

Perspectives

Recovery Strategies from the OR to Home

In This Issue

Chronic obstructive pulmonary disease (COPD) now affects 5% of the U.S. population nearly doubling in the past 20 years. It is the fourth leading cause of death in the USA. The primary risk factor for COPD is smoking, a shared risk factor for head and neck cancers. Surgery is indicated in stages I through IV for patients with or without COPD. Co-morbidities are an important consideration in surgical planning with this patient group. Dr. Bauldoff, an expert in the area of COPD, describes the perioperative and postoperative concerns with a COPD patient, which are numerous, including the combination of the underlying pathophysiological changes, anesthesia, and ventilatory requirements.

Ventilator-associated pneumonia (VAP) is a common complication of patients in intensive care units. Overall, pneumonia ranks second as the most frequent cause of nosocomial infections and the vast majority of which are associated with ventilator use. The incidence of VAP ranges from 6% to 52% of intubated patients and the risk of developing VAP increases each day that a patient is intubated and on ventilator. VAP is a preventable nosocomial infection. The medical literature, including the CDC's 2003 Guideline for Prevention of Healthcare-associated Pneumonia, describes many nursing interventions that can significantly reduce a patient's risk of developing VAP. Our authors describe the ventilator guidelines/protocol that has been developed at their facility to reduce the incidence of VAP.

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COPD in the Head-Neck Surgery Patient

by Gerene S. Bauldoff, RN, PhD, FCCP

Chronic obstructive pulmonary disease (COPD) afflicts about 15 million Americans. The incidence of COPD has doubled in the past 25 years, increasing by 41.5% since 1982.^{1,2} It is now the fourth leading cause of death in the USA. From 1966 to 1995, the death rate for COPD increased by 71%, compared to a 45% decline for coronary heart disease and 58% decline for stroke. COPD accounts for about 110,000 deaths per year, and 95,000 new patients are diagnosed annually. An average of 9.8 years of life are lost in patients with COPD.³ The economic burden of COPD exceeds \$20 billion per year.

Pathophysiology

COPD is characterized by chronic airflow obstruction and reduction in expiratory flow, which worsen as the disease progresses. The septa (walls) of alveoli (air sacs) are destroyed by the breakdown of elastin in the connective tissues of these structures. This destruction causes the loss of elastic recoil, leading to expiratory airway collapse, air trapping, and the hyperinflation of alveoli. As destructive changes progress, lung mechanics are altered due to the disease, increasing the work of breathing by 10 to 20 times that of a normal person.⁴

Etiology

The primary cause of COPD is cigarette smoking. Smoking attributes to 87% to 91% of COPD development. Smoking is also an important risk factor in the development of head and neck cancers. Other



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contributing factors to COPD include recurrent respiratory tract infections, ambient air pollution, heredity, and aging.⁵

Symptoms

Dyspnea is the primary symptom of COPD. It develops from the increase in ventilatory work. Patients fear the sensation of dyspnea, which leads them to avoid activity.⁶ As dyspnea progresses, they abandon activities, leading to a downward spiral of disability.⁷ The consequence is more dyspnea at lower levels of activity. Eventually, deconditioning is so severe that dyspnea occurs even at rest.

Anxiety, commonly associated with dyspnea, has been reported in up to 96% of COPD patients. It may compound the impact of dyspnea.^{8,9} Dyspnea is anxiety-provoking due to sensations of suffoca-

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Preventing Ventilator-associated Pneumonia

By Lisa Caffery, MS, RN, BC, CIC, and Denise Antle, MSN, ARNP, CCRN, CCNS

Ventilator-associated pneumonia (VAP) is a common complication of patients in intensive care units (ICUs). Overall, pneumonia ranks second as the most frequent cause of nosocomial infections, over 80% of which are associated with ventilator use.¹ The incidence of VAP ranges from 6% to 52% of intubated patients, depending on risk factors.⁴ The risk of developing VAP increases from 1% to 3% for each day that a patient is intubated and on ventilator.⁴

Nosocomial pneumonia is associated with higher death and injury rates. The crude death rates are estimated to be from 28% to 37% but may be higher in some patient populations, e.g., patients infected with *Pseudomonas* or *Acinetobacter* have a higher death rate.^{1,5} The cost of hospital-acquired pneumonia is about \$3000 to \$6000 per patient, and the additional length of stay for patients who develop VAP is estimated at 13 days.⁴

Definition

VAP is defined as an inflammation of the lung parenchyma caused by infectious agents not present or incubating when mechanical ventilation began.¹ It is divided into two stages: early-onset and late-onset VAP. Early-onset VAP occurs after 48 hours but less than 5 days of mechanical ventilation, while late-onset VAP occurs after 5 days of mechanical ventilation.¹

In early VAP, common organisms are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, and *Moraxella catarrhalis*.¹ In patients with risk factors, *Pseudomonas aeruginosa*, methicillin-resistant *Staphylococcus aureus*, *Enterobacter*, and *Acinetobacter* are common.¹

Diagnosis is based on the patient's signs, symptoms, and diagnostic test results. Chest x-ray may show a new or progressive infiltrate. Leukocytosis and a positive sputum gram stain may be used to diagnose VAP. Symptoms include fever, chest pain, cough crackles, altered mental status, purulent tracheobronchial secretions, fever greater than 100.4° F, worsening gas exchange, and hypoxemia.¹¹ Blood cultures may be obtained as part of the work-up for patients with VAP, but the bacterial growth may not be the same as that in the sputum.

