

Process of Swallowing

Food Pressure

Once the tongue has moved the food bolus to the back of the mouth the physical pressure of the food bolus in the pharynx causes the muscles of the pharynx to contract and to move the food from the pharynx into the esophagus. This action is referred to as swallowing.

Uvular Contraction

The palatine uvula, usually referred to as simply the uvula, is a conic projection from the back edge of the middle of the soft palate. During the action of swallowing the uvula contracts, flattens, and covers the opening of the nasopharynx, preventing food from entering the nasal passages.

Laryngeal Movement

Once the food bolus or liquid reaches the back of the oral cavity, the larynx moves upward. This action helps close the glottis over the tracheal opening and prevents food from passing through the vocal cord and into the trachea.

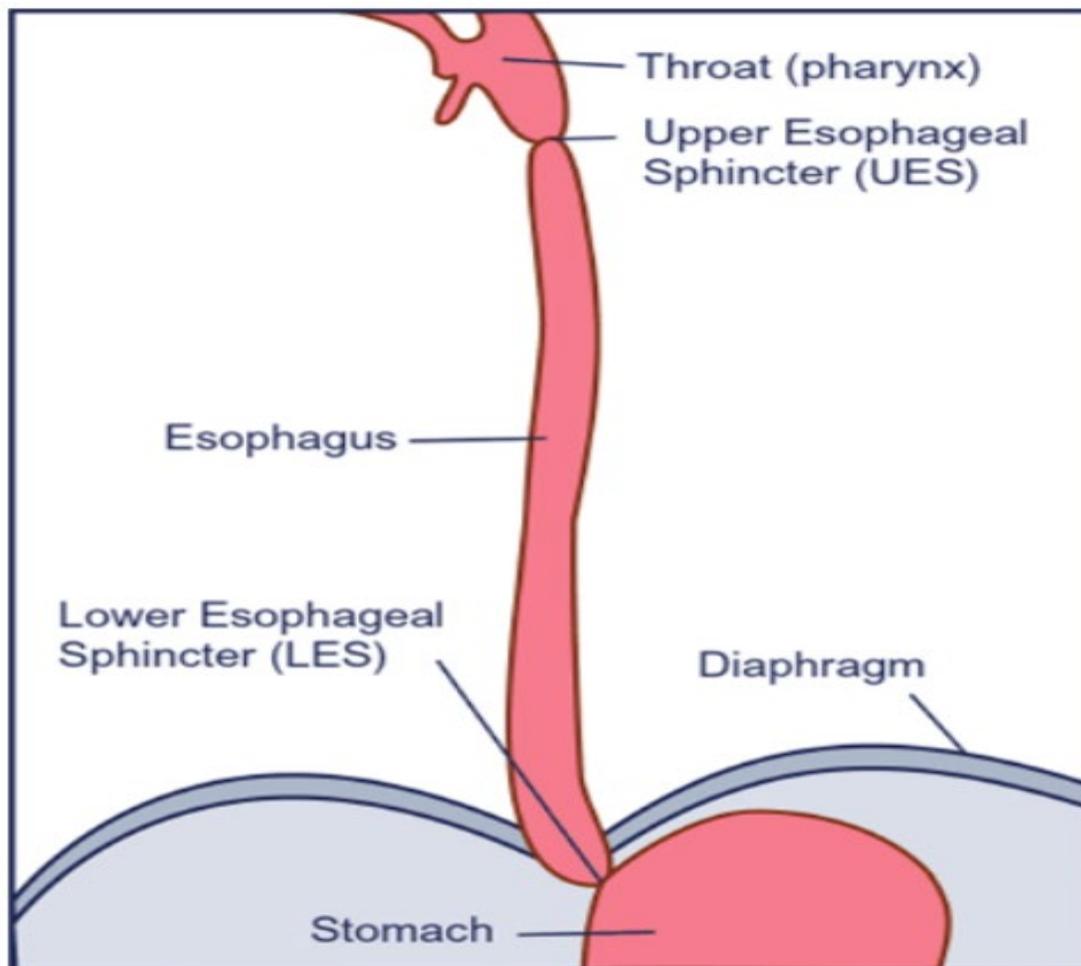
Movement of the Epiglottis

At the same time that the larynx is moving upward to close the glottis, the epiglottis swings down and covers the opening of the vocal cords and larynx, acting as a cover. This prevents food or liquid from entering the trachea.

