

Strength of Evidence Level: 3**PURPOSE:**

Implement and educate patient/caregiver on precautions that prevent aspiration.

CONSIDERATIONS:

1. Precautions should be taken with all patients who are unable to protect their airway to prevent the involuntary inhalation of foreign substances, such as gastric contents, oropharyngeal secretions, food or fluids, into the tracheobronchial passages.
2. Patients at particular risk for aspiration include those whose normal protective mechanisms are impaired.
3. Major risk factors include:
 - a. Decreased level of consciousness (confusion, coma, sedation).
 - b. Documented previous episode of aspiration.
 - c. Neuromuscular disease and structural abnormalities of the aerodigestive tract.
 - d. Depressed protective reflexes (cough or gag).
 - e. Presence of an endotracheal tube.
 - f. Persistently high gastric residual volumes.
 - g. Vomiting.
 - h. Need for prolonged supine position.
 - i. Diagnosis of dysphagia.
4. Additional risk factors:
 - a. Poor oral care.
 - b. Malpositioned feeding tube.
 - c. Presence of a large-bore naso-enteric tube.
 - d. Non-continuous or intermittent tube feeding.
 - e. Delayed gastric emptying.
 - f. Oral surgery or trauma.
 - g. Abdominal/thoracic surgery or trauma.
 - h. Transport.
5. Potential outcomes from aspiration include: airway obstruction and asphyxiation, chemical pneumonia, bacterial pneumonia and/or death.

EQUIPMENT:

None

PROCEDURE:

1. Keep head of bed (HOB) elevated 30-45 degrees at all times unless medically contraindicated. If HOB cannot be raised, position patient in reverse Trendelenberg at 30-45 degrees unless medically contraindicated.
2. Perform mouth care every 4 hours and as needed. Avoid triggering the gag reflex when performing care activities, especially mouth care.
3. Monitor respiratory status and level of consciousness as follows when taking vital signs:
 - a. Auscultate breath sounds. Vesicular (normal) breath sounds should be heard over the distal lung field.
 - b. Observe respiratory efforts.
 - c. Determine ability to effectively manage secretions.

4. Consult speech therapist for patients with dysphagia, as needed, and as ordered by healthcare provider.
5. Consult dietitian for diet evaluation, as needed (requires physician's order).
6. If patient receiving enteral feedings, *See Digestive - Gastrostomy or Jejunostomy Tube Feeding.*
7. Monitor patient when eating/drinking:
 - a. Instruct family or caregiver to do the same.
 - b. Observe adequacy of swallowing.
 - c. SN: order ST eval for tube fed patients for swallow eval as appropriate.
8. Maintain calm environment when the patient is eating or drinking.
9. If patient is unable to manage own oral secretions, nasopharyngeal suctioning may be indicated, consult with healthcare provider and refer to nasopharyngeal suctioning policy as needed.
10. Keep wire cutters at HOB of patient with wired jaws and instruct patient and caregiver in use.
11. Notify healthcare provider immediately for any signs or symptoms of aspiration such as tachypnea, cough, crackles, cyanosis, wheezing, fever or apnea as these will usually develop within two hours of the aspiration.

AFTER CARE:

1. Document in patient's record:
 - a. Maintenance of aspiration precautions.
 - b. Respiratory rate, effort and quality.
 - c. Patient's response to eating/drinking and adequacy of swallowing.
 - d. Instructions to patient/caregivers or family.

REFERENCES

Goodwin, R.S. (2009). *Prevention of aspiration pneumonia: a research-based protocol*. Retrieved March 4, 2009, from <http://www.pspinformation.com/disease/aspiration/pneu.shtml>

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Strength of Evidence Level: 3**PURPOSE:**

To prevent and minimize bacterial growth in respiratory therapy equipment.

CONSIDERATIONS:

1. If not cleaned properly, respiratory therapy equipment provides an excellent reservoir for growth of pathogenic organisms that can be introduced to the patient via the airway.
2. If the patient experiences an upper respiratory infection, nasal prongs and face masks should be changed once symptoms are controlled.
3. Scrupulous attention should be given to all parts of the equipment (i.e., exterior, tubing, reservoirs, etc.).
4. Equipment should be rinsed in warm running water after each treatment and disinfected daily.
5. Two complete sets of washable equipment should be on hand so that a clean, dry set is available if needed.
6. DO NOT use hair dryers and blowers to dry equipment, let equipment air-dry.
7. All equipment should be kept in a clean, dry, dust-free area.
8. Humidification bottles should be washed with soap and warm water, rinsed thoroughly between refills.

EQUIPMENT:

Liquid dish detergent

Nylon brush

Clean, dry towel or paper towels

Disinfecting agent

Basin

Plastic bag, if equipment is to be stored

Gloves

Personal protective equipment, as needed

PROCEDURE:

1. Adhere to Standard Precautions.
2. Remove all washable parts of equipment and disassemble.
3. Wash equipment in liquid dish detergent and hot water, scrubbing gently with a nylon brush. Scrub thoroughly to remove mucus, secretions, medications and foreign material.
Oxygen Concentrator:
Clean at least once a week. The outside of the concentrator can be wiped down with a clean damp cloth and a mild dish detergent. Never spray cleaner directly onto the machine. Concentrator may have exterior filters that need to be changed at least once per week. Filters can be removed and placed under warm running water. Excess water should be wrung out and the filters should be left to air dry.
Cannula: Clean daily with mild dish detergent and rinse. Replace every 2 weeks.
Tubing: Replace monthly

Water Trap: Empty as needed. Remove at least twice a week and clean with mild dish detergent and rinse

Humidifier Bottle: Use only distilled or sterile water. Empty daily and replace with new distilled water or sterile water. Clean and disinfect at least twice a week. First wash with mild detergent and rinse well; then soak in 1 part water and 1 part distilled white vinegar. Rinse thoroughly and allow to air dry.

Yankhauer/Suction Tubing:

After suctioning patient, suction clean water to avoid buildup/obstruction. At the end of the day, after cleaning with water, suction a soap and water mixture through the equipment to clean. At least twice weekly, after performing above, suction a solution of 10% white distilled vinegar/90% water. Vinegar/water solution should remain in tubing for 30 minutes to disinfect. Replace suction equipment, tubing, canister weekly.

4. Rinse equipment thoroughly, making sure all detergent is removed.
5. Soak equipment in disinfecting agent or other disinfecting agent recommended by equipment manufacturer.
6. Rinse equipment parts, using sterile or filtered water for the final rinse.
7. Air dry equipment by:
 - a. Shaking or swinging excess water out of tubing and hard to dry areas.
 - b. Hanging tubing to drip-dry completely.
 - c. Placing remaining equipment on clean paper towels and covering with paper towels.
8. Discard solution according to manufacturer's instructions.
9. Wipe down all surfaces of machines with a clean cloth daily.
10. Store unused equipment in plastic bag.

AFTER CARE:

1. Document in patient's record:
 - a. Instructions given to patient/caregiver.
 - b. Patient/caregiver understanding and return demonstration.
 - c. Condition of equipment after cleaning.

REFERENCES:

American Association for Respiratory Care. (2005). *Healthy living*. Retrieved March 4, 2010, from http://www.yourlunghealth.org/healthy_living/living/resp_home_care/

Strength of Evidence Level: 3**PURPOSE:**

To prevent infection and skin breakdown of the tracheostomy and surrounding tissues.