Risk factors

While all hospitalized patients have some risk of developing nosocomial pneumonia, those who receive mechanical ventilation are at highest risk. The risk factors are:

- aspiration from oropharynx or gastrointestinal tract
- thoracoabdominal surgical procedures
- decreased level of consciousness
- chronic illness
- age >65 years of age
- endotracheal intubation
- ventilator circuit changes in less than 48 hours
- nasogastric tubes
- enteral tube feedings
- stress ulcer prophylaxis with antacids or H₂-blockers
- poor hand hygiene by staff and patient

Pathophysiology

VAP results from pulmonary aspiration of bacterial colonization in the oropharynx or gastrointestinal tract. The presence of an artificial airway impairs pulmonary defense mechanisms, providing a direct route for bacteria to enter the lungs, bypassing normal filtration in the upper airways and the natural barrier provided by the epiglottis.¹¹

In VAP, the cough reflex and mucociliary clearance are impaired, causing the stagnation or pooling of mucus. Irritation and inflammation disrupt the mucus membranes. The inflamed membranes and pooled secretions improve bacterial adherence and stimulate further colonization. Stabilizing the endotracheal tube with a manufactured device will help reduce movement and accidental extubation.

Current research

Ventilator-associated pneumonia is a preventable nosocomial infection. The medical literature describes many nursing interventions that can significantly reduce a patient's risk of developing VAP.

The 2003 Centers for Disease Control and Prevention (CDC) Guideline for Prevention of Healthcare-associated Pneumonia recommends the implementation of several interventions to prevent nosocomial pneumonia in patients on

mechanical ventilation. This guideline is available from the CDC Web site at www.cdc.gov.

Many of these interventions are easy to adopt. In most cases, they do not add to the cost of patient care. Most are standard nursing-care practice and do not require a physician's order for implementation. Simple interventions, such as elevating the head of the bed and frequent oral care, can significantly reduce a patient's risk of VAP.

The development of a ventilator care guideline or protocol may be useful in providing a consistent plan of care for all patients on a mechanical ventilator. Our hospital has developed a nursing guideline that is used in our ICUs and Pulmonary Unit. This Ventilator Care Guideline, which is based on the CDC guideline and current research, was developed by a team of representatives from Infection Control, ICU staff, Critical Care CNS, and Critical Care Educator and Respiratory Therapy.

The development of a ventilator guideline provides a great opportunity to implement a performance-improvement project in the ICU setting. Before our guideline was adopted, the ICU Clinical Nurse Specialist developed a computer-based education module. All nursing staff caring for patients on ventilators were required to review the module and take a post-test.

Recently, the Infection Control Team has started to monitor head-of-the-bed elevation at daily ICU rounds. The ICU staff is monitoring oral care and other interventions in the guideline. The data collected by Infection Control is reported to ICU managers, who in turn share it with staff. When improvements are needed, action plans are developed by ICU staff and reported to Infection Control.

Interventions to prevent VAP

Reducing the risk of ventilator-associated pneumonia (VAP) is a priority in the care of patients on mechanical ventilation. Interventions proposed in the literature are supported by varying degrees of evidence. They vary in complexity from hand hygiene to the use of specialized endotracheal tubes.

Hand hygiene

Hand hygiene is the single most important intervention in the hospital setting to prevent the spread of disease. It is performed immediately after gloves are removed and between all patient contacts.

Hand hygiene may be accomplished by using an antimicrobial soap with water and hand-washing for a minimum of 20

seconds or by using an alcohol rub. Both methods provide adequate cleansing in the health-care setting.

Semi-recumbent positioning

Colonization of the oropharynx/stomach and aspiration of bacteria are two major risk factors for VAP. In patients on mechanical ventilation, elevating the head of the bed by 30 to 45 degrees markedly reduces gastroesophageal reflux and aspiration. There is strong evidence to support this practice in all patients on mechanical ventilation, unless there are known contraindications, e.g., unstable cervical fracture or large bore femoral catheters.^{2,3}

Sedation care

Inconsistent sedation practices and oversedation of patients prolongs mechanical ventilation.⁷ Protocols and guidelines should be implemented to help nursing staff to give patients an adequate level of sedation without oversedation. Current evidence indicates that patients spend fewer days on a ventilator when aroused every 24 hours. On arousal, a neurological assessment is completed. Sedation is then resumed at the lowest possible dose to attain the desired outcome.

Neuromuscular blocking agents

In the ICU, neuromuscular blocking agents (NMBAs) are used in severe respiratory failure or ventilator asynchrony. Patients are sedated then paralyzed in order to provide adequate oxygenation. NMBAs should be titrated to meet an established clinical outcome, using both clinical assessment and train-of-four testing (peripheral nerve stimulator).⁸ The goal is to achieve the established outcome with the least amount of NMBA for the least amount of time. NMBAs may cause prolonged paralysis and weakness as well as adverse effects on other body organs. The use of NMBAs may prolong mechanical ventilation.