Sphincter Relaxation

The Upper Esophageal Sphincter (UES) relaxes, providing access to the esophagus. The Upper Esophageal Sphincter will close once the bolus has passed through. The bolus will then move into the esophagus and is transported down the esophagus by gravity and peristalsis where it will encounter the second sphincter just prior to entering the stomach. This lower sphincter is referred to as the Lower Esophageal Sphincter (LES) and once the bolus reaches this area the Lower Esophageal Sphincter will relax and open allowing the bolus to enter the stomach.

IMAGE 4: UPPER AND LOWER ESOPHAGEAL SPHINCTERS



Peristaltic Action

Once food or liquid enters the esophagus, it is moved along by involuntary rhythmic muscle actions called peristalsis and gravitational pull. Because the esophagus is essentially a closed tube, pressure on any portion of the esophagus will cause contraction of the muscles and begin to move food or liquid in the direction of least resistance. Least resistance will be towards the Lower Esophageal Sphincter (LES) and the stomach. A useful way to think of this is to imagine squeezing an open tube of toothpaste; squeezing moves the contents through the opening, and peristaltic contractions in the esophagus function in the same way.

Once the bolus has reached the Lower Esophageal Sphincter (LES), it relaxes and allows for the passage of the food bolus or liquid into the stomach.

During the process of swallowing, other physiological actions that involve the oral cavity, the pharynx, the larynx, or the esophagus cannot be done; for example, when a person swallows, there is an inability to inhale, exhale, talk, vomit, or cough.

Two things play a prominent role in the process of swallowing and the risk for aspiration:

1. The gastrointestinal tract and the respiratory tract are in close proximity, and at certain points, there is very little that separates them.
2. Swallowing is a relatively complicated act that requires the coordinated action of many muscles, nerves, and reflexes.

There are many steps in the process of swallowing that can break down. This factor, along with the close proximity of the respiratory tract to the GI tract, means that there is considerable potential for food or liquid to be aspirated.

Gag and Cough Reflex

The *gag reflex* and the *cough reflex* protect the lungs from aspiration and the entry of foreign objects. The gag reflex involves the oral cavity and the upper part of the gastrointestinal tract. The gag reflex triggers the back of the throat (oropharynx) muscles to resist swallowing. This helps prevent the passing of foreign objects and the swallowing of things that could be potentially harmful. Along with violent muscle spasms in the throat, gagging is often accompanied by intense abdominal muscle contractions. The gag reflex, which is more formally called the *pharyngeal reflex*, is the most important protective mechanism for the prevention of aspiration.

The cough reflex involves the upper part of the respiratory tract. A cough causes a rapid, forceful expulsion of air from the lungs. This voluntary or involuntary act clears the throat and breathing passage of foreign particles, irritants, fluids, microbes, and mucus.

The gag reflex occurs when a foreign object touches the roof of the mouth, the back of the tongue, the areas around the tonsils, the uvula, or the oropharynx. During normal swallowing food and liquids contact these areas but aspiration is prevented by the automatic closing of the epiglottis. This protective mechanism is absent during potential aspiration but the gag reflex takes over and attempts to stop the foreign object from entering the lungs. Nerve endings located in the roof of the mouth, the back of the tongue, and the throat are stimulated by the physical contact with a foreign body, such as food or fluid, and this stimulation initiates strong, forceful contractions of the pharynx. These contractions of the pharynx attempt to expel the foreign body. The expulsion of the foreign object is experienced by the patient when they gag, cough, or choke.

The gag reflex is commonly described as “having something go down the wrong way.” When a piece of food or liquid reaches the back of the mouth, the person begins to gag and cough. An intact functioning

gag reflex is essential to prevent aspiration; however, it has been estimated that the gag reflex is absent in almost 30% of the population and some people may have a gag reflex but it is not very strong. In addition, there are many diseases and medical conditions that can temporarily or permanently damage the gag reflex, making someone susceptible to aspiration.