CONSIDERATIONS:

1. Generally in homecare, tracheostomy care is a clean procedure. If tracheostomy is new (within 4 to 6 weeks) or patient is immuno-compromised, sterile technique should be used.
2. It is recommended that suctioning equipment be kept available for an emergency, especially for patients with new tracheostomy tubes or when the patient's condition requires suctioning to control secretions.
3. Cleaning the inner cannula:
 - a. If communication is impaired, an alternate system of communication should be established.
 - b. Keep extra sterile tracheostomy tube and obturator on hand in case of accidental expulsion of the tube or blocked tube.
 - c. Prevention of complications in the patient with a tracheostomy should include assessment for:
 - (1) Tube displacement leading to inadequate air exchange, coughing and/or vessel erosion.
 - (2) Subcutaneous emphysema.
 - (3) Pneumothorax.
 - (4) Stomal infection.
 - (5) Amount, color, consistency and odor of secretions.
 - (6) Collection of secretions under dressing, bibs, or twill tape, which will promote infection.
 - (7) Occlusion of cannula.
 - (8) Tracheal erosion.
 - (9) Lower respiratory infection.
 - d. Tracheostomy cleaning may need to be performed more frequently when the tracheostomy is new. The healed tracheostomy may be cleansed less frequently if few secretions and encrustations are present.
 - e. The use of powder, oil-based substances or dressings cut to fit around stoma is contraindicated due to danger of aspiration.
 - f. Soft cuffs should be inflated to a minimally occlusive volume to reduce the risk of tissue necrosis.
4. Changing the tracheostomy ties:
 - a. Tracheostomy ties stabilize the tracheostomy tube and prevent accidental expulsion from trachea.
 - b. Length of ties depends on neck size. The neck may change in size due to swelling and/or changes in body position. Ties should be examined frequently to insure proper tension. Ties that are too loose will allow expulsion of the tube; too tight causes necrosis, circulatory and respiratory impairment. Tight or crooked ties could lead to malpositioning of the tracheostomy tube and subsequent tracheal erosion. You should be able to slip only one or 2 fingers between the collar and the neck.
 - c. Alternate securing the knot to the right and left side of the neck to avoid irritation.
 - d. Velcro tracheostomy holder should be changed if soiled.
5. Changing and cleaning the tracheostomy button/plug:
 - a. Buttons and plugs are used as the last stage to wean the patient from tracheostomy. It consists of a short tube that fits the stoma and reaches the trachea and a solid cannula that closes the tube. The plug fits directly into the stoma and into the trachea and usually does not require ties to hold it in place.
 - b. Recommended time of cleaning is mornings upon awakening at least twice a week and PRN. Early morning secretions are usually the most viscous.
 - c. Always inspect the clean button, cannula or plug for defects, especially the "petals" at the cannula's proximal end.
6. Many masks/mouthpieces distributed for protection while performing artificial respiration are not adaptable for use with a tracheostomy tube. When a patient has a tracheostomy tube and has not been designated as do not resuscitate, special equipment such as a manual resuscitator or a mask/mouthpiece, which can be used with a tracheostomy tube, should be available to protect the nurse if artificial ventilation is needed.
7. Metal tubes can be cleaned and reused. Clean metal tubes with soap and water using pipe cleaners, and making sure to rinse well. Using a pan specifically used for tracheostomy tubes, boil tube parts for 15 minutes. Drain water; allow metal parts to cool and to air dry. Then, place in sterile container. DO NOT leave metal tubes soaking for long periods of time as this causes pitting of the metal.

EQUIPMENT:

Gloves goggles/mask with eyeshield and other personal protective equipment (PPE), as needed

Suction catheter

Sterile normal saline or distilled water

4x4 gauze sponges

Stethoscope

Hemostat

Second tracheostomy tube and obturator

3 small bowls

Measuring tape

Suction machine

Impervious trash bag

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Hydrogen peroxide

Cotton-tipped applicators

Bandage scissors

5-10 mL syringe for cuffed tracheostomy tube

Small nylon bottlebrush and/or pipe cleaner

Trachostomy tube pan

Twill tape or velcro ties

FOR TRACHEOSTOMY BUTTON/PLUG

Clean button and cannula or clean plug

Hydrogen peroxide

Small bottle brush or pipe cleaner

Gloves and other PPE, as needed

Water-soluble lubricant

4x4 precut unfilled gauze tracheostomy dressings

Clean plastic bag

PROCEDURE:

1. Adhere to Standard Precautions.
 2. Explain procedure to patient.
 3. To clean the inner cannula (nonmetal):
 - a. Prepare equipment.
 - (1) Place impervious trash bag near work site.
 - (2) Create a clean field for equipment.
 - (3) Pour hydrogen peroxide in one container.
 - (4) Pour distilled water or saline into second container.
 - (5) Pour distilled water or saline into third container into which 4x4 sponges are placed for cleaning encrustations.
 - (6) Prepare new tracheostomy ties for replacement, if soiled.
 - b. Place patient in semi-Fowler's position.
 - c. Remove oxygen, ventilation or humidification devices.
 - d. Suction patient.
 - e. Return patient to oxygen or ventilator to allow rest period before continuing care.
 - f. Remove old tracheostomy bib or dressing and discard.
 - g. Remove and discard contaminated gloves. Wash hands.
 - h. Put on clean gloves.
 - i. Using presoaked 4x4 sponge and damp applicators, gently wash skin around stoma, under tracheostomy ties, and flanges. Wipe only once with each sponge or applicator and discard.
 - j. Clean inner cannula:
 - (1) Unlock and remove inner cannula.
 - (2) Place inner cannula in hydrogen peroxide and allow soaking to remove encrustation.
 - (3) Using nylon brush or pipe cleaners, gently scrub inner cannula.
 - (4) Rinse cannula with normal saline or distilled water. Shake off excess solution.
 - (5) Examine cannula for patency; if not clean, repeat cleansing process.
 - (6) Re-insert clean inner cannula in tracheostomy tube and lock securely into position.
 - k. Assess patency of airway, position of the tube and patient's respiratory status.
 - l. If applicable, reconnect patient to oxygen, ventilator or humidification.
 - m. Apply new tracheostomy bib or dressing.
 - n. Tighten tracheostomy ties, if too loose. Replace old ties, if soiled.
 - o. Discard soiled supplies in appropriate containers.
4. Changing the tracheostomy ties:
 - a. Adhere to Standard Precautions.
 - b. Explain procedure to patient.
 - c. Prepare twill ties according to method selected:
 - (1) Double strand tie method: Cut two lengths of 20 inches twill tape.
 - (2) Single strand with slit ties: Cut two lengths of twill tape, one 10 inches, one 20 inches. Fold back one inch and cut small slit, repeat with second tie.
 - (3) Single strand with knot: Cut two lengths of twill tape 20 inches each. Tie large knot in end of each strand.
 - d. With patient in semi-Fowler's position, remove the old ties by untying or cutting and discard.
 - e. Examine neck for skin breakdown.
 - f. Change ties according to method selected:
 - (1) Double strand tie method: Thread through hole in tracheostomy tube flange. Approximate ends; repeat with second tie.
 - (2) Single strand with slit ties: Thread slit end through underside of tracheostomy and then, thread the other end of tie completely through slit ends and pull taut so it loops firmly through tube's flange.
 - (3) Single strand with knot: Thread unknotted end of tie through tracheostomy tube flange hole.
 - g. Bring both ends of ties to right or left side of neck and secure.
 - h. Evaluate tapes for snugness. Tie should be loose enough to admit one finger underneath.
 - i. Cut off excess tape.
 5. Changing/cleaning the tracheostomy button or plug:
 - a. Adhere to Standard Precautions.
 - b. Explain procedure to patient.