Oral care program

A primary source of VAP-causing pathogens is the oral cavity. Bacterial colonization of the oropharynx along with aspiration is one of the most important risk factors for VAP. Dental plaque also harbors and provides a medium for bacterial growth.⁵ In a healthy person, normal flora is stable and predominantly gram positive (*Streptococcus salivarius*). Within 48 hours of hospital admission, the oral flora of critically ill patients changes to predominantly gram-negative organisms. They are more virulent and include pathogens that may cause VAP.



Oral Care Management (courtesy of Sage Products Inc.)

The endotracheal tube provides a direct route from the oropharynx to the lungs. The presence of this tube interferes with swallowing, causing secretions to pool and micro-aspiration of bacteria to occur.

Based on this pathophysiology, an oral hygiene program may reduce the incidence of VAP; however, evidence linking oral hygiene programs to a reduction in VAP is insufficient to date. Evidence-based protocols delineating the frequency and methods for performing oral hygiene in the ICU setting are unavailable. Only small studies advocate toothbrushing to remove plaque a minimum of once or twice daily as well as suctioning and swabbing the oral cavity with weak hydrogen peroxide solutions or a chlorhexidine rinse every 2 to 4 hours.

To date, the CDC recommends that hospitals implement some type of oral hygiene program for all mechanically ventilated patients until evidence-based protocols are established in the literature.

Continuous subglottic suctioning

Endotracheal tubes with subglottic suctioning help to prevent the aspiration of oral secretions that are colonized with VAP-associated bacteria. Studies have shown that these tubes can reduce the occurrence of VAP by 50%.^{4,9} They provide either continuous or intermittent subglottic suction to remove secretions. Based on current evidence, the CDC has placed the use of endotracheal tubes with subglottic suctioning as a category II (supported by suggested studies or theoretical rationale) recommendation for implementation.⁶ These tubes are cumbersome and costly, but if the literature continues to show better outcomes, savings in VAP prevention should offset their expense.

Lateral rotation therapy/continuous oscillation

The use of continuous oscillating beds remains controversial. Further studies are needed to determine their usefulness.⁴ In most randomized trials, continuous oscillation was started within 24 hours of intubation and the usual rotation was 40 to 60 degrees. Based on existing evidence, continuous oscillation to prevent VAP cannot be recommended.

Ventilator circuits and suctioning

Ventilator circuits and in-line suction catheters should only be changed when visibly soiled. Endotracheal suction catheters should be flushed with sterile saline after each suctioning. Oral suction catheters should be flushed after each use.

Suctioning may be performed with either an in-line suction catheter or a disposable single-use suction catheter. Suctioning should be done only when necessary and without the use of normal saline (tracheal bronchial toiletry). The use of normal saline does not ease the removal of secretions and may dislodge bacteria into the lower airways.¹³ Oral suctioning should be done after endotracheal suctioning and prn to prevent secretions from pooling in the oropharynx. Ventilator tubing should be kept free of moisture. Gloves should be worn whenever respiratory secretions or objects that may be contaminated by respiratory secretions are handled.

Stress ulcer prophylaxis

One major risk factor for critically ill patients is gastrointestinal (GI) bleeding. It is known to increase both death and injury in ICU patients. The use of an agent to reduce gastric ulcer formation is strongly recommended; however, these agents work by reducing gastric acidity and bacteria are more likely to grow in an alkaline environment. As gastric pH increases, the potential for gastric colonization by bacteria known to cause VAP also increases.

Sucralfate (Carafate) has been advocated as first-line therapy for gastric ulcer prophylaxis, because it does not change stomach pH. Several studies have reported that the incidence of VAP decreases when sucralfate is used for gastric ulcer prophylaxis.

According to a recent study, sucralfate may be inferior to H₂-antagonists in the prevention of GI bleeding.⁴ The use of H₂-antagonists in ICU patients at moderate to high risk for GI bleeding may be indicated.



NG Tube Holder (Dale Medical Products)

Oral vs. nasal intubation

Nasal intubation increases the risk of sinusitis. The sinuses drain into the oropharynx. As swallowing is impaired by the presence of an artificial airway, there is more risk for aspiration of infected material and a higher risk of VAP. Nasal intubation should be avoided, whenever possible.

Nasogastric/enteric tubes

Patients on mechanical ventilation often have gastric tubes, which are placed through the nose or mouth to provide gastric suction or feeding. The potential for gastrointestinal reflux increases when a gastric tube interrupts the integrity of the cardiac sphincter.

The gastric tube may provide a route for bacteria to travel from stomach to oropharynx. Patients receiving enteric feedings should have gastric tube placement routinely verified. If possible, the patient's tolerance to feedings should be verified by aspiration of gastric contents. Elevation of the head of the bed is essential.

Enteric feeding is the preferred method of nutrition delivery. With the use of tube feedings, gastric volume increases, as does the potential for gastroesophageal reflux. The use of agents like metoclopramide may assist gastric motility. Standard nursing practice should include periodic checking of gastric residuals and enteric tube placement, according to institutional policy. An NG tube holder designed to stay in place over an extended period of time, can minimize the risk of tube movement, disconnection, and skin irritation.