Dysphagia is difficulty swallowing, taking more time and effort to move food or liquid from the mouth to the stomach. Dysphagia is usually caused by another health condition, such as damage to the nervous system like a stroke, head injury, multiple sclerosis, or dementia. Other causes are cancer, such as mouth cancer or esophageal cancer. Gastroesophageal reflux disease (GERD) is when stomach acid leaks back up into the throat and/or mouth. This is caused by the Upper Esophageal Sphincter or Lower Esophageal Sphincter not closing properly.

An absence of the gag reflex may be a symptom of damage to the glossopharyngeal nerve, the vagus nerve, or the brain. The aging process potentially weakens the gag reflex without evident impairment and up to one-third of healthy people do not have a gag reflex.

Neurological disorders that could have the potential to affect the gag reflex are:

1. Epilepsy
2. Alzheimer's Disease
3. Migraines
4. Strokes
5. Parkinson's Disease
6. Multiple Sclerosis
7. Cerebral Palsy

Impaired physical mobility affects many aspects of health but the conditions listed in table 1 have the greatest influence in regard to

aspiration. Immobility creates physical weakness both externally and internally, leading to the malfunction of those muscular structures within and supporting the function of the lungs.

TABLE 1: HAZARDS OF IMMOBILITY WITHIN THE LUNGS

<ol style="list-style-type: none">1. Decreased strength of respiratory muscles2. Diminished lung expansion3. Hypoventilation4. Impaired gas exchange5. Decreased cough reflex6. Pulmonary secretion pooling7. Fluid builds within the lung tissue

The cough reflex is extremely important for preventing aspiration. The primary function of the larynx and trachea is to move air into the lungs and the respiratory tract. Any foreign substance that enters the airways interferes with respiration and is a potential cause of infection. Nerve endings located on the larynx and the trachea are stimulated when a foreign body enters the larynx or trachea, a forceful cough is produced in an effort to expel the foreign object.

Causes of Aspiration

Aspiration occurs when the gag reflex and the cough reflex fail to prevent a foreign substance or object from entering the lungs. The common conception of aspiration is that it is an abnormal and dramatic pathologic event that causes coughing, choking, and serious complications such as pneumonia.

This is certainly true for some aspirations but an aspiration is actually a common event and it may not result in harm. Studies have shown that at least one-half of all adults aspirate during sleep and the aspiration does not wake them up or cause signs and symptoms. These common aspirations happen to normal, healthy adults who have a functioning gag reflex. They aspirate small amounts of saliva, mucous, and sometimes gastric juices.

Aspirations can result in serious harm and can occur in some people under certain circumstances. These specific circumstances can have potentially serious consequences and why and how they are harmful is explained below.

Volume

A patient may suffer a serious aspiration even when a small volume enters the lungs but serious aspiration often occurs when it is a larger volume. An example of this would be a patient who has aspirated tube feeding. A milliliter or two may be tolerated but, 30 ml or more, for example, could be extremely harmful to the patient and the patient would likely be demonstrating signs and symptoms of aspiration. The patient will likely be violently coughing in an attempt to clear the tube feeding from their lungs.

It is important to realize that the larger the volume, the greater the potential harm. Preventative measures could include:

1. Cutting food into smaller pieces or taking smaller bites when eating. Take smaller swallows when drinking fluids.
2. If drinking, eating, or receiving tube feeding while in bed, keep the head of the bed at least 45 degrees.
3. Stay upright after completion of tube feeding, drinking, or eating for at least 45 minutes if able.
4. Eat and drink free of distractions. Turn off the television and don't talk on the phone.
5. Take time to drink and chew, enjoy the food. Do not rush the meal.
6. Always check the patient's file for aspiration risk and know those patients that have a potential medical diagnosis that puts them at risk for aspiration.

Substance

If the aspirate contains infectious bacteria the patient may develop aspiration pneumonia. The causative microorganisms in aspiration pneumonia are basically thought to be bacteria residing in the oral cavity, such as pneumococcus, Haemophilus influenzae, Staphylococcus aureus, and anaerobes.