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- c. With patient in sitting position, cleanse the area around the stoma using distilled water and a 4x4 gauze.
- d. Remove button, cannula or plug carefully using an out and down pull.
- e. Inspect skin area around stoma for any breakdown or any type of irritation.
- f. If using a button, lubricate clean cannula with water-soluble lubricant and insert button into cannula as far as it will go. If using a plug, lubricate and insert gently.
- g. Check fit by pulling gently outward. If inserted correctly, it will remain in stoma.
- h. Clean button cannula or plug by soaking in hydrogen peroxide and cleaning with small bottlebrush or pipe cleaner.
- i. Rinse with water, allow to air dry and store in clean, covered jar or plastic bag.
- j. Discard soiled supplies in appropriate containers.

Lewarski, J. S. & Gay, P. C. (2007). Client issues in home mechanical ventilation. *CHEST*, 132, 671-676.

AFTER CARE:

1. Clean reusable equipment and suction machine.
(See *Cleaning and Disinfection of Respiratory Equipment*.)
2. Document in patient's record:
 - a. Procedure performed and time.
 - b. Quality and quantity of suctioned secretions.
 - c. Drainage, color, odor and quantity of drainage on dressing.
 - d. Condition of stoma and surrounding skin.
 - e. Physical assessment and patient's response to treatment.
 - f. Instructions given to patient/caregiver.
 - g. Patient/caregiver understanding of instructions.

RESOURCES:

Aaron's Tracheostomy Page Cleaning Equipment 1996-2010

<http://www.tracheostomy.com/faq/equipment/index.htm>

American Association of Respiratory Care. (2007). AARC Clinical Practice Guideline

Oxygen Therapy in the Home or Alternate Site Health Care Facility—2007 Revision & Update. *Respiratory Care*, 52(1), 1063-68. Retrieved June 16, 2010, from <http://www.rcjournal.com/cpgs/pdf/08.07.1063.pdf>

American Association of Sleep Medicine. (2005). *The Basics of CPAP*. Retrieved June 16, 2010, from <http://www.sleepeducation.com/CPAPCentral/CPAPBasics.aspx>

Kohorst, J. (2005). Transitioning the ventilator-dependent patient from hospital to home. *Medscape Pulmonary Medicine*, 9(2). Retrieved June 17, 2010, from <http://www.medscape.com/viewarticle/514735>

Strength of Evidence Level: 3**PURPOSE:**

To increase expectoration of sputum by learning to control the cough in an effective manner.

CONSIDERATIONS:

1. Vibration, percussion, postural drainage and coughing all increase expectoration of sputum. The primary function of the cough is to expectorate secretions and foreign material from the airways.
2. Educating the patient with an ineffective cough, e.g., chronic, paroxysmal, hacking cough, to a controlled, effective cough requires training and practice. Stress is placed on minimizing the forcefulness of the cough and in using diaphragmatic breathing between coughs.
3. Controlled coughing should make a hollow sound. The first cough in the procedure loosens; the second cough moves the mucus. The momentary stopping and starting of inspired air (sniffing) prevents triggering the coughing mechanism.
4. The most comfortable position for coughing is in a sitting position with head slightly forward, feet on the floor.
5. The cough procedure should become a routine part of the patient's chest physical therapy.

EQUIPMENT:

Tissues/paper towels

Impervious trash bag

Gloves

Mask, protective eye wear (optional)

PROCEDURE:

1. Adhere to Standard Precautions.
2. Explain procedure to patient, reviewing diaphragmatic and pursed-lip breathing.
3. Position the patient in a forward leaning posture, feet on floor, tissues in hand.
 - a. Instruct the patient to do the following:
 - (1) Slowly inhale through your nose.
 - (2) Hold the deep breath for 2 seconds.
 - (3) Cough twice with mouth slightly open. Use strong tissues or paper towels to dispose of mucus. Deposit used tissues/towels in impervious bag.
 - (4) Pause.
 - (5) Inhale by sniffing gently. This gentle breath helps prevent mucus from moving back down the airways.
 - (6) Rest.
 - b. Have the patient practice the procedure, then write down the steps, if a printed handout is not available.
4. Discard soiled supplies in appropriate containers.

AFTER CARE:

1. Document in patient's record:
 - a. Length and time spent on cough training.
 - b. Color, amount, odor and viscosity of sputum.
 - c. Instructions given to patient/caregiver.
 - d. Patient's response and ability to give a return demonstration of procedure.

REFERENCE:

Cleveland Clinic (2009). *Controlled coughing*. Retrieved March 4, 2010, from http://my.clevelandclinic.org/disorders/Chronic_Obstructive_Pulmonary_Disease_copd/hic/Controlled_Coughing.aspx

Strength of Evidence Level: 3**PURPOSE:**

To care for the Heimlich Valve which allows air to flow out of the chest.

CONSIDERATIONS:

1. DO NOT disconnect valve from tubing.
2. Make sure ends are properly connected.
3. DO NOT put lotions, creams or powders around insertion site.
4. Valve fluttering or noises are normal. Also seeing air or fluids pass through the valve is normal.
5. DO NOT clamp valve unless told by physician.

EQUIPMENT:

Clean cloth

Gloves

Skin prep or barrier

Soap and water

Tape

4x4 Gauze drainage sponge

4x4 Gauze sponge

PROCEDURE:

1. Wash hands and be sure to adhere to Standard Precautions.
2. Remove old dressing and inspect the insertion site for signs of infection.
3. Be sure to cleanse site with soap and water. Make sure to rinse well and pat dry with a clean, dry cloth. Apply a skin barrier to surrounding tissue to avoid irritating due to repeated tape exposure, if necessary.
4. Cover with 4x4 drainage sponge and tape. For added protection cover with 4x4 gauze sponge.
5. Tape the valve to the skin below the insertion site. This is done so fluid does not reenter the chest at the insertion site.
6. Wash hands after procedure is completed.

AFTERCARE:

1. Document valve care in patient medical record.
2. Document and describe drainage, if any. Also be sure to document patient's tolerance for the procedure and skin appearance around the insertion site.
3. Contact physician with any changes.
4. Instruct patient and caregiver with emergency measures if the tube falls out.

RESOURCES:

Heimlich (Flutter) Valve Care. Visiting Nurse Services and Hospice. Hackley.

Strength of Evidence Level: 3**PURPOSE:**

To identify areas requiring intervention while establishing a baseline for measuring improvement or deterioration in condition of patient.

CONSIDERATIONS:

1. Key elements of a comprehensive respiratory assessment include a patient history followed by inspection and examination of the patient.
2. The physical examination involves inspection, palpation, percussion and auscultation.
3. Common symptoms of lung problems include dyspnea, orthopnea, eupnea, apnea, bradypnea, tachypnea, hypoxia, hypernea, Cheyne-stokes respirations, cough, chest pain, fever or blood in the sputum.
4. OASIS items identify the level of exertion/activity that results in a patient's dyspnea or shortness of breath.

EQUIPMENT:

Personal protective equipment, as indicated.

Stethoscope

Pulse oximeter

PROCEDURE:

1. Patient history obtained through review of documentation from referring entity and interview of patient and/or family members.
 - a. Presence/absence of common symptoms of lung problems.
 - b. Cough: productive versus non-productive.
 - c. Past medical history:
 - (1) Chief complaints.
 - (2) Previous hospitalizations for similar complaints.
 - (3) Symptoms and when they started.
 - (4) Medications currently prescribed for problem.
 - (5) Allergies.
 - (6) Relevant work history.
 - (7) Asthma.
 - (8) Smoking: pack years=number of packs/day x number of years
2. Inspection of the patient: A comprehensive visual assessment that provides a baseline for measuring improvement or deterioration in condition.
 - a. General appearance: Well-nourished, malnourished, obese, relaxed, anxious, diaphoretic, pale, cyanotic, disheveled.
 - b. Level of consciousness.
 - c. Vital signs.
 - d. Examination of the head.
 - e. Examination of the neck.
 - f. Examination of thorax and lungs:
 - (1) Thoracic configuration - barrel chest often indicates chronic lung disease.

