ANY TIME a patient inhales foreign matter such as food or bacteria into his lower airway, he’s at risk for aspiration pneumonia. Patients who develop aspiration pneumonia are commonly older or debilitated; receiving nasogastric tube feedings; and have an impaired gag reflex, poor oral hygiene, or a decreased level of consciousness. Preventing aspiration pneumonia and recognizing the signs and symptoms are key nursing measures to protect your patients.

How pneumonia develops
The most common form of aspiration pneumonia is bacterial infection from inhalation of bacteria that normally reside in the upper airways. The aspirated material impairs lung defenses, causes inflammation, and leads to bacterial growth and a resulting pneumonia. If untreated, the pneumonia can cause death. Most commonly, the bacteriologic findings in this type of pneumonia include Gram-positive cocci, Gram-negative rods, and occasionally anaerobic bacteria.

If a patient aspirates gastric contents, the volume and character of the aspirated material are primarily responsible for the complications of aspiration pneumonia. For example, a small localized aspiration from regurgitation can cause pneumonia and acute respiratory distress; a massive aspiration is usually fatal.

A full stomach contains solid food particles. If these are aspirated, the airways become blocked and secondary infection sets in. Even if the patient is fasting, his stomach contains acidic gastric juice which, if aspirated, can be very destructive to the alveoli and capillaries.

Fecal contamination of gastric contents (more likely with intestinal obstruction) increases the likelihood of death for these reasons:
• Intestinal organisms produce endotoxins that may be absorbed into the patient’s system.
• Thick, protein-rich material found in the intestinal contents may obstruct the patient’s airway, leading to atelectasis and secondary bacterial invasion.

Aspiration pneumonia may develop from aspiration of substances with a pH of less than 2.5 and a volume of gastric aspirate greater than 0.3 mL per kilogram of body weight (about 20 to 25 mL in adults). The more acidic and the larger the volume, the more it will damage the lung tissue for these reasons:
• Because of their acidic nature, the aspirated gastric contents cause a chemical burn of the tracheobronchial tree and pulmonary parenchyma.
• An inflammatory response occurs, resulting in destruction of alveolar-capillary endothelial cells.
• Protein-rich fluids leak from the endothelial cells into the interstitial and intra-alveolar spaces.
• Surfactant (a lipoprotein substance secreted in the lungs that helps keep lung tissue elastic) is lost, causing the airways to close and the alveoli to collapse.
• The impaired exchange of oxygen and carbon dioxide causes respiratory failure.

What to look for
The signs and symptoms of aspiration pneumonia vary. The predominant symptoms may be headache, low-grade fever, pleuritic pain, myalgia, rash, and pharyngitis. After a few days, the patient expectorates mucoid or mucopurulent sputum. In severe pneumonia, the patient’s cheeks are flushed and central cyanosis affects the lips and nail beds, a late sign of poor oxygenation (hypoxemia).

The patient may have shortness of breath when reclining (orthopnea); he may prefer being propped up or sitting in bed leaning forward (orthopneic position) in an effort to achieve adequate gas exchange without coughing or breathing deeply. His appetite may be poor, and he
may sweat excessively and tire easily. Sputum is often purulent; however, this isn’t a reliable indicator of the cause of the pneumonia.

The patient’s underlying condition may affect his signs and symptoms. For example, cancer and therapy with immunosuppressants decrease resistance to infection, so a patient with either condition may have fever, crackles, and physical findings that indicate consolidation of lung tissue:
- increased tactile fremitus (vocal vibration detected on palpation)
- percussion dullness
- bronchial breath sounds
- egophony (when auscultated, the spoken “E” becomes a loud, nasal-sounding “A”)
- whispered pectoriloquy (whispered sounds easily auscultated though the chest wall).

These changes occur because sound is transmitted better through solid or dense tissue (consolidation) than through normal air-filled tissue.