Noninvasive ventilation

If possible, noninvasive, positive pressure ventilation (NIPV) should be used. NIPV, which is delivered by a face or nose mask, eliminates the need for an invasive endotracheal tube.

Conclusion

Although extensive evidence supports the many interventions described here, it is often difficult to convince staff to implement them. We have found that ongoing education, concurrent monitoring, and data reporting help to improve compliance with mechanical ventilator protocols.

References

1. Wenzle R. Prevention and Control of Nosocomial Infections. Fourth Edition. Baltimore; Lippincott William and Wilkens, 2003, pp 312-330.
2. Drakulovic M et al. Supine body position as a risk factor for nosocomial pneumonia in mechanically ventilated patients: a randomized trial. *Lancet* 1999,354:1851-1858.
3. Cook D et al. Toward understanding evidence uptake: semi-recumbency for pneumonia prevention. *Critical Care Medicine* 2002;30:1472-1477.
4. Collard H, Saint S, Matthay M. Prevention of ventilator-associated pneumonia: an evidence-based systematic review. *Ann Intern Med* 2003,138(6):494-501.
5. Munro CL, Grap M J. Oral health and care in the intensive care unit: state of the science. *Am J Crit Care* 2004,13(1):25-34.
6. Centers for Disease Control and Prevention. Guideline for Preventing Health-Care-Associated Pneumonia, 2003. At: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm>
7. Heffner JE. A wake-up call in the intensive care unit. *New Engl J Med* 2000,342(20):1520-1522.
8. Arbour R. Monitoring neuromuscular blockade. *AACN News* 2001,18(11):14-17.
9. American Association of Critical Care Nurses. Practice Alert: Ventilator Associated Pneumonia. 2004. At: www.aacn.org
10. Hixson S, Sole M, King T. Nursing strategies to prevent ventilator-associated pneumonia. *AACN Clinical Issues. Advanced Practice in Acute and Critical Care* 1998,9(1).
11. Dent MR. Hospital-acquired pneumonia: the "gift" that keeps on taking. *Nursing* 2004,34(2):48-51.
12. Hagler DA, Traver GA. Endotracheal saline suction catheters: sources of lower airway contamination. *Am J Crit Care* 1995,3(6):444-447.

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COPD in the Head-Neck Surgery Patient – Continued

tion and other physiological factors that generate fear.¹⁰ Often, patients with COPD develop anxiety when they believe an episode of dyspnea is beyond their control.

Activity intolerance is also reported by people with COPD. About 40% report limiting daily activities, such as walking, due to dyspnea.

Medical management

Several interventions are indicated in the medical management of COPD (Table 1). Smoking cessation is very important to reduce continued exposure to damaging effects of tobacco smoke. Pharmacologic therapy includes use of bronchodilators, such as beta-agonists and anticholinergics, for symptomatic relief, and corticosteroid therapy, which is controversial and indicated only in the presence of inflammation.⁴

Oxygen therapy is an important therapeutic option for hypoxemic patients. It can improve survival in COPD patients when used continuously (>19 hours/day).¹¹

Pulmonary rehabilitation teaches patients how to manage their symptoms and attain their maximum level of functioning. The American Thoracic Society defines pulmonary rehabilitation as “a multidisciplinary program of care for patients with chronic respiratory impairment that is individually tailored and designed to optimize physical and social performance and autonomy”.¹² The scientific basis for pulmonary rehabilitation has been well-established in many randomized, controlled, clinical trials.¹³ Specific components of pulmonary rehabilitation typically include^{13,14}:

- education
- chest physiotherapy, including bronchial hygiene
- breathing training techniques, including pursed-lips breathing
- nutritional counseling
- oxygen
- psychosocial support
- relaxation training
- energy conservation techniques
- exercise

Table 1: Medical management of COPD

- Smoking cessation
- Drug therapy
 - Bronchodilators
 - beta₂-agonists
 - anticholinergics
 - Corticosteroids
- Oxygen therapy
- Pulmonary rehabilitation

Specific guidelines regarding the intensity, exercise grade, session duration and frequency, and program duration have been established by a number of organizations, most specifically the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR).¹⁴

Head and neck cancers

Head and neck cancers include cancers of the oral cavity, pharynx, and larynx. The U.S. incidence of head and neck cancers is 40,000 to 60,000 cases per year. They account for 13,000 deaths per year. The primary risk factor is smoking, a shared risk factor with COPD.¹⁵ Surgery is indicated in stages I through IV. Co-morbidities are an important consideration in surgical planning.