- (2) Breathing pattern and effort.
 - (3) Retractions.
 - (4) Synchrony of diaphragm and upper chest
 - (5) Abdominal paradox: predictor of impending respiratory failure.
3. Palpation: The art of touching the chest wall to evaluate underlying structures.
 - a. Skin and subcutaneous tissues: crepitus.
 - b. Pain.
 - c. Tactile fremitus.
 - d. Thoracic expansion.
 4. Percussion of the chest: Act of tapping on the chest wall to evaluate underlying structures.
 - a. Percussion sounds:
 - (1) Dull indicates fluid or increased tissue density.
 - (2) Hyperresonant (hollow) or tympany indicates increased air.
 - (3) Resonance over normal lung tissue.
 - (4) Flat over massive pleural effusion of atelectasis.
 5. Breathing patterns:
 - a. Cheyne-stokes: Irregular patterns of deep breathing followed by periods of shallow breathing and usually ending with a period of apnea.
 - b. Biot's breathing: Irregular patterns of breathing, usually very disorganized.
 - c. Kussmaul's breathing: Rapid and deep breathing.
 - d. Apneustic pattern: Prolonged inspirations, serial inspirations without exhalation after each, followed by a 'summative' exhalation.
 - e. Asthmatic pattern: Excessively long expiratory periods.
 - f. Paradoxical breathing: Present when a portion of chest wall moves in the opposite direction as it should during the breathing cycle. Seen especially in infants who have a very pliable chest. Indicates respiratory distress.
 6. Auscultation: Listening to breath sounds.
 - a. Stethoscope:
 - (1) Bell for low pitch sounds (heart sounds).
 - (2) Diaphragm for higher pitched sounds (breath sounds).
 - b. Optimal technique:
 - (1) Patient breathes through his/her mouth.
 - (2) Sounds on one side of the chest should be compared to the opposite side.
 - (3) May be necessary to have the patient sit up or roll from side to side.
 - (4) Place stethoscope under clothing onto bare skin.

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- c. Normal breath sounds:
 - (1) Vesicular: Soft ‘rustling’ sounds heard over most lung tissue.
 - (2) Bronchovesicular: Heard only over major airways.
 - (3) Tracheal: Hollow tubular sounds.
- d. Abnormal (adventitious) breath sounds:
 - (1) Crackles (rales): Discontinuous ‘pop-like’ sounds generally heard on inspiration that are indicative of atelectasis, bronchitis, pneumonia, pulmonary edema or pulmonary fibrosis.
 - (2) Wheezes: High-pitched continuous musical sounds that can be heard on both inspiration and exhalation.
 - (3) Rhonchi: Low-pitched shoring sound that is continuous and can be heard on inspiration or exhalation. Can clear with cough or suctioning. It is usually indicative of secretions in many conditions and in COPD, can indicate air flow obstruction unrelated to secretions.
 - (4) Bronchial breath sounds: Tracheal sounds heard over lung parenchyma.
 - (5) Stridor: High-pitched raspy sound heard at it’s loudest over the trachea. Indicates upper airway narrowing or obstruction and can be heard in conditions such as post extubation stenosis and croup.
 - (6) Pleural friction rub: Clicking or grating sound caused by friction that is produced as the parietal and visceral pleura rub against each other during breathing. Can be heard in some types of pneumonia.
 - (7) Egophony: “e” to “a” changes. Indicative of density or fluid consolidation.

REFERENCES:

Centers for Medicare and Medicaid Services (2009). *OASIS User Manual Home Health Quality Initiatives*. Retrieved February 2010 from http://www.cms.hhs.gov/HomeHealthQualityInits/14_HHQIOASISUserManual.asp#TopOfPage

Physical assessment, (n.d.). Retrieved February 2010 from <http://www.virtual.yosemite.cc.ca.us/lylet/224/224/Lectures/PhysicalAssessment/Lecture%20Phys%20Assessment.htm>

Simpson, H. (2006). Respiratory assessment. *British Journal of Nursing*, 15(9), P. 484-488. Retrieved February 2010 from <http://EBSCOhost> database.

AFTER CARE:

- 1. Report findings to physician.
- 2. Document in patient's medical record:
 - a. Instructions given to patient and/or caregiver.
 - b. Communication with physician.
 - c. Coordination with other disciplines.

Strength of Evidence Level: 3**PURPOSE:**

To optimize lung function and prevent respiratory complications.

CONSIDERATIONS:

1. An incentive spirometer is a device used to measure how much air can go into the lungs.
2. An incentive spirometer is made up of a tube, an air chamber and an indicator.
3. An incentive spirometer is commonly used in those who are at risk of having airway or breathing problems. Patients with lung diseases may improve their lung function by using an incentive spirometer.
4. The incentive spirometer also will help keep the lungs active when a person is recovering from surgery.

EQUIPMENT:

Incentive spirometer

PROCEDURE:

1. Adhere to Standard Precautions.
2. Instruct the patient to perform the following;
 - a. Sit up with head and neck centered.
 - b. Hold incentive spirometer in an upright position.
 - c. Place the target pointer to the level that is needed to reach the desired level.
 - d. Exhale normally.
 - e. Place the mouthpiece in mouth with lips tightly sealed around it.
 - f. Inhale slowly and deeply through the mouthpiece to raise the indicator, attempting to make the indicator rise up to the level of the target pointer.
 - g. When unable to inhale any longer, remove mouthpiece and hold breath for approximately 2 to 6 seconds.
 - h. Exhale normally. Encourage patient to cough after each repetition, if secretions are present.
3. Repeat these steps 5 to 10 times every hour when awake, or as often as healthcare provider has advised.
4. After each use, clean the mouthpiece with water and shake it to dry.
5. Keep track of progress by writing down the highest level able to reach.

AFTER CARE:

1. Document in patient's record:
 - a. Instructions given to patient/caregiver.
 - b. Patient/caregiver understanding and return demonstration.

REFERENCES:

McConnell, E. (1993). Teaching your patient to use an incentive spirometer. *Nursing*, 23(2), 18. Retrieved from CINAHL with Full Text database.

Strength of Evidence Level: 3**PURPOSE:**

To monitor arterial oxygen saturation non-invasively.

