function, decreased dyspnea, and enhanced exercise capacity. As of 2003, the CMS agreed to cover the costs of LVRS for patients who were not at high risk of death from the procedure, whose disease affected the upper lobes exclusively, and who had a combination of diffuse disease and low exercise capacity.62 Pioneering work in bronchoscopic lung volume reduction may offer expanded options for nonsurgical candidates in the future.63

**DIET.** Improving nutrition is an important goal.90 (See discussion under Nursing Interventions.)

**HEALTH PROMOTION AND PREVENTION.** Ideally, all types of COPD would be prevented if people quit smoking and respiratory irritants were removed from the environment. Although this is not likely to happen soon, continued efforts should be made to educate people about respiratory irritants and dangers. Public education must focus on the pulmonary health risks associated with inhaled irritants, regardless of their source. Increased public awareness of the vital role that clean air plays in pulmonary health is essential for the success of any legislative actions promoting air quality standards. Individuals must also understand the importance of personal responsibility to decrease their own health risk through smoking cessation. *Healthy People 2010* has set goals for reducing cases of chronic respiratory disease (see Healthy People 2010 box).64

Persons with a family history of emphysema should be screened for AAT deficiency. It is imperative that persons with this enzyme deficiency take active measures to prevent progressive lung damage from smoking, air pollution, and infection. Those at high risk for emphysema may require vocational counseling if their current work environment has inhaled irritants. These individuals should also be counseled to receive the influenza vaccine yearly and the pneumococcal vaccine every 3 to 5 years.

**ASSESSMENT**

**Pulmonary Disease**

**Assessment of the Patient with Chronic Obstructive Pulmonary Disease**

**Health History.** Assess for:

- History, character, onset, and duration of symptoms
- Dyspnea, including its effects on ADLs and whether it is associated with any specific illness or event
- Relevant laboratory findings, including an elevated hemoglobin, hematocrit, and WBC count; alterations in ABGs; and normal to increased lung volumes (TLC, FRC, RV)

**Healthy People 2010**

**Selected Objectives for Reduction of Chronic Respiratory Diseases**

- Reduce cigarette smoking by adolescents and adults.
- Reduce the proportion of nonsmokers exposed to environmental tobacco smoke.
- Reduce the proportion of persons exposed to air that does not meet the U.S. Environmental Protection Agency’s health-based standards for ozone.


**NURSING DIAGNOSES, OUTCOMES, AND INTERVENTIONS**

**Nursing Diagnosis: Impaired Gas Exchange**

**Outcomes.** Common examples of expected outcomes for the patient with a diagnosis of impaired gas exchange are:

- Patient will:
  - Demonstrate improved ventilation and oxygenation.
  - Exhibit arterial blood PaO2, PaCO2, and pH levels at patient’s baseline.
  - Explain how and when to use oxygen therapy.

**Interventions.** The nurse monitors ABGs for indications of hypoaxemia, respiratory acidoses, and respiratory alkalosis. Hypoxemia and hypercapnia often occur simultaneously, and
the signs and symptoms are similar. These include headache, irri-
tability, confusion, increasing somnolence, asterixis (flapping
tremors of the extremities), cardiac dysrhythmias, and tachycar-dia.
Morning headache is a frequent sign of hypercapnia. If hypercap-
nia is developing, tachypnea, vertigo, tingling of the extremities,
muscular weakness, and spasm are often present. The presence of
signs and symptoms associated with altered levels of PaO2 and
PaCO2 depends more on the rate of change than on the degree.
Rapidly changing signs usually indicate a rapid worsening of the
patient’s condition, whereas patients with longstanding hypox-
emia and hypercapnia may be relatively asymptomatic because
they have physiologically accommodated to increased PaCO2 and
decreased PaO2.