Frequency

If aspirations are happening regularly, the respiratory tract and the lungs will be subjected to more frequent stress and the patient will have less time to recover.

Patient Issues

There are many individual factors that influence how often aspirations occur and whether or not these aspirations cause complications. Examples include patients who have a decreased level of consciousness, who have a compromised immune system, or who have a respiratory illness such as pneumonia or chronic obstructive pulmonary disease (COPD) that decreases the oxygen content of the blood.

In any of the above clinical scenarios, the patient is more likely to aspirate or more likely to suffer harm from an aspiration. There are many causes of aspiration and a list of some of these is provided in Table 1.

Table 1: CAUSES OF ASPIRATION

- 1. Cerebral vascular accident (Stroke)**
- 2. Drug or alcohol overdose**
- 3. Dysphagia**
- 4. Excessive production of oral secretions**
- 5. General anesthesia**
- 6. Grand mal seizure**
- 7. Mechanical ventilation**

- 8. Nasogastric feedings**
- 9. Neurologic diseases**
- 10. Prolonged vomiting**
- 11. Sedative, hypnotic, or opioid medications**
- 12. Tracheostomy**
- 13. Traumatic brain injury**

As mentioned previously, this list is not all-inclusive and it also contains some overlap; many people who have had a stroke develop dysphagia. This list is useful to help a health care professional see the similarities that exist between the different causes of aspiration. Understanding these similarities helps a health care professional recognize which patients are at risk for aspiration. The physical characteristics that may be associated with the various causes of aspiration include a depressed level of consciousness and an absent or compromised protective reflex.

Depressed Level of Consciousness:

Someone who has a depressed level of consciousness often has a weak or absent gag reflex. This is a patient who cannot protect the airway. This can happen to a patient who has had a stroke, it can happen during a seizure, or it can be a consequence of an overdose.

Absent or Compromised Protective Reflexes:

Examples of an absent or compromised protective reflex would include a patient who has been endotracheally intubated or who has a tracheostomy, placement of a nasogastric feeding tube, or the patient has dysphagia.

Many patients have a depressed level of consciousness and a loss of protective reflexes, the two frequently go together. For example, a

patient who has had a stroke may be comatose and have a damaged gag reflex.

Dysphagia is a medical term that means difficulty in swallowing. Dysphagia is a significant risk factor for aspiration. Common neurological problems such as Alzheimer's disease, stroke, and traumatic brain injury frequently cause dysphagia. Dysphagia is very common. The authors of a recent article in the medical journal *Chest* noted that dysphagia is present in at least 30% of all hospitalized patients. This percentage is probably higher since dysphagia is often not recognized.

Signs and Symptoms of Aspiration

The signs and symptoms of aspiration can be subtle or very clear. Some patients can aspirate and initially be asymptomatic. The obvious signs and symptoms of aspiration are coughing, choking, and difficulty breathing.

Signs and symptoms of aspiration often occur after a situation that puts the patient at risk. For example, a patient who recently had a stroke is taking fluids by mouth for the first time since the stroke. The patient begins to cough and gasp, the patient has aspirated. Situations with a high potential for aspiration where a patient is coughing and gasping are more obvious than those situations that are more subtle.

When there is a slight aspiration, the signs and symptoms may be minor, or the patient is initially asymptomatic. Recognizing the presence of aspiration in this situation can be difficult. A health care professional must remember who is at risk for aspiration and must be on the alert for clues that aspiration has happened. These situations are listed in Table 2.

Table 2: SIGNS AND SYMPTOMS OF ASPIRATION

1. Change in consciousness, especially depressed consciousness

2. **Decreased oxygen saturation as measured by pulse oximetry**
3. **Excessive drooling**
4. **Fatigue**
5. **Fever**
6. **Increased sputum production**
7. **Persistent, mild cough**
8. **Rapid breathing**
9. **Tachycardia**
10. **Vomiting soon after meals**

Some of the signs and symptoms of aspiration are nonspecific. For example, there are many reasons why a patient may have a fever or a rapid pulse. However, if these signs are present in a patient who has risk factors for aspiration, then the possibility should be investigated.