CONSIDERATIONS:

1. The symbol SpO₂ is used to denote non-invasive, electronically measured arterial oxygen saturation. The symbol SaO₂ is used to indicate invasively measured arterial oxygen saturation.
2. Oximetry measures the percentage of hemoglobin that is saturated with oxygen. If the patient is anemic (not enough hemoglobin), the SpO₂ may be within normal limits but the blood may not be carrying enough oxygen to meet the tissue oxygen needs. In this situation, the patient could appear hypoxic with a “normal” SpO₂ value.
3. Oximetry gives NO information about the level of blood carbon dioxide (CO₂). Patients can have hypercarbia with normal oxygen saturation.
4. The SpO₂ value must always be interpreted in the context of the patient’s complete clinical care.
5. Preferred probe sites for adults and children are fingertips and ear lobes. Acceptable sites for infants include fleshy portion of hand, fleshy portion of foot, or toe. For neonates, the ball of the foot or heel of the hand are the best sites.
6. Results may be inaccurate if the patient has any of the following:
 - a. Conditions which cause poor perfusion to probe site:
 - (1) Low cardiac output
 - (2) Vasoconstriction
 - (3) Hypothermia
 - b. Elevated carboxyhemoglobin levels.
 - c. Elevated methemoglobin levels.
 - d. Artificial nails or nail polish.
7. If unable to remove nail polish or artificial nails, place the probe sideways so the light goes through the finger side to side and bypasses the nail.
8. Other causes of inaccurate results include:
 - a. Excessive ambient light sensed by the probe sensor.
 - b. Patient movement.
 - c. Inability of oximeter to accurately sense the patient’s pulse.
9. Patient should be in a “steady state” on correct dose of oxygen (or off oxygen) for at least 15 minutes before obtaining a reading. If initial reading done on oxygen, then with oxygen off, the nurse must wait at least 15 minutes after oxygen removed to obtain accurate room air reading.
10. If the patient shows clinical signs of distress after oxygen removal, immediately replace the oxygen at the appropriate liter flow.
11. For infants and neonates, clarify with physician if oximetry reading needs to be done during a feeding session, during sleep or during awake/active times.

12. Normal SpO₂ levels are 95-100% at sea level, lower with higher altitudes (e.g. 90% or greater at 1 mile above sea level).

EQUIPMENT:

Oximeter
Finger or ear probe
Alcohol wipes
Nail polish remover (if needed)

PROCEDURE:

1. Adhere to Standard Precautions.
2. Verify physician’s order for procedure.
3. Explain procedure to patient.
4. Prepare equipment according to manufacturer’s instructions.
5. Ensure patient has been on correct dose of oxygen for at least 15 minutes prior to obtaining reading.
6. Select probe site appropriate for age and condition of patient.
7. Place probe so sensors are opposite of each other. For ear lobe, gently massage site for about 10 seconds prior to probe application.
8. Turn on pulse oximeter. The unit will perform a self-check, then the pulse indicator should flash synchronously with the patients pulse. The pulse rate displayed by the oximeter must be equal to the patient’s apical/radial pulse. If the pulse is not sensed accurately, the SpO₂ value will be inaccurate.
9. Read SpO₂ value after several minutes when reading stabilized.

AFTER CARE:

1. Remove probe, turn off and unplug unit. Clean the probe gently with alcohol wipe.
2. Document in patient’s record:
 - a. Procedure type.
 - b. Date and time.
 - c. Probe location.
 - d. O₂ type and concentration, if in use.
 - e. Patient activity.
 - f. SpO₂ reading.
 - g. Action taken, if any.
 - h. Patient’s response to procedure.

Strength of Evidence Level: 3**PURPOSE:**

To instruct the patient/caregiver in the correct usage of a metered dose inhaler (MDI) for the effective delivery of inhaled medications.

CONSIDERATIONS:

An MDI gives one dose of medicine with each puff. The inhaler must be used correctly to effectively deliver the medicine into the throat and lungs. If used incorrectly, the medicine may be left on the tongue and back of oral cavity.

EQUIPMENT:

Inhaler
Spacer (optional)

PROCEDURE:

1. Adhere to Standard Precautions.
2. Instruct the patient to perform the following;
 - a. Shake the inhaler 5 or 6 times.
 - b. Remove the mouthpiece cover.
 - c. If using a spacer, place it over the mouthpiece at the end of the inhaler.
 - d. Put your lips and teeth over the mouthpiece/spacer being careful not to block the mouthpiece with your tongue.
 - e. Breathe in slowly. As you do so, squeeze the top of the canister once. (If using a spacer, squeeze the top of the canister first, and then breathe in slowly.)
 - f. Keep inhaling even after you finish the squeeze.
 - g. Continue inhaling slowly and deeply.
 - h. After inhaling, remove the mouthpiece/spacer from your mouth and hold your breath for up to 10 seconds.
 - i. If you need another dose of medication, repeat the previous steps.
 - j. Replace the mouthpiece cover and store equipment.
 - k. Rinse your mouth and gargle with water, spit out, DO NOT swallow.
3. Clean Equipment. (*See Respiratory - Cleaning and Disinfection of Respiratory Therapy Equipment*)

AFTER CARE:

1. Document in patient's record:
 - a. Instructions given to patient/caregiver.
 - b. Patient/caregiver understanding and return demonstration.

REFERENCE:

Mayo Clinic. (2009). *Using a metered dose asthma inhaler and spacer*. Retrieved March 11, 2010, from <http://www.mayoclinic.com/health/asthma/MM00608>

Strength of Evidence Level: 3**PURPOSE:**

To safely maintain the ventilator-dependent patient in a home setting through comprehensive nursing assessment and intervention.

CONSIDERATIONS:

1. Mechanical ventilation is never used on a patient with unresolved pneumothorax.
2. The medical equipment supplier is expected to provide/ensure that:
 - a. A respiratory therapist is available 24 hours per day.
 - b. Electrical equipment is properly grounded. Extension cords are not acceptable unless approved by the manufacturer or supplier.
 - c. A back-up ventilator and suction unit should be in the home. Judgement may be used to determine if a back-up ventilator is necessary. Some factors which should be considered are:
 - (1) Patient's degree of dependence on mechanical ventilation.
 - (2) Skill and reliability of caregivers.
 - (3) Proximity/accessibility of equipment supplier.
 - d. Only equipment recommended by the manufacturer is used.
 - e. Any defective equipment is replaced in a timely manner.
 - f. A manual resuscitation bag is maintained in the home.
 - g. Instructions are placed in the home for use, maintenance and emergency measures in case of mechanical or power failure.
 - h. Education to the patient/caregiver regarding use and maintenance of equipment and safety measures.
3. Oxygen precautions must be observed.
4. The patient is never ventilated with dry gas.
5. The ventilator tubing must be kept free of condensation.
6. Proper cleaning of equipment reduces the risk of infections.
7. A system of communication should be established with the patient.
8. Potential medical complications requiring observation and reporting are:
 - a. Airway obstruction.
 - b. Tracheal damage.
 - c. Pulmonary infection.
 - d. Pneumothorax.
 - e. Subcutaneous emphysema.
 - f. Cardiac instability.
 - g. Atelectasis.
 - h. Gastrointestinal malfunction.
 - i. Renal malfunction.
 - j. Central nervous system malfunction.
 - k. Psychiatric trauma.
9. Mechanical ventilation for the patient is initiated in the hospital. Criteria for homecare of the ventilator dependent patient includes:
 - a. A willing and able patient and caregiver(s).
 - b. Demonstrated capabilities of both patient and caregiver(s).
 - c. A plan for 24 hour availability of caregiver(s).
 - d. A home appropriate for the ventilator dependent patient:
 - (1) Adequate space for placement of the equipment.
 - (2) Water.
 - (3) Electricity.
 - (4) Telephone service.
 - (5) Clean environment.
 - e. A plan for periodic medical care and laboratory studies.
 - f. Funding source(s) for professional services, supplies and equipment.
 - g. Back-up emergency equipment and source of electricity.
10. Prior to hospital discharge, careful planning is necessary to return the ventilator-dependent patient to the home setting.
 - a. Patient should be medically stable, secure artificial airway, adequately oxygenated with < 40% FiO₂, and maintain adequate ventilation on standard ventilator settings.
 - b. The patient should be using the same type of ventilator in the hospital as ordered for homecare.
 - c. The homecare nurse should make a hospital visit to meet the patient and participate in the care planning process with the multidisciplinary hospital team.
11. Preparing for the first day at home includes all the considerations unique to the ventilator-dependent patient. Special planning is required to transport the patient home with portable ventilator equipment. Prior to attaching the patient's airway to the home ventilator, all systems must be carefully checked per manufacturer's directions.
12. All essential equipment including oxygen source must be in home when patient arrives.
13. Local emergency contacts should be listed for patient/family.
14. Letters should be sent to telephone and local electrical companies notifying them that patient should be on the priority reconnect list. Emergency Medical Systems should be contacted.