The nurse is in a key role to assess the need for supplemental
oxygen, to assess the response to therapy and acceptance of thera-
py, and to ensure that the patient meets Medicare criteria for
home oxygen therapy. It is important for the nurse to educate the
patient and family on the following points:
• Oxygen is to be delivered at the prescribed flow rate.
• Safety precautions must always be observed. Oxygen is not
used with activities that produce tachypnea, which leads to
increased PaCO2.
• Oxygen is to be delivered at the prescribed flow rate.
• Oxygen dries the nose membranes. Applying a water-
soluble lubricant (K-Y Jelly) to the inside of the nose may
reduce dryness and cracking. Petroleum jelly (Vaseline)
should not be used because it may be inhaled.
• If humidification is used, the amount of water in the
humidifier bottle must be checked every 6 to 8 hours and
refilled as needed with sterile or distilled water.
• A new supply of oxygen must be ordered when the oxygen
container reads one-fourth full.
• Safety precautions must always be observed. Oxygen is not
flammable itself, but it supports combustion. No one
should smoke in the room where oxygen is being used; patients
using oxygen should stay away from gas stoves, gas
space heaters, or kerosene heaters or lamps; the container
should always be kept upright to prevent leakage; and an
all-purpose fire extinguisher should be readily available in
the home.
• The health care provider should be notified if breathing is
more difficult or if restlessness, anxiety, tiredness, drowsiness,
difficulty waking up, persistent headache, slurred speech,
confusion, or cyanosis of the fingernails or lips occurs.

Related NIC Interventions. Airway Management, Cough
Enhancement, Respiratory Monitoring

Nursing Diagnosis: Ineffective Airway Clearance

Outcomes. Common examples of expected outcomes for the
patient with a diagnosis of ineffective airway clearance are:
Patient will:
• Demonstrate adequate airway clearance.
• Use effective methods of coughing.
• Use bronchoactive medications, including MDIs, dry powder
inhalers (DPis), nebulizers, and humidiﬁers appropriately.

Nursing Interventions. Clearing of the airways is of utmost
importance in meeting tissue demands for increased oxygen dur-
ing periods of rest and increased activity. The nurse should teach
the patient effective coughing maneuvers of sitting upright and
using the huff coughing technique.

Chronic Obstructive Pulmonary Disease Chapter 27 681

To thin secretions, a fluid intake of 3 to 4 L has traditionally
been encouraged unless contraindicated. However, evidence sug-
gests that this quantity of fluids may not be needed to keep secre-
tions mobile. Although expectorants are sometimes prescribed,
some experts believe they do more harm than good. Water is still
considered the best expectorant, and the nurse should encourage
adequate hydration without ﬂuid overload.

Pulmonary physiotherapy techniques may be helpful to some
patients with COPD, but many are not able to tolerate this inter-
vention because of hypoxemia, age, debilitation, and other fac-
tors. The Global Initiative for Chronic Obstructive Lung Disease
recommends manual or mechanical chest percussion and postural
drainage in patients producing more than 25 ml of sputum each
day as well, as in those with lobar atelectasis. (These techniques
are discussed under Cystic Fibrosis.)

Related NIC Interventions. Airway Management, Cough
Enhancement, Respiratory Monitoring

Nursing Diagnosis: Ineffective Breathing Pattern

Outcomes. Common examples of expected outcomes for the
patient with a diagnosis of ineffective breathing pattern are:
Patient will:
• Demonstrate effective breathing pattern.
• Have inspiratory/expiratory ratio 5:10 seconds.
• Use forward-leaning postures, controlled breathing tech-
niques (pursed-lip breathing), and diaphragmatic breathing
(abdominal muscle breathing).
• Use effective methods of coughing.

Nursing Interventions. The nurse encourages the patient to
use controlled breathing techniques, including pursed-lip breath-
ing, the forward-leaning position, and abdominal breathing, to
control dyspnea and anxiety. The goal is a reduced respiratory rate
and enhanced expiratory tidal volume, thus decreasing air trapping.

Pursed-lip breathing (see Figure 27-5) decreases dyspnea when
it is used with activities that produce tachypnea, which leads to
progressive air trapping. Pursed-lip breathing decreases the respi-
ratory rate, increases tidal volume, decreases PaCO2, and increas-
es PaO2 and SaO2. Some patients use pursed-lip breathing intra-
ritively, and others need to be taught. To teach it, the nurse asks the
patient to (1) inhale through the nose for several seconds with
the mouth closed and (2) exhale slowly (taking twice as long as
inhalation) through pursed lips held in a narrow slit. One method
of teaching this technique is by using a child’s soap bubble wand
and blowing one big soap bubble. This approach combines an
enjoyable activity with a measurable means of visualizing a
pursed-lip exhalation. It provides immediate patient feedback, and
promotes relaxation of the patient’s upper body and decreased use
of accessory breathing.