In a patient with chronic obstructive pulmonary disease, purulent sputum or slight changes in respiratory symptoms may be the only sign of pneumonia. Determining whether increased symptoms signal an exacerbation of the underlying disease or an additional infection may be difficult.

**What the tests tell you**

The diagnosis of pneumonia is made by history, physical examination, chest X-ray, and sputum examination. Obtain a sputum sample, if possible, by having the patient do the following:
- rinse his mouth with water to minimize contamination by normal oral flora
- breathe deeply several times
- cough deeply
- expectorate the raised sputum into a sterile container.

Sputum may also be obtained by more invasive procedures such as nasotracheal or orotracheal suctioning with a sputum trap or by fiberoptic bronchoscopy. Bronchoscopy is often used in patients with acute severe infection, in patients with chronic or refractory infection, in immunocompromised patients when a diagnosis can’t be made from an expectorated or induced specimen, and in mechanically ventilated patients.

**How it’s treated**

The treatment of aspiration pneumonia includes antibiotics as determined by results of a Gram stain and culture and sensitivity test. Guidelines exist to guide antibiotic choice, but resistance patterns, prevalence of etiologic agents, patient risk factors, and costs and availability of newer antibiotic agents must also be considered. See *Antibiotic therapy* for more information.

Several organizations have published guidelines and comprehensive reviews of the medical management of aspiration pneumonia. Guidelines may be classified in terms of risk factors (see *Risk factors for aspiration*), treatment setting (inpatient versus outpatient), or specific pathogens.

Usually, therapy with parenteral agents is changed to oral antimicrobial agents when the patient shows evidence of a clinical response and he’s stable and able to tolerate oral medications. Patients with pneumonia caused by bacterial pathogens are treated for 1 to 2 weeks after their fever subsides. Those with atypical pneumonia (such as *Legionella* or *Mycoplasma pneumoniae*) are usually treated for 10 to 21 days.

If a patient with aspiration pneumonia develops hypoxemia, he requires oxygen therapy. Pulse oximetry or analysis of arterial blood gases helps determine his oxygen needs and evaluate the effectiveness of oxygen therapy. Arterial blood gases may be used to get a baseline measure of his oxygenation and acid-base status; pulse oximetry is used for continuous monitoring of his oxygen saturation and response to therapy. If oxygen therapy alone can’t maintain an adequate oxygen saturation level, he needs more aggressive respiratory support via endotracheal intubation or mechanical ventilation.

**Possible complications**

Severe complications of aspiration pneumonia include:
- hypotension, shock, and respiratory failure (especially with Gram-negative bacterial disease in older patients)
- atelectasis (from accumulated secretions obstructing a bronchus or small airways), which may occur at any stage of acute pneumonia
- parapneumonic pleural effusions (any pleural effusion associated with bacterial pneumonia, lung abscess, or bronchiectasis), which occur in at least 40% of bacterial pneumonias

**Risk factors for aspiration**

- seizure activity
- decreased level of consciousness from trauma, drug or alcohol intoxication, excessive sedation, or general anesthesia
- nausea and vomiting in a patient with a decreased level of consciousness
- stroke
- swallowing disorders
- cardiac arrest
- silent aspiration (aspiration without outward signs of coughing or respiratory difficulty)
• **Superinfection** (the development of an additional infection brought on by the use of antibiotics for an infection somewhere else in the body), which may occur with the administration of very large doses of antibiotics such as penicillin, or with combinations of antibiotics.

**Gerontologic considerations**

Pneumonia in older people results in a higher mortality rate. However, the diagnosis may be missed because the classic symptoms of cough, chest pain, sputum production, and fever may be absent or masked in older adults. Instead, general deterioration, weakness, abdominal symptoms, anorexia, confusion, tachycardia, and tachypnea may signal the onset of pneumonia.

The presence of some signs of pneumonia in older adults may be misleading. Abnormal breath sounds, for example, may be caused by microatelectasis that occurs as a result of decreased mobility, decreased lung volume, or other respiratory function changes that go with aging. The patient may require a chest X-ray to differentiate pneumonia from chronic heart failure, which is often seen in older adults, as the cause of signs and symptoms.