EQUIPMENT:

Portable ventilator with alarms
 Adequate power source
 Cascade heating elements
 Humidifying system
 Breathing circuit tubing and hose assemblies

Strength of Evidence Level: 3

Supplemental oxygen source
 Main hose
 Tracheal tube adapters
 Exhalation valve
 Flex tubing
 Suction unit and equipment
 Two 12-volt leak-proof batteries, cases and cables
 One 8-hour capability
 One 6-hour capability
 Battery recharger
 Non-sterile gloves
 Obturator
 Tracheal tubes with cuff
 Tracheostomy care kit (optional)
 Sterile wrap
 Basins (3)
 Forceps
 Drape
 Flexible nylon bristle brush
 Pipe cleaners (3)
 30" twill tape or velcro ties
 Gauze sponges (4)
 Precut non-woven trach dressings (3)
 Sterile gloves
 Sphygmomanometer
 Stethoscope
 Normal saline solution
 Hydrogen peroxide
 Sterile distilled water
 Disinfectant
 Manual resuscitation bag, required for portability and power failure
 Daily checklist for caregiver(s)
 Weekly checklist
 Oxygen (if required)
 Back-up ventilator (optional)
 Nebulizer unit (if ordered)
 In-line adapter to ventilator circuit or Pulmo-Aid unit
 Surge protector
 Medication
 Communication means

PROCEDURE:

1. Adhere to Standard Precautions.
2. Don any necessary protective equipment.
3. Explain procedure to patient.
4. Review physician's order:
 - a. Ventilator type.

- b. Ventilator rate.
 - c. Ventilation mode (e.g., intermittent mandatory ventilation (IMV), synchronized intermittent mandatory ventilation (SIMV), assist/control).
 - d. Tidal volume.
 - e. Fraction of inspired oxygen concentration.
 - f. Sigh rate, sigh volume if applicable.
 - g. Oxygen tension setting (PEEP).
 - h. Low and high pressure alarm settings.
 - i. Duration of treatment.
 - j. Inspiratory:Expiratory ratio (I:E Ratio)(optional).
 - k. Flow rate (optional).
 - l. Medication and diluent (optional).
5. Evaluate pulmonary status:
 - a. Check home ventilator to determine that all settings are per physician's orders, connections and tubing are intact.
 - b. Evaluate patient's pressure reading for normal values.
 - c. Assess patient for symmetrical chest expansion.
 - d. Auscultate lung fields.
 - e. Suction trachea as needed to maintain an open airway. (*See Respiratory - Tracheal Suctioning.*)
 - f. Provide routine tracheostomy care. (*See Respiratory - Tracheostomy Care.*)
 - g. Provide periodic sighing or deep breathing with ventilator mechanism or manual resuscitation bag.
 - h. Check humidification system to ensure patient is never ventilated with dry gas.
 - i. Keep tubing free of condensation.
 - j. Monitor and record level of oxygen in tank.
 - k. Check that back-up ventilator and batteries are in home and operational.
 - l. Check and test alarm limits.
 6. Evaluate gastrointestinal status:
 - a. Auscultate bowel sounds.
 - b. Palpate abdomen.
 - c. Measure abdominal girth.
 - d. Monitor bowel functioning.
 7. Evaluate cardiovascular status:
 - a. Auscultate heart sounds.
 - b. Assess for jugular neck vein distention.
 - c. Observe for peripheral edema.
 - d. Monitor blood pressure and pulse.
 8. Evaluate fluid balance:
 - a. Assess intake and output.
 - b. Assess skin turgor and mucous membranes for signs of dehydration.
 9. Evaluate nutritional status:
 - a. Assess oral intake.
 - b. Observe for possible dysphagia and/or aspiration.
 10. Assess for signs/symptoms of infection:
 - a. Monitor temperature.
 - b. Observe for increases in heart rate.

Strength of Evidence Level: 3

- c. Observe for changes in tracheal secretions.
11. Identify and establish methods of communication.
12. Assess adequacy of rest/sleep periods:
 - a. Instruct patient/caregiver to schedule activities to allow patient adequate rest/sleep periods.
 - b. Instruct patient/caregiver in relaxation techniques.
13. Periodically review plan of care for medical intervention and laboratory studies.
14. Evaluate psychosocial status of patient/caregivers on a regular basis. Provide emotional support to patient and caregivers.
15. Clean ventilator equipment. (*See Respiratory - Cleaning and Disinfection of Respiratory Equipment.*)
16. Reassemble equipment.
17. Discard soiled supplies in appropriate containers.

AFTER CARE:

1. Document in patient's record:
 - a. Nursing assessment.
 - b. Operation of home ventilator system including alarms.
 - c. Caregiver's ability to meet patient's needs.
 - d. Instructions to patient/caregiver.
 - e. Patient/caregiver returns demonstration responses.
 - f. Communication with physician, medical equipment supplier and respiratory therapist.
 - g. Patient/caregiver coping strategies with the plan of care.

Strength of Evidence Level: Blank

Strength of Evidence Level: 3**PURPOSE:**

To prevent or reverse hypoxemia and provide oxygen to the tissues.

CONSIDERATIONS:

1. Oxygen is provided to the patient through a variety of devices (e.g., mask, nasal cannula, tracheostomy collar) from a variety of sources (e.g., cylinder, concentrator, liquid oxygen system).
 2. Home oxygen therapy is provided as a joint effort of the patient and family, physician, respiratory vendor, respiratory therapist and homecare staff. The nurse must carefully coordinate the activities and teaching strategies of all healthcare providers to prevent overwhelming or confusing the patient and/or family.
 3. Oxygen therapy must be prescribed by the patient's physician, not the respiratory equipment vendor. The physician is responsible for identifying the type of therapy, the rate (LPM), based on Arterial Blood Gases, and equipment needed by the patient. The nurse and/or respiratory therapist may need to provide vital information regarding sources of electricity, financial circumstances, mobility of patient, etc., to enable the physician to make an appropriate selection.
 4. Oxygen masks may not be appropriate for use with chronic obstructive pulmonary disease patients because oxygen delivery cannot be controlled with precision.
 5. A tracheostomy collar or tracheostomy mask is indicated when oxygen must be given to a patient with a tracheostomy.
 6. Trans-tracheal oxygen therapy is held in place by a necklace. Since trans-tracheal oxygen therapy bypasses the mouth, nose and throat, a humidifier is required at flow rates of 1 LPM or greater.
 7. Oxygen promotes and feeds combustion. The patient should be cautioned about the following:
 - a. Oxygen concentrator will perform best when it's located in a well-ventilated area at least 3 (three) inches away from walls, furniture, and curtains.
 - b. Visitors & family members should smoke outdoors. "No Smoking" Signs are to be posted throughout all areas of the home where oxygen will be in use including the front door.
 - c. Avoid all open flames. Person using oxygen should stay a minimum of 5 feet from any open flame.
 - d. Oxygen concentrator's are equipped with an audible alarm to alert you in case of an interruption in power or a possible equipment malfunction.
 - e. Do not use any oily substances (petroleum based lip products, Vaseline, Blistex, Chapstick) on your nose, lips, or lower part of your face. An alternative is water-based products such as KY Jelly. Keep all grease, oil and petroleum products (even small amounts) and flammable materials away from your oxygen equipment. These materials can react violently with oxygen if ignited and cause a hot spark.
- d. Smoke Alarms and Fire Extinguishers
 - Have a working smoke detector on each level of your home. Ideally, smoke detectors should be placed in common areas of your home and outside of bedrooms. Many local fire departments have established smoke alarm programs to assist the community in obtaining home smoke alarms.
 - Smoke detectors should be tested on a regular basis and batteries should be changed every six months.
 - Have a working fire extinguisher and know how to use it. A fire extinguisher can be purchased at most home improvement or department stores.
 - e. Notify the fire department, physician, and/or Office of Emergency Management (Dial 211) of oxygen in home.
 - f. Avoid Static Electricity
 - Avoid nylon or woolen clothing because it may cause static electricity. Clothing and bed linen made of cotton materials will avoid sparks from static electricity.
 - Use a humidifier in winter to add moisture to the air in your home.
 - g. Using Electrical Equipment
 - Do not use equipment with frayed cords or exposed wires. They could cause a spark.
 - Plug concentrator into a properly grounded electrical wall outlet. Do not plug oxygen into an outlet controlled by a light switch.
 - Avoid using electric razors and hair dryers while using oxygen. Battery operated razors and hair dryers if they have less than 10 volts can be used.
 - Do not use extension cords with oxygen equipment. Concentrator may cause the cord to overheat and cause a fire.
 - Do not use an appliance with a control box, such as a heating pad or electric blanket. Control boxes may throw sparks.