Asymptomatic aspiration is also called *silent aspiration*, and it is especially worrisome. It cannot be detected without specialized testing, and patients who have silent aspirations are much more likely to develop aspiration pneumonia. Silent aspirations are not rare. One study found that 25% of confirmed, documented aspirations were silent aspirations.

Prognosis of Aspiration

Aspiration can cause the following conditions individually or in combination:

1. airway obstruction
2. interference with ventilation
3. inflammation of the lungs (chemical pneumonitis)
4. aspiration pneumonia

Aspiration pneumonia is perhaps the most common complication associated with aspiration. Aspiration pneumonia occurs when a patient aspirates bacteria or other microorganisms from the oral cavity, nasal passages, or upper stomach. These microorganisms are part of the

normal flora of the upper respiratory tract and the gastrointestinal tract, but if they enter the lungs they can multiply and are no longer benign. If these oral, nasal, or gastric nasal secretions contain a large number of microorganisms, if the aspirations are frequent, or if the patient is susceptible to a respiratory infection, aspiration pneumonia can develop.

It is important to remember that the size of the aspiration is not important. Aspiration pneumonia can occur even after a small volume enters the lungs and aspiration pneumonia can be caused by a silent aspiration. Pneumonia occurs in approximately one-third of all patients who aspirate.

The exact incidence of aspiration pneumonia is not known but it is a relatively common problem. It is especially prevalent in the elderly population, and quite common in the elderly who have dysphagia and in elderly people who are hospitalized. For the latter group, it is very dangerous. One study found the mortality rate of hospital-associated aspiration pneumonia to be almost 30%.

The signs and symptoms of aspiration pneumonia vary considerably and they depend on how recently the aspiration occurred, the patient's basic state of health, and the virulence of the microorganism. Common clinical problems that are seen are:

1. drowsiness
2. fever
3. rapid breathing
4. tachycardia

If the patient is elderly and dehydrated, hypotension may be an issue as well. It is also possible for the patient to have relatively mild signs and symptoms for a few days as aspiration pneumonia develops. Aspiration pneumonia is diagnosed by examining the patient and by recognizing risk factors for aspiration, and the most reliable is by obtaining a chest X-ray. Laboratory studies and the examination or

culture of sputum have limited usefulness in diagnosing aspiration pneumonia. Aspiration pneumonia is treated with antibiotics and fluids.

Prevention of Aspiration

As with any medical problem, disease prevention is far better than treatment. Aspiration prevention is considered to be a key component of good healthcare, and it involves identifying patients who are at risk and then using practical methods to ensure that patients do not aspirate.

Screening: Identifying High-Risk Patients

Aspiration prevention is considered to be a key component of good healthcare. The Agency for Healthcare Research and Quality (AHRQ) is an agency of the National Institutes of Health, and the AHRQ recommends as one of its 30 Safe Practices for Better Health Care that all patients be screened for aspiration. To quote the AHRQ: "Upon admission, and regularly thereafter, evaluate each patient for the risk of aspiration." Evaluating stroke patients within 24 hours of admission for their risk of aspiration and the presence of dysphagia is also typically recommended.

Prevention of aspiration begins with recognizing patients who are at risk for aspiration. This has been shown to be both a simple and a difficult process. The simple part is identifying which patients are likely to suffer an aspiration. This was discussed earlier, and a basic screening tool would be: If the patient answers 'yes' to any of the following questions then the patient is at risk for aspiration.

Table 3: Basic Screening for Aspiration Risk

- | |
|--|
| <ol style="list-style-type: none">1. Is the patient elderly?2. Is the patient receiving any medications that can cause sedation?3. Does the patient have a neurological disease or disorder?4. Does the patient have excess secretions? |
|--|

- 5. Was general anesthesia recently used?**
- 6. Does the patient have obvious difficulty eating and/or swallowing?**
- 7. Is the patient unable to sit upright?**
- 8. Has the patient had a prior aspiration?**
- 9. Does the patient have a history of dysphagia?**
- 10. Does the patient have a depressed level of consciousness?**

This basic assessment should be done for all patients, and for patients who are especially susceptible to aspiration and it should be repeated from time to time. Most healthcare facilities will have an aspiration screening tool and a protocol for how and when to use it. There are bedside and technical-based screening methods that can be used for detecting aspiration and for detecting one of its most common causes, dysphagia.