The nurse teaches the forward-leaning (tripod) position for
accessory breathing. A forward-leaning position of 30 to 40 degrees with
the head tilted at a 16- to 18-degree angle effectively improves
exhalation (Figure 27-7). As mentioned previously, patients with
Emphysema have increased TLC and RV with the diaphragm in a fixed, flattened position. Therefore the diaphragm cannot assist in exhalation as it does normally. Leaning forward allows removal of more air from the lungs on exhalation. The patient can achieve the forward-leaning position while sitting or standing. The patient sits on the edge of the bed or a chair and leans forward on two or three pillows placed on a table or overbed stand, or sits in a chair with the legs spread apart shoulder width (or wider, if the patient is obese) with the elbows on the knees and the arms and hands relaxed, or stands with the back and hips against the wall with the feet spread apart and about 12 inches (30 cm) from the wall. The patient then relaxes and leans forward. In these positions the patient cannot use the accessory muscles of respiration, and the upward action of the diaphragm is improved.

Abdominal breathing improves the breathing efficiency of persons with COPD because it assists in elevating the diaphragm. Abdominal breathing can be done in the sitting or lying position. The patient sits on the side of the bed or in a chair and holds a small pillow or a book against the abdomen. The patient exhales slowly while leaning forward and pressing the pillow or book against the abdomen. In the lying position, the patient places a hand on the abdomen and then “puffs out” the abdomen while inhaling and raises the hand as high as possible. The patient then exhales slowly through pursed lips while pulling in on the abdominal muscles. Manual pressure on the upper abdomen during expiration facilitates this maneuver (see Chapter 26). In addition to abdominal breathing, exercises to strengthen the abdominal muscles help patients use them more effectively in emptying their lungs. This controlled breathing pattern is used while performing various ADLs, from sitting, standing, walking, and climbing stairs to more complex activities. As this pattern becomes natural, the patient uses it automatically during periods of increased shortness of breath.

Environment plays a significant role in ease of breathing. Humidity of 30% to 50% is ideal and can be achieved with a humidifier. An air conditioner may reduce dyspnea by controlling the temperature and preventing entrance of pollutants from outside air. The cost of an air conditioner is a medically deductible expense for persons with COPD. Movement of cool air with a fan has also been shown to reduce dyspnea, perhaps from the stimulation of receptors on the face or decreased temperature of facial skin. Wearing a scarf over the nose and mouth in cold weather helps warm the air and prevent bronchospasm. Masks for this purpose are also available. Smoking cessation is essential, as is minimal exposure to air pollution and the avoidance of environmental tobacco smoke.

**RELATED NIC INTERVENTIONS.** Airway Management, Oxygen Therapy, Respiratory Management

**Nursing Diagnosis: Activity Intolerance**

**OUTCOMES.** Common examples of expected outcomes for the patient with a diagnosis of activity intolerance are:

- Patient will:
  - Maintain or work toward an optimal activity level.
  - Pace activities.
  - Plan for simplification of activities.
  - Participate in planned muscle-conditioning program.
  - Demonstrate how to carry out the exercise program to be followed at home, including specific exercises to be completed; frequency of each exercise; and criteria for monitoring physical response to exercises, such as heart rate increase or perceived fatigue.

**NURSING INTERVENTIONS.** To minimize the discomfort of dyspnea, individuals with COPD often avoid physical exertion. The result is gradual deconditioning and dyspnea at ever-lower levels of exertion. Fatigue and muscle wasting also result from deconditioning. Exercise training (aerobic exercise training, strength training,
training, and inspiratory muscle training) improves aerobic capacity, endurance, strength, and functional performance in day-to-day life, and it reduces breathlessness and fatigue during exertion. Patients should undertake both general exercises and specific muscle training.

For general exercise conditioning, graded leg exercises performed by stationary cycling, stair climbing, and walking are safe and well tolerated. Oxygen during exercise is recommended for patients who have significant exercise desaturation and show improved exercise tolerance while using oxygen.

Leg-raising exercises, with each leg being raised alternately as the patient exhales, is one way to strengthen abdominal muscles. Another way is for the patient to raise the head and shoulders from the bed while he or she exhales. With practice and encouragement, the patient can do the exercises 10 times each morning and evening after clearing the lungs of secretions as completely as possible.

The term muscle reconditioning refers to a variety of muscle-toning exercises. For patients who are able to be out of bed, walking, using a treadmill, or riding a stationary bicycle is helpful. The exercise period starts slowly, with 10 minutes twice daily three times a week, increasing to 20 minutes twice daily three times a week. The patient needs to be assessed for his or her ability to carry out such an exercise program, and a staff member should be present during the exercise period.