Preoperative assessment

For any patient who has surgery, a routine preoperative assessment is essential. Determination of co-morbidities is an important factor in establishing anesthesia-related surgical risks and postoperative complications (Table 2).¹⁶ Additional testing and evaluation is indicated in people with COPD (Table 3). Expected changes in pulmonary function tests in COPD include:¹⁷⁻¹⁹

- drop in the forced expiratory volume in the first second (FEV₁)
- drop in FEV₁/forced vital capacity (FVC) ratio
- rise in total lung capacity (TLC) and residual volume (RV)
- rise in partial pressure of carbon dioxide (PaCO₂)

Preoperative tuning in COPD

Optimizing the COPD patient's health before head and neck surgery is the primary goal of preoperative tuning. Interventions include:^{4,17,18}

- maximal medical therapy
- IV aminophylline
- nebulized beta₂-agonists
- nebulized or IV steroids
- nebulized anticholinergics (ipratropium bromide)

Table 2: Preoperative assessment

- History and physical exam
- Primary site with measurement of tumor dimensions
- Preoperative laboratory screen
 - CBC/Diff; urinalysis; HIV, if indicated
- Diagnostic radiology
 - Chest PA/lateral
 - Spiral computed tomography (CT) of head/neck
 - Magnetic resonance imaging (MRI) to assess soft tissue

Impact of COPD on anesthesia

The American Association of Anesthesiologists Operative Risk scale classifies COPD in classes II to III, depending on the patient's functional limitations. In people with an FEV₁ less than 50% of predicted, 29% develop postoperative pulmonary complications.¹⁸ McCullough et al have identified smoking as the primary predictor of postoperative pulmonary complications that developed in 15% of head and neck surgery patients.²⁰

Concerns about anesthesia

The use of anesthesia may precipitate pulmonary dysfunction because of the marked abnormalities of lung compliance in COPD patients. Unfortunately, it is not uncommon for COPD patients to develop diffuse wheezing on auscultation after general anesthesia is induced, leading to high inspiratory pressures during mechanical ventilation. COPD patients can have impaired uptake of inhaled anesthesia due to pre-existing pathophysiological changes. Some inhaled anesthetics, e.g., isoflurane, halothane, and enflurane, reduce ciliary motility of the respiratory epithelium. For this reason, intravenous general anesthesia is favored.²¹

The use of neuromuscular relaxation can result in postoperative muscle weakness. This may lead to reduced vital capacity, resulting in prolonged intubation. Clinically, patients exhibit rocking movements of respiration that are characteristic of residual neuromuscular blockade.²¹

Intraoperative concerns

A very narrow margin of error exists for the development of perioperative hemodynamic instability in elderly and COPD patients. Careful monitoring is required with arterial and pulmonary arterial monitors and measurement of end-tidal carbon dioxide concentrations. Hypothermia can contribute to hemodynamic instability. Shivering, a common response to hypothermia, is associated with a marked increase in oxygen consumption. Catecholamine release occurs in people who are cooled to 30° C, contributing to arrhythmias. Adding to potential problems is the COPD patient with polycythemia, who has a higher risk of complications related to greater blood viscosity.²²

Postoperative concerns

Postoperative concerns are numerous in the COPD patient (Table 4). The combination of the underlying pathophysiological changes, anesthesia, and ventilatory requirements can lead to complications.²³

Table 3: COPD preoperative assessment

Pulmonary function testing

- Spirometry
 - Forced vital capacity (FVC)
 - Forced expiratory volume in the first second (FEV₁)
 - Ratio of FVC/FEV₁
- Lung volumes
 - Total lung capacity (TLC)
 - Residual volume (RV)
- Arterial blood gas

Ventilatory management

The ventilatory management of the COPD patient indicates specific interventions. According to Peigang and Marini²⁵, it is crucial to include controlled hypoventilation to maintain dynamic hyperinflation below a critical level. Controlled hypoventilation-or permissive hypercapnia is aimed at preventing complications by supplying adequate oxygen while accepting or provoking a certain degree of hypercapnia by alveolar hypoventilation. The technique is based on restricting tidal volume and respiratory rate as long as is necessary to recover more favorable mechanical conditions.³¹ Additional ventilatory interventions include longer expiratory time, titrated extrinsic lower tidal volumes and controlled sedation which help maintain synchrony of ventilator triggering, power, breath timing and positive end-expiratory pressure (to avoid dynamic hyperinflation [auto PEEP]). The development of auto PEEP increases hemodynamic compromise, work of breathing, difficulty triggering the ventilator, and dynamic hyperinflation.^{25, 32}

Airway management

Specific interventions reduce potential COPD-related complications. The COPD patient is at risk for developing excess cough and mucous production, especially if chronic bronchitis is present. The use of humidified, warmed air and maintenance of adequate hydration to reduce thickness of secretions are indicated to reduce excess secretion drying with

Table 4: Postoperative concerns

- Pulmonary dysfunction
- Respiratory depression
- Bronchospasm
- Airway edema
- Atelectasis
- Impaired ciliary motility
- Mucous plugging
- Neuromuscular weakness



Fig.1. Tracheostomy Holder (Dale Medical Products)

mechanical ventilation. Due to underlying disease, hypoxia due to suctioning should be avoided. Suction only as needed, and hyperoxygenate the patient before suctioning.^{25,26}

The use of tracheostomy is common in head-neck cancer surgery. The stabilization of the trachea is important for safety and comfort (Fig. 1). Permanent tracheostomy, laryngectomy, or changes in the mouth cause a need for alternatives for metered dose inhalers or nebulized medications.