Unfortunately, there is no universal agreement as to which one is best and when they should be used and that is the part of aspiration or dysphagia screening that is difficult. Explaining all of these screening methods is beyond the scope of this section but commonly used ones are listed in Table 4. The EAT-10 can be done at the bedside without specialized equipment.

Table 4: SCREENING METHODS FOR ASPIRATION/DYSPHAGIA

- 1. Barium swallow test**
- 2. EAT-10**
- 3. Endoscopy**
- 4. Video-fluoroscopic evaluation (VSE)**
- 5. Water swallow test**

The above-mentioned tests, except the EAT-10, are technical. The EAT-10 is a questionnaire that can be used to determine the need for more complicated screening and asks the patient to respond to the following 10 statements.

TABLE 5: THE EAT-10 QUESTIONNAIRE

- 1. My swallowing problem has caused me to lose weight.**
- 2. My swallowing problem interferes with my ability to go out for meals.**
- 3. Swallowing liquids takes extra effort.**
- 4. Swallowing solids takes extra effort.**
- 5. Swallowing pills takes extra effort.**
- 6. Swallowing is painful.**
- 7. The pleasure of eating is affected by my swallowing.**
- 8. When I swallow food sticks in my throat.**
- 9. I cough when I eat.**
- 10. Swallowing is stressful.**

The answers to the questions are scored on a scale from 0 – 4, no problem to severe, and if the total score is 3 or higher the patient may have a swallowing problem and a more aggressive evaluation should be considered.

Prevention of Aspiration

If a patient has been identified as being at risk for aspiration or if the patient has aspirated, then practical methods designed to prevent this from happening should be started. The first step is to use the aspiration evaluation protocol that the healthcare facility has adopted. The health care professional should also keep in mind the questions that are listed in Tables 2 and 3.

Specific measures for preventing aspiration include:

1. patient positioning
2. oral care
3. assessment of nasogastric tube placement
4. tube feeding technique
5. measuring residual gastric volume
6. avoiding the use of sedating drugs

Each healthcare facility will use these preventive measures differently and some of them may not be used at all in the workplace, it is not possible to provide strict, definitive guidelines for their use. The health care professional should follow the in-place protocols of the workplace and if there are any doubts about what to do the health care professional should ask a supervisor for guidance.

Patient Positioning

Elevating the head of the bed is a very effective method for preventing aspiration. Lying flat or with the head slightly elevated increases the possibility of aspirating, especially so if a patient has an absent/weak gag reflex or is receiving feedings by a nasogastric tube. Remember, one of the first things everyone does when food or liquid “goes down the wrong way” is to stand up. The exact degree to which the head of the bed should be elevated is determined by the protocol of the workplace, but 30°-45° is typically recommended.

Oral Care

Aspiration pneumonia is caused by the entry of oral, nasal, and gastric secretions into the lungs. Rigorous attention to oral care and possibly the use of antiseptic mouth rinses that contain chlorhexidine are often used as ways to reduce the number of microorganisms in the oral cavity and to prevent aspiration pneumonia. Chlorhexidine is an antibacterial agent; a 0.12%-0.2% solution can be applied to a sponge and the patient’s mouth is swabbed four times a day. The frequency of chlorhexidine use and the protocol may vary from hospital to hospital.

Assessment of Nasogastric Tube Placement

Nasogastric tubes can easily become misplaced, putting the patient at risk for aspiration. Frequent assessment of the proper position of nasogastric tube placement would not typically be a responsibility of

the health care professional but this is a recommended preventative technique.

Tube Feeding Technique

If a patient is receiving tube feedings and is at risk for aspiration, tube feedings should be given at the prescribed rate. The rate of a tube feeding should not be increased unless there is a specific order to do so and a tube feeding should never be administered as a bolus; this increases the risk for aspiration.