Patients need to be encouraged not to rush (i.e., to allow ample time for activities). Supplemental oxygen may be needed before and during activities. Activities such as walking should be gradually increased. The nurse should provide positive feedback on progress and encourage new endeavors when the patient is ready. The nurse assists patients in balancing work, rest, and recreation to regulate energy expenditure.

New research suggests that the nurse should take a sleep history. Physiologic changes during sleep can exacerbate COPD symptoms and disrupt sleep. Changes in sleep patterns may be early indicators of illness progression and changes in health status. Sleep affects breathing, even in healthy adults, by increasing airway resistance and decreasing ventilation, particularly during rapid-eye-movement sleep. Changes in airway caliber resulting from mild nocturnal bronchoconstriction and relaxation of upper respiratory muscles are common causes of increased airway resistance during sleep. Minute ventilation falls by about 0.5 to 1.5 L/min. In persons with COPD this increase in airway resistance and decline in minute ventilation during sleep can lead to hypoxemia and hypercapnia during sleep. Hypoxemia is a common cause of arousals and sleep disruption as a result of the increased respiratory effort that occurs when the body corrects for increases in airway resistance or decreases in minute ventilation. Bronchospasm and coughing can prolong period of wakefulness.

Recurrent episodes of hypoxemia are seen in COPD patients during sleep. Effects of nocturnal hypoxemia include cardiac dysrhythmias, pulmonary hypertension, heart failure, and polycythemia. Hypoxemia during sleep may also adversely affect daytime cognition and function. Nurses need to routinely assess sleep and breathing patterns. For patients with COPD, therapies to promote rest should avoid benzodiazepines, since they can depress respiration. Tiadrodine is perhaps the most frequently prescribed hypnotic, since it reduces arousals and increases overall sleep quality. Melatonin has improved both duration and quality of sleep.

RELATED NIC INTERVENTIONS. Energy Management, Exercise Promotion: Strength Training, Exercise Therapy: Ambulation, Sleep Enhancement

Nursing Diagnosis: Imbalanced Nutrition: Less Than Body Requirements

OUTCOMES. Common examples of expected outcomes for the patient with a diagnosis of imbalanced nutrition are:

Patient will:
- Explain dietary changes required after discharge.
- Maintain optimal weight for height, age, and gender.
- Describe food and fluid requirements and daily plan for achieving them.
- State specific foods to avoid.
- Discuss plan for frequent, small feedings that are easily chewable, increased time for eating, and use of supplemental oxygen as indicated.

NURSING INTERVENTIONS. Malnutrition plays a role in the deterioration of physical performance, the development of clinical complications, and overall prognosis. Loss of appetite affects many people with COPD, and evidence shows that hypoxia may be contributory. Hypoxia has an anorexic effect and is a key catabolic stimulus. In malnourished COPD patients hypoxia-induced cytokine release leads to anorexia and muscle wasting. Other contributing factors are the feeling of satiety that occurs with small amounts of food because the flaccid diaphragm compresses abdominal contents; dyspnea, which interferes with eating; and gastric irritation associated with the use of bronchodilators and steroids. Diminished total weight is correlated with a dramatic decrease in size and strength of respiratory muscle (especially the diaphragm). Physical reconditioning and endurance training combined with a balanced diet are essential to maintaining or improving energy metabolism and nutritional status.

To help the patient with COPD maintain adequate nutrition, the nurse explores the patient’s and family’s usual dietary habits and counsels the patient to select foods that provide a high-protein, high-calorie diet. It is important to counsel the patient to select foods that derive their calories from high fat rather than high carbohydrate levels. Persons with advanced chronic bronchitis or emphysema are unable to exhale the excess carbon dioxide that is a natural end product of carbohydrate metabolism. Therefore calories obtained from high-carbohydrate foods may elevate PaCO2 levels in persons with COPD. The nurse also advises the patient to take supplemental vitamins and prepackaged food supplements such as milk shakes or snack bars between meals because they are an excellent source of protein and calories. The patient is taught that smaller, more frequent meals are often tolerated better than three larger meals. Larger meals require more energy to digest and limit the downward movement of the diaphragm during inspiration. Patients are encouraged to select foods that are easy to chew and swallow to further conserve energy.
Protection of COPD, and the cause of most hospital readmissions, is respiratory infection that produces acute exacerbations (AECOPD). Bacteria, viruses, and atypical pathogens have been implicated as causes of AECOPD.35 Palmonary response to the infectious process includes increased respiratory rate, mucosal irritation, and increased mucus production. Because of these localized responses, patients may have bronchospasm and a change in their pattern of sputum production. If the infection remains untreated, the result is overall increased work of breathing with eventual respiratory failure. Patient teaching is an important component of infection prevention (see the Patient/Family Teaching box).