The use of coughing and deep breathing and positioning is important in COPD patients. When short of breath, these patients may find that the use of tripod positioning to maximize respiratory excursion can reduce dyspnea. Commercially available abdominal binders may be applied to help patients to, breath more deeply and to turn, cough and ambulate more comfortably (Fig.2).

Oxygenation

The continued evaluation of oxygen need is important in postoperative management. Oxygen levels should be titrated to the lowest effective dose to maintain adequate systemic oxygenation. Hypercapnia (elevated CO₂) can occur but must be carefully monitored to avoid the development of pulmonary hypertension.²³

Infection

The possibility of postoperative infection is a concern in COPD patients. Early mobilization and incentive spirometry can reduce perioperative pulmonary infections. Head and neck procedures may indicate the use of antibiotics, such as clindamycin, which has activity against oral anaerobic and aerobic organisms.²⁰

Nosocomial pneumonia

Pneumonia is the second most common nosocomial infection and the leading cause of death from nosocomial infection. The most common pathogenic organisms

are the gram-negative bacilli *Pseudomonas* (17% incidence) and *S. aureus* (13% incidence). Successful treatment is related to the antibiotic's ability to penetrate the respiratory tract. Use of tracheostomy tube holders and additional anti-disconnect devices help to reduce the risk of decanulation and/or disconnection, which can lead to infection.²⁰

Pain management in head-neck surgery

Pain management is an important consideration in postoperative patients, as higher pain scores correlate with higher fatigue scores, slowing postoperative recovery.³⁰ Postoperative pain in the head-neck surgical patient is reported most often in the jaw, mouth, neck, and shoulder with rates of 40% to 80%.²⁷ The World Health Organization recommends a three-step analgesic ladder of nonsteroidal anti-inflammatory drugs, weak opioids (e.g., codeine), and strong opioids (e.g. morphine, fentanyl).²⁸

Postoperative neuropathic pain is common. It is caused by loss of sensory nerve branches during lymph node dissection. Treatment focuses on the addition of drugs that reverse abnormal peripheral nerve processing, i.e., tricyclic antidepressants and anticonvulsants.²⁸

Inadequate pain control has negative consequences, influencing postoperative recovery. Nutrition, activity, and sleep are negatively affected (Table 5).

Pain pharmacology and COPD

The use of pain medications can impact COPD. Codeine may reduce cough and opioids may reduce sensations of dyspnea. Careful titration of pain medications is needed to reduce the potential for respiratory depression.²¹



Fig.2 Abdominal Binder (Dale Medical Products)

Table 5: Consequences of inadequate pain control

- Anxiety
- Sleep deprivation
- Limited mobility
- Stasis of pulmonary secretions
- Reduction in airway clearance techniques
- Reduction in eating behaviors
- Chewing problems
- Swallowing problems

Nutritional concerns

Nutrition plays an important role in the recovery of head-neck surgery patients with COPD. Unfortunately, weight loss and cachexia in both head-neck cancer and COPD patients indicates a poor prognosis. Patients with a history of tobacco and/or alcohol abuse may have poor dietary habits. Patients with COPD often have a faster metabolism due to increased work of breathing. Complicating the clinical picture is that COPD patients often report early satiation and bloating due to the downward pressure of a depressed diaphragm, reducing food intake. A higher intake of carbohydrates increases CO₂ production, increasing dyspnea.

In light of these problems, small, frequent, high-protein, high-fat meals are indicated for COPD patients. Early postoperative nutritional assessment and intervention are needed. If tube feedings are indicated, a pulmonary-specific formula needs to be considered for patients with COPD. The use of enteral nutrition may be indicated to provide adequate nutritional support after surgery.²⁹ To minimize possible complications associated with the repeated application and removal of traditional tape, a commercially available latex-free, adhesive-backed NG tube holder can be applied for an extended period of time.

Long-term needs

The rehabilitation of the head-neck surgery patient crosses therapeutic boundaries. Swallowing rehabilitation and speech therapy are generally needed and are specific to head-neck cancer surgery. COPD does not impact the need for or the interventions used in these rehabilitative therapies.

Pulmonary rehabilitation may be indicated to regain functional performance. Exercise is an important component of pulmonary rehabilitation. Upper extremity exercise training is indicated in both COPD and head-neck surgery patients to improve functional performance of the upper body for activities of daily living. Lower extremity exercise training is indicated to promote overall activity endurance and increased mobility.¹²⁻¹⁴

Take-home pearls

- COPD and head-neck cancer share tobacco abuse as the primary risk factor in their development
- Preoperative evaluation for lung disease is imperative to determine surgical risk and plan for postoperative management.
- COPD symptoms can be managed in head-neck cancer patients.