Strength of Evidence Level: 3

8. Oxygen Storage & Handling
- Keep oxygen cylinders/concentrators in a well ventilated area (not in closets, behind curtains, or other confined spaces.)
 - Keep oxygen at least 6 feet from any fireplace, stove or electrical appliance such as hairdryer, electric toothbrush or razor, electric blanket, electric toy, space heater or electric baseboard heater.
 - Keep the oxygen as far away as possible from an oven or stove while cooking, and be very wary of grease splatters.
 - Keep the oxygen away from any flammable liquid.
 - Oxygen cylinders must remain upright at all times. Never tip an oxygen cylinder on its side or try to roll it to a new location.
 - Do not transport oxygen tanks in the trunk of a car. Oxygen tanks need to be transported properly secured to reduce movement.
 - Always have a full back-up tank available in case of emergencies, such as a need to leave your home or a power failure. Should tank gauge not read full, patient should notify the oxygen provider of need for a full tank delivery.
 - Minimum on 2 full tanks should be kept on hand.
 - Patient is not to use back-up tanks for portability. This increases the risk of not having an adequate supply of oxygen on hand should an emergency occur.
- Oxygen is colorless, odorless and tasteless. Patients who receive inadequate oxygen may not be aware they are suffering from hypoxia. Families and health professionals should observe the patient frequently for symptoms of hypoxia (shortage of oxygen in the body):
- Restlessness, anxiety/euphoria.
 - Irregular respirations/dyspnea.
 - Drowsiness/confusion and/or inability to concentrate/altered level of consciousness.
 - Increased heart rate/arrhythmia.
 - Perspiration, cold, clammy skin.
 - Flaring of nostrils, use of accessory muscles of respiration.
 - Altered blood pressure.
 - Yawning.
 - Cyanosis.
 - Muscle and mental fatigue.
 - Headache.
 - Dizziness/visual impairment.
 - Nausea.
9. Patients with compromised respiratory systems are understandably anxious about ongoing oxygen supply.
- A back-up source of oxygen should be available in the patient's home in case the oxygen source malfunctions or is prematurely depleted.
10. Give emergency phone numbers to the patient for:
- Paramedics and ambulance.
 - Physician.
 - Home health agency.
 - Respiratory equipment vendor.
 - Hospital.
11. Teach family members to operate, maintain and troubleshoot equipment. Equipment should be checked at least daily.
12. Patients experiencing inadequate oxygenation may feel that more oxygen will relieve their discomfort. Therefore, it is essential to emphasize to the patient that oxygen is to be used only at the flow rate prescribed. Alert the patient to the danger of oxygen above prescribed limits.
13. Water-soluble lubricant may be applied to lips and nasal membranes PRN for dryness and lubrication.
14. Moisture and pressure may cause skin breakdown under oxygen tubing and straps on administration devices. Therefore, the skin must be examined frequently, kept clean and dry, and relieved of pressure. Gauze may be tucked under tubing.
15. Oxygen delivery devices should be cleaned or replaced when dirty or contaminated with secretions to prevent infection.
16. If used, humidifier water should be replaced:
- If water is below a minimum level
 - Daily. Adding water to the water present in the humidifier will encourage growth of bacteria. The humidifier bottle should be cleaned or changed at least every 2 weeks.
17. DO NOT use more than 50 feet of oxygen extension tubing connected to oxygen delivery device.
- EQUIPMENT:**
- Stethoscope
- Oxygen source (cylinder, concentrator or liquid oxygen system)
- Oxygen delivery device (cannula, mask, trach collar), 2 sets
- Humidity bottles and adapters, if needed
- Sterile distilled water
- "Oxygen in Use" signs
- Cleansing solution
- Gloves
- Instructions for specific types of equipment from vendor supplying equipment*
- * A wide variety of oxygen therapy equipment is available from respiratory equipment suppliers. To describe the exact operation of each type is beyond the scope of this procedure. It is imperative that the nurse reviews the operation of specific equipment with the vendor. General guidelines for major types of equipment are included in this procedure.*
- PROCEDURE:**
- Adhere to Standard Precautions.