The nurse should also evaluate the patient’s knowledge of the care, cleansing, and use of inhalant and nebulizer equipment. Contaminated MDIs, DPIs, and nebulizer equipment are common sources of infection.

Infection Control, Infection Protection

Nursing Diagnosis: Ineffective Coping (Individual and Family)

Outcomes. Common examples of expected outcomes for the patient with a diagnosis of ineffective coping are:

Patient will:
- Identify own coping mechanisms, both effective and ineffective.
- Identify stressors, threats to role.

NURSING INTERVENTIONS. The most common complication of COPD, and the cause of most hospital readmissions, is respiratory infection that produces acute exacerbations (AECOPD). Bacteria, viruses, and atypical pathogens have been implicated as causes of AECOPD.35 Palmonary response to the infectious process includes increased respiratory rate, mucosal irritation, and increased mucus production. Because of these localized responses, patients may have bronchospasm and a change in their pattern of sputum production. If the infection remains untreated, the result is overall increased work of breathing with eventual respiratory failure. Patient teaching is an important component of infection prevention (see the Patient/Family Teaching box).

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Infection Control, Infection Protection

Nursing Diagnosis: Ineffective Coping (Individual and Family)

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Patient will:
- Identify own coping mechanisms, both effective and ineffective.
- Identify stressors, threats to role.

PATIENT/FAMILY TEACHING

The Patient With Chronic Obstructive Pulmonary Disease

To decrease the risk of respiratory infections, the nurse should teach the patient to:
- Avoid large crowds, especially during known influenza seasons.
- Avoid contact with people who have an upper respiratory tract infection.
- Obtain influenza and pneumonia immunizations.
- Contact the health care provider if the following common signs and symptoms occur: change in sputum color, amount, and consistency; more frequent or productive cough; elevated temperature; change in behavior (e.g., more argumentative than usual), which indicates an increase in PaCO₂; increased fatigue; increased dyspnea; weight gain; or peripheral edema.
- Use effective coping mechanisms (discussion with family, health care providers).
- Set realistic personal goals.
- Participate in ADEs and therapeutic regimens.
- State names and telephone numbers of appropriate community support services, such as home health provider, Visiting Nurse Association, home medical equipment supplier.

NURSING INTERVENTIONS. Persons who are short of breath are usually anxious and frightened. The nurse encourages the patient to talk about anxiety and fears with family members and health care professionals. The nurse should foster a realistic assessment of abilities and limitations, with a focus on those activities the patient is still able to do. Positive body responses should be stressed without negating the seriousness of the health issues involved. Vocational rehabilitation may be an option for some patients. Enrollments in pulmonary rehabilitation programs can also mitigate the sense of isolation and encourage ongoing involvement. The nurse encourages the patient to try new coping behaviors and gradually master them. Referral to professional counseling should be initiated if indicated.

Acute exacerbations in COPD are particularly stressful and affect quality of life. Patients may experience fear because of excessive breathlessness, which can trigger anxiety, depression, or panic. COPD patients are reported to perceive an acute exacerbation as a possible life threat. Nurses are in a unique position to determine needs for psychologic support that may enhance quality of life.37 They should provide patients phone numbers for support services such as the home health nurse, medical equipment supplier, etc., and encourage them to call when needed.

COPD also affects the well-being of the family and caregivers. Spouses of COPD patients are more likely to report depressive symptoms compared with spouses of individuals without COPD. Nurses and other health care providers should be aware of the strain that COPD places on caregivers’ mental health and consider methods of screening for depressive symptoms.28,57

RELATED NIC INTERVENTIONS. Coping Enhancement, Emotional Support, Support System Enhancement

EVALUATION

To evaluate the effectiveness of nursing interventions, compare patient behaviors with those stated in the expected patient outcomes.


GERONTOLOGIC CONSIDERATIONS

Many patients with COPD are older and may require additional time and support in learning how to take their medications, perform breathing exercises, and use oxygen properly. A multidisciplinary team, including social services, nutritional services, and physical therapy, may be necessary to assess the patient and assist...