References

1. Centers for Disease Control. National Vital Statistics Report 2002;50(16):15-19.
2. Centers for Disease Control. Chronic obstructive pulmonary disease surveillance, United States, 1971-2000. Morbidity and Mortality Weekly Report (MMWR) 2002;51(SS-6):1-16.
3. Global Obstructive Lung Disease Initiative. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. 2000.
4. American Thoracic Society. American Thoracic Society Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease. American Journal of Respiratory and Critical Care Medicine 1995;152(5):S78-121.
5. Burrows B. Course and prognosis in advanced disease. In: Petty, TL, ed. Chronic Obstructive Pulmonary Disease. 2nd ed. New York: Marcel Dekker, Inc., 1985.
6. Fishman AP. Pulmonary Rehabilitation Research, NIH Workshop Summary. American Journal of Respiratory and Critical Care Medicine 1994;149: 825-833.
7. Gift AG. Dyspnea. Nursing Clinics of North America 1990;25(4):955-965.
8. Carrieri-Kohlman V, Gormley JM, Douglas MK, Paul SM, Stuhlberg M. Exercise training decreases dyspnea and the distress and anxiety associated with it. Monitoring alone may be as effective as coaching. Chest 1996;110(6):1526-1535.
9. Gift AG, Moore T, Soeken K. Relaxation to reduce dyspnea and anxiety in COPD patients. Nursing Research 1992;41(4):242-246.
10. Kaplan RM, Eakin EG, Ries AL. Psychosocial issues in the rehabilitation of patients with chronic obstructive pulmonary disease. In: Casaburi R, Petty TL, eds. Principles and Practice of Pulmonary Rehabilitation. Philadelphia: W.B. Saunders Company, 1993.
11. Nocturnal Oxygen Therapy Group. Continuous or nocturnal oxygen therapy in hypoxemic chronic obstructive lung disease: a clinical trial. Ann Intern Med 1980;93:391-398.
12. American Thoracic Society Pulmonary Rehabilitation Panel. Pulmonary Rehabilitation 1999. American Journal of Respiratory and Critical Care Medicine 1999;159:1666-1682.
13. ACCP/AACVPR Pulmonary Rehabilitation Guidelines Panel. Pulmonary Rehabilitation: Joint ACCP/AACVPR Evidence-Based Guidelines. Chest 1999;112(5):1363-1396.
14. American Association of Cardiovascular and Pulmonary Rehabilitation Association. Guidelines for Pulmonary Rehabilitation Programs. 2nd ed. Champaign, IL: Human Kinetics, 1998.
15. American Cancer Society. Cancer Facts and Figures 2002.
16. Lefor AT. Perioperative management of the patient with cancer. Chest 1999;115(5):165S-171S.
17. Ferguson MK. Preoperative assessment of pulmonary risk. Chest 1999;115(5):58S-63S.
18. Kroenke K, Lawrence VA, Theroux JF, Tuley MR. Operative risk in patients with severe obstructive pulmonary disease. Arch Intern Med 1992;152(5):967-971.
19. McAlister FA, Kahn NA, Straus SE, Papaioakim M, Fisher BW, Majumdar SR, Gajic O, Daniel M, Tomlinson G. Accuracy of the preoperative assessment in predicting pulmonary risk after non-thoracic surgery. Am J Respir Crit Care Med 2003;167:741-744.

20. McCulloch TM, Jensen NF, Girod DA, Tsue TT, Weymuller EA, Jr. Risk factors for pulmonary complications in the postoperative head and neck surgery patient. Head and Neck 1997;19(5):372-377.
21. Hanowell LH, Junod FL. Pulmonary Care of the Surgical Patient. Mt. Kisco, NY: Futura, 1994
22. Lefor AT. Perioperative management of the patient with cancer. Chest 1999;115(5):165S-171S.
23. Skolnick J. The operation summary. Chest 1999;115(5):47S.
24. Thelan LA, Davie JK, Urden LD. Textbook of Critical Care Nursing: Diagnosis and Management. St. Louis: Mosby, 1990.
25. Peigang Y, Marini JJ. Ventilation of patients with asthma and chronic obstructive pulmonary disease. Current Opinion in Critical Care 2002;8(1):70-76.
26. Price JA, Rizk NW. Postoperative ventilatory management. Chest 1999;115(5):130S-137S.
27. Keefe FJ, Manuel G, Brantley A, Crisson, J. Pain in the head and neck cancer patient: changes over treatment. Head and Neck Surgery 1986;8(3):169-176.
28. Feber T. Head and Neck Oncology Nursing. London: Whurr, 2000.
29. Harrison LB, Sessions RB, Hong WK. Head and Neck Cancer: A Multidisciplinary Approach. Philadelphia: Lippincott-Raven, 1999.
30. Watt-Watson J, Graydon J. Impact of surgery on head and neck cancer patients and their caregivers. Nursing Clinics of North America 1995;30(4):659-671.
31. Perret, C. & Feihl, F. (1996). Permissive hypercapnia from choice to unavoidable decision. La Presse Medicale, 25 (31), 1415-1416.
32. Tuxen, D.V. (1994). Permissive hypercapnia. In M. J. Tobin (Ed.), Principles and Practice of Mechanical Ventilation (pp. 371-392). New York: McGraw-Hill.

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This program has been approved for 1.5 contact hours of continuing education (CRCE) by the American Association for Respiratory Care (AARC). AARC is accredited as an approver of continuing education in respiratory care.