Strength of Evidence Level: 3

2. Explain procedure to patient.
3. Review order from physician for oxygen therapy.
4. Evaluate the patient's respiratory status. Assure a patent airway before commencing oxygen administration.
5. Post "Oxygen in Use" warning sign. Evaluate environment for hazards related to combustion.
6. Evaluate patency of nostrils if nasal cannula is to be used.
7. Prepare oxygen source:
 - a. Crack (break seal) on cylinder, plug in concentrator, check liquid contents of liquid system.
 - b. Screw humidifier onto tank outlet or concentrator oxygen outlet, if humidifier is to be used.
 - c. Connect oxygen tubing to oxygen source.
 - d. Set flow on flow dial, flow tube, oxygen flow control, or flow meter at prescribed liter flow.
 - e. If concentrator is used, turn power switch on and adjust flow rate.
8. Apply oxygen delivery device:
 - a. Nasal Cannula
 - (1) Set flow rate as ordered (humidity not required for $\leq 4\text{L/minute}$)
 - (a) 1-2 L/minute provides 23-30% O₂
 - (b) 3-5 L/minute provides 30-40% O₂
 - (c) 6 L/minute provides 42% O₂
 - (2) Place prongs in nostrils with flat surface against skin.
 - (3) If prongs are curved, direct curve downward toward floor of nostrils.
 - (4) Secure cannula tubing over each ear and slide adjuster under chin to secure tubing taking care to adjust to patient comfort.
 - (5) Clean nasal cannula daily and PRN. (*Refer to After Care.*)
 - (6) Provide frequent mouth and nasal care, lubricate nose with water-soluble lubricant if dry.
 - b. Oxygen Mask
 - (1) Select a mask that will afford patient the best fit.
 - (2) Set flow rate as ordered by physician. Rate must exceed 5 liters/minute to flush mask of carbon dioxide. In high humidity masks, oxygen should be turned up until mist flows from mask. For low flow systems:
 - (a) Simple mask: 6-8 L/minute provides 40-60% oxygen.
 - (b) Partial rebreather mask: 6-11 L/minute provides 50-75% oxygen.
 - (c) Non-rebreather : 12 L/minute provides 80-100% oxygen.
 - (3) Position mask over the patient's face covering the nose, mouth and chin to obtain a tight seal.
- (4) Slip loosened elastic strap over patient's head, positioning it above or below the ears.
- (5) Tighten elastic strap so that mask is snug but not uncomfortably tight. Make sure that oxygen is not leaking into patient's eyes.
- (6) If rebreathing mask is used, check to see that one-way valves are functioning properly. This mask excludes room air and a valve malfunction could lead to a build-up of carbon dioxide in the mask.
- (7) If a non-rebreathing or partial rebreathing mask is used:
 - (a) Flush the mask and bag with oxygen before applying.
 - (b) Observe bag and make sure that there is only slight deflation when the patient breathes. If marked deflation occurs, increase the flow rate of oxygen bag.
 - (c) Keep the reservoir bag from kinking or twisting and free to expand at all times.
- (8) Clean mask daily and PRN. (*Refer to After Care.*)
- c. Trach Collar or Trach Mask
 - (1) Attach the large-bore tubing coming from the oxygen source to the swivel adapter on the collar.
 - (2) Set oxygen flow rate and concentration as ordered.
 - (a) 8-10 L/minute provides 30-100% oxygen in this high flow system
 - (3) Place elastic strap in one flange of trach collar.
 - (4) Place collar's opening directly over the patient's tracheostomy tube.
 - (5) Slip the unattached end of the elastic strap behind the patient's neck while stabilizing trach collar with free hand. Attach elastic to free flange. Tighten gently.
 - (6) Position wide bore tubing.
 - (7) DO NOT block exhalation port.
 - (8) Assure that nebulizer delivers constant mist.
 - (9) Empty any build-up of condensation every 2 hours.
 - (10) Clean tracheostomy collar as needed.

9. Discard soiled supplies in appropriate containers.

AFTER CARE:

1. Clean oxygen therapy equipment as instructed by respiratory equipment company using cleaning solution. Two sets should be used alternately with one being cleaned while the other in use. (*See Cleaning and Disinfection of Respiratory Therapy Equipment.*)
2. Document in patient's record:
 - a. Date and time oxygen is being used.
 - b. Flow rate and concentration of oxygen.
 - c. Patient's response to oxygen therapy.

Strength of Evidence Level: 3

- d. Findings of physical assessment.
- e. Equipment evaluation for safety, functioning and time of oxygen source change.
- f. Instructions given to patient/caregiver.
- g. Patient/caregiver understanding of instructions using 'teach back' method.

Strength of Evidence Level: 3**PURPOSE:**

To assess patient's lung capacity and ability to push air out of the lungs.

CONSIDERATIONS:

1. Using a peak flow meter is important to determine the patient's lung function.
2. Often times medication is prescribed based on peak flow meter measurements.
3. Measuring lung function is especially important to those with asthma and Chronic Obstructive Pulmonary Disease.
4. Peak flow meter measurements can often times see the onset of a problem before symptoms arise.
5. Peak flow measurements should always be taken around the same time each day.
6. A normal peak flow measurement is based on the race, sex, age and height. A normal reading for a patient can be found by keeping a log of peak flow measurements.
7. When the patient is within 80-100% of their personal best, they are considered to be in the green zone. This means their asthma is under control.
8. When the patient is within in 50-79% of their personal best, this is considered the yellow zone. Patient may need quick relief medications as their asthma is getting worse.
9. When the patient drops below 50% of their personal best, the patient needs to take quick relief medication and seek medical attention immediately.
10. Adults, teenagers and larger children can use a standard peak flow meter. Small children need to use a low range peak flow meter.

EQUIPMENT:

Peak flow meter

Peak flow meter daily log book

PROCEDURE:

1. Have peak flow meter set at the bottom of the scale.
2. Have patient remove any food or gum from his/her mouth.
3. Patient should stand up straight; instruct him/her to take a deep breath in.
4. Creating a complete seal around the mouth piece of the flow meter and keeping the tongue away from the mouthpiece, instruct patient to blow one breath out as fast and hard as possible. The force of the breath will push the marker up the meter giving a measurement of their lung capacity.
5. Document this number.
6. Instruct the patient to perform the measurement 3 more times. The patient has performed the test properly when all the measurements are close together.
7. Once you have documented the measurements, record the highest reading in the patient's log book and in the patient record. The highest measurement, not the average, shows patient's lung

capacity. Be sure to include the time and date that the measurement was taken.

AFTER CARE:

1. Document measurement in patient's record.
2. Contact physician as needed.
3. Instruct patient and caregiver to continue using peak flow meter and to document measurements in patient's daily log book.
4. Instruct patient and caregiver to contact a physician if measurements are below normal for the patient, based on the log book.
5. Instruct the patient to clean the peak flow meter on a regular basis and after each use when the patient is sick.

REFERENCES:

(American Lung Association.). *Measuring Your Peak Flow Rate*. Retrieved July 21, 2010, from <http://www.lungusa.org/lung-disease/asthma/living-with-asthma/take-control-of-your-asthma/measuring-your-peak-flow-rate.html>

(The Ohio State University Medical Center.) *Peak Flow Meter*, Retrieved July 23, 2010 from http://medicalcenter.osu.edu/patientcare/healthcare_services/allergy_asthma/about_asthma/asthma_peak_flow_meter/Pages/index.aspx

Strength of Evidence Level:3**PURPOSE:**

To provide means of draining malignant or persistent pleural effusion.

CONSIDERATIONS:

1. The Pleurx catheter is used primarily for draining persistent or malignant pleural effusion.
2. The catheter is a surgically implanted tunneled tube leading from the pleural space and exiting the body in the area of the upper abdomen.
3. Care of the catheter requires sterile technique and the patient/family should be thoroughly instructed.
4. The insertion site should be assessed for signs/symptoms of infection with each drainage/dressing change.
5. The dressing is changed with each drainage procedure and whenever the occlusive dressing is soiled.
6. The frequency of drainage is determined by the physician's orders. The amount of drainage will change, usually decreasing over time. No more than 1,000 mL (or 2 vacuum canisters) may be drained at any one time. The vacuum canisters are technically 600 mL but only fill to approximately 500 mL.
7. Assess the patient for pain, discomfort or the development of a dry, hacking cough. If the cough occurs, the drainage is to be stopped until the patient is no longer coughing. The procedure may then be reinitiated.
8. Patient may shower when occlusive dressing is intact. Patient may not bathe.
9. Instruct patient to keep scissors and other sharp objects away from catheter.

EQUIPMENT:

Gloves and other personal protective equipment
Pleurx catheter drain/dressing kit
Leak-proof bag

PROCEDURE:

1. Verify physician order for drainage frequency.
2. Adhere to Standard Precautions and hand hygiene.
3. Explain procedure to patient.
4. Prepare materials for procedure.
5. Place leak-proof bag to act as waste receptacle.
6. Open pleurx kit and establish sterile field.
7. Open and place alcohol wipes at field edge.
8. Apply clean gloves and remove old dressing. Place old dressing in waste bag.
9. Clean the cap of the catheter tubing with an alcohol wipe, remove it and discard. The end of the catheter tubing must be protected from soiling once the cap is removed.
10. Remove soiled gloves and perform hand hygiene.
11. Apply sterile gloves and open the pleurx drainage bottle bag. Be sure that all of the clamps on the vacuum bottle are closed and that the green

accordion valve on