Measuring Residual Gastric Volume

A technique that has traditionally been used to prevent aspiration in patients who are receiving nasogastric feedings is measuring residual gastric volume. After a tube feeding, the amount of enteral nutrition liquid that is still in the stomach is measured. If the residual is above a certain amount then it is assumed that the patient's gastrointestinal tract is not properly absorbing the liquid nutrition and the excess volume puts the patient at risk for aspirating. This technique may be helpful for certain patients but recent research has questioned its usefulness.

Avoid Sedating Drugs

The use of sedating drugs increases the risk of aspiration. While the administration of these medications is not a health care professional's responsibility, the health care professional should be assessing patients for excessive drowsiness caused by sedatives, analgesics, and other drugs that can cause central nervous system depression and should report these adverse effects if they are found to occur.

Case Study: Aspiration Pneumonia

Mrs. B is an 86-year-old female who has just been discharged from a hospital and admitted to a long-term care facility. She recently suffered a stroke that left her with significant weakness in her left arm and leg. She is unable to walk but with some assistance, she can perform some simple activities of daily living and her mental status and speech are completely intact.

The patient has been depressed and occasionally mildly agitated as she tries to adjust to her limitations. In addition, her appetite has been poor and for the past two days she has refused to eat, telling the staff that food "makes her sick." She also complains of persistent pain in her left side.

Because of these developments, the provider ordered the patient to be given a low dose of fluoxetine, a commonly used antidepressant. The physician also requested an orthopedic and physical therapy consultation and while awaiting the results of those evaluations, she prescribed a non-narcotic analgesic, tramadol. Finally, after extensive discussions with the patient, and with her acceptance, a small nasogastric tube was inserted and enteral tube feedings were begun. It was understood that the feeding tube would be in place for only a short period of time.

Several days after the fluoxetine, tramadol, and tube feedings were started the patient's condition was improved. Her mood was brighter, her pain was decreased, and she seemed to have more energy. Her pain was diagnosed as osteoarthritis, she was able to start physical therapy, and plans were made for her to move (within a few weeks) to a relative's house, albeit with the support of visiting nurses.

After a week of clinical gains, the staff began to notice some mild regressions in Mrs. B. She was noted to be sleeping more and had less energy during the day, although there were periods of time in which she seemed normal. She also had a fever of 100.1° F, but this only occurred once and the fever responded to fluids and a dose of acetaminophen.

On the seventh day of her tube feedings Mrs. B was noted to have a fever of 102.7° F and her respiratory rate was 24. Shortly after being assisted from her bed to a chair Mrs. B had several forceful, productive coughs and the health care professional saw undigested tube feeding residue in the patient's sputum. The provider was notified, a chest X-ray was done, and it was clear that Mrs. B had aspirated and had pneumonia.

Discussion

This patient had obvious risk factors for aspiration. She had recently had a stroke, she was prescribed several medications that are known to cause central nervous system depression, a nasogastric tube was in place, and she was receiving enteral tube feedings. The clinical course she experienced was fairly typical, with some subtle signs of silent aspiration being present before it became clear that some of the tube feeding and gastric juices had entered her lungs.

Summary

Aspiration is a common condition that involves the inhalation of foreign substances into the lungs and can cause significant and serious complications. There are many causes of aspiration. Some of the common ones are stroke, dysphagia, drug or alcohol overdose, neurologic diseases, prolonged vomiting, and traumatic brain injury. Dysphagia is the most common cause of aspiration.

A depressed level of consciousness and the protective mechanisms that prevent aspiration are absent or compromised when aspiration occurs. The obvious signs and symptoms of aspiration are coughing, choking, and difficulty breathing. Aspiration can cause airway obstruction, interference with ventilation, inflammation of the lungs, which is called chemical pneumonitis, and aspiration pneumonia.

Prevention is far better than treatment in a case of aspiration. Aspiration prevention is considered to be a key component of good healthcare. It involves identifying patients who are at risk and then using practical methods to ensure that patients do not aspirate.