After reading this article, the learner should be able to:

1. Describe the pathophysiology of ventilator-associated pneumonia (VAP) and causative agents.
2. Discuss current VAP research, evidence, and theory.
3. Discuss medical and nursing interventions that are used to prevent VAP.
4. Apply principles of nursing care as well as theoretical and scientific knowledge from related disciplines in the provision of care related to COPD in head and neck cancer patients undergoing surgery.
5. Identify interventions that positively influence health status, promote safety, and manage symptoms related to COPD in head and neck cancer patients undergoing surgery.
6. Assess health risks for COPD in head and neck cancer patients.

To receive continuing education credit, simply do the following:

1. Read the educational offering (both articles).
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6. Your results will be sent within four weeks after the form is received.
7. The administrative fee has been waived through an educational grant from Dale Medical Products, Inc.
8. Answer forms must be postmarked by Dec. 31, 2007.

- Ventilator-associated pneumonia (VAP) is thought to be caused or influenced by all of the following, except:**
 - bacterial colonization of the oropharynx
 - aspiration of secretions
 - use of an in-line suction catheter
 - nasal intubation
- Nursing interventions used to prevent VAP include all of the following, except:**
 - elevating the head of the bed by 30 to 45 degrees
 - frequent oral hygiene
 - changing ventilator circuits routinely every 24 to 48 hr
 - Monitoring tube feeding residuals to prevent gastric distention
- Risk factors associated with VAP include:**
 - presence of an artificial airway, age over 65, abdominal or thoracic surgery
 - noninvasive ventilation, oxygen use
 - high levels of PEEP
 - use of pressure ventilation
- Mechanically ventilated patients should be suctioned:**
 - routinely every 2 hours with saline instillation prior to suctioning
 - only when necessary with saline instillation prior to suctioning
 - routinely every 2 hours without saline instillation
 - only when necessary and saline lavage should not be used.
- Oral suctioning should be completed each time endotracheal suctioning is done.**
 - T
 - F

- Agents that reduce gastric acid production may accelerate gastric bacterial colonization by:**
 - increasing gastric pH, which may promote bacterial growth
 - decreasing gastric pH, which may promote bacterial growth
 - altering gastric pH, which has no effect on bacterial growth
- Oral hygiene should include frequent suctioning and swabbing of the oral cavity with a soft swab.**
 - T
 - F
- Early-onset VAP occurs after 48 hours but in less than 5 days of mechanical ventilation with pathogenic bacteria, such as *Streptococcus pneumoniae* and *Staphylococcus aureus*.**
 - T
 - F
- The primary symptom of COPD is:**
 - fatigue
 - anxiety
 - dyspnea
 - reduced activity tolerance
- The risk factor that contributes to both COPD and head-neck cancer is:**
 - alcohol abuse
 - cigarette smoking
 - age > 60 years
 - body mass index < 20
- Preoperative assessment for a patient with head-neck cancer to also assess for COPD would include:**
 - cardiac catheterization
 - bone scan to assess for metastasis
 - upper GI series
 - pulmonary function testing

- Intraoperative management in the head-neck surgical patient who has COPD would include:**
 - careful monitoring of arterial and pulmonary arterial pressures as well as end-tidal carbon dioxide concentrations.
 - management of hyperthermia in the OR
 - assessment of hypoxemia related to anemia (low red cell count).
 - favored use of inhaled versus IV-administered anesthesia.
- The most common intervention in airway management in the head-neck surgical patient is:**
 - scheduled suctioning
 - avoidance of coughing/deep breathing
 - utilization of tracheostomy
 - maintenance of negative fluid balance to avoid pulmonary edema.
- Pain management in the head-neck surgical patient with COPD should include which of the following principles?**
 - avoidance of all narcotics
 - factors related to pain control have no impact on postoperative recovery
 - use of opioids may reduce the sensation of dyspnea as well as relieve pain
 - respiratory depression is of no concern in this patient
- Nutrition is an important component of recovery in the head-neck surgery patient. COPD may impact nutrition in this patient by:**
 - leading to obesity, resulting in longer mechanical ventilation dependence
 - the inability to feel "full" with meals, leading to overeating
 - leading to low weight due to increased metabolism related to work of breathing in combination with lack of tolerance for large meals
 - none of the above are true

Participant's Evaluation		Mark your answers with an X in the box next to the correct answer																																																																																																																																																																																													
<p>What is the highest degree you have earned (circle one) ?</p> <p>1. Diploma 2. Associate 3. Bachelor's 4. Master's 5. Doctorate</p> <p>Indicate to what degree you met the objectives for this program: Using 1 = Strongly disagree to 6 = strongly agree rating scale, please circle the number that best reflects the extent of your agreement to each statement.</p> <table border="0"> <tr> <td></td> <td style="text-align: center;">Strongly Disagree</td> <td></td> <td style="text-align: center;">Strongly Agree</td> </tr> <tr> <td>1. Describe the pathophysiology of ventilator-associated pneumonia (VAP) and causative agents.</td> <td style="text-align: center;">1 2 3 4 5 6</td> <td></td> <td></td> </tr> <tr> <td>2. Discuss current VAP research, evidence, and theory.</td> <td style="text-align: center;">1 2 3 4 5 6</td> <td></td> <td></td> </tr> <tr> <td>3. 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