Supportive treatment for pneumonia includes hydration (with caution and frequent assessment because fluid overload poses a greater risk in older adults), supplemental oxygen therapy, and assistance with deep breathing, coughing, frequent position changes, and early ambulation. To reduce or prevent serious complications of pneumonia, older adults should receive vaccination against pneumococcal and influenza infections.

**Preventing aspiration**

Prevention is a primary goal when you care for patients at risk for aspiration. Risk factors include:
• decreased level of consciousness
• supine positioning
• presence of a nasogastric tube
• tracheal intubation and mechanical ventilation
• bolus or intermittent feeding delivery methods
• advanced age.

You can take several preventive measures to protect at-risk patients from aspiration pneumonia.

**Keep the patient in a semirecumbent position.** Elevating the head of his bed to between 30 and 40 degrees decreases the risk of aspiration.

**Compensate for absent reflexes.** A patient who can’t adequately coordinate protective glottic, laryngeal, and cough reflexes has a greater risk of aspiration. This hazard is increased if the patient:
• has a distended abdomen
• is supine
• has his upper extremities immobilized by intravenous infusions
• has received a local anesthetic to the oropharyngeal or laryngeal area for diagnostic procedures
• has been sedated
• has had long-term intubation.

During vomiting, most people can protect their airway by sitting up or turning on the side and coordinating breathing, coughing, gag, and glottic reflexes. A patient with these reflexes intact shouldn’t have an oral airway inserted to protect him from aspirating his own vomitus.

If a patient has an artificial airway in place, it should be pulled out the moment he gags so as not to stimulate the pharyngeal gag reflex and promote vomiting and aspiration. Suctioning oral secretions with a catheter should be performed with minimal pharyngeal stimulation.

**Assess feeding tube placement.** Tube feedings must be given only when the feeding tube’s correct position is certain. Feedings are given slowly and regulated by a feeding pump. Many patients receive enteral feeding directly into the duodenum through a small-bore flexible feeding tube or surgically implanted tube. A patient who’s intubated may aspirate foreign material even with a nasogastric tube in place, so assessment of tube placement is key to preventing aspiration. The best way to determine tube placement is with an X-ray.
Other than X-ray, the most reliable method to assess tube placement is by observation of the aspirate and testing its pH. Gastric fluid may be grassy green, brown, clear, or colorless. Mucus aspirated from the lung may be off-white or tan. Pleural fluid is watery and usually straw-colored.

Gastric pH is typically lower (more acidic) than the pH of intestinal or respiratory secretions. Gastric pH is usually between 1 and 5; intestinal or respiratory pH is 7 or higher.

Although observation of aspirated contents and pH evaluation should be performed for intermittent feedings with small-bore tubes, the pH method isn’t useful for continuous feedings because you’d be checking the infused formula rather than the patient’s gastric fluid.

Properly administer tube feedings. Patients receiving continuous infusions should receive small volumes under low pressure and be placed in an upright position to help prevent aspiration. Patients receiving infusions at timed intervals are maintained in an upright or semirecumbent position (head of the bed elevated to 30 to 40 degrees) during the feeding and for at least 30 minutes afterward to let the stomach partially empty.

Manage the effects of prolonged intubation. Prolonged endotracheal intubation or tracheostomy can depress the laryngeal and glottic reflexes because of disuse. Encourage patients with prolonged tracheostomies to phonate (make vocal sounds) and exercise their laryngeal muscles. For patients who’ve had long-term intubation or tracheostomies, having a rehabilitation therapist experienced in speech and swallowing disorders (such as a speech therapist) work with the patient to assess the swallowing reflex may be helpful.

Protect patients at risk for aspiration pneumonia by using preventive measures and by responding quickly when you detect signs and symptoms of this dangerous respiratory disorder. LPN

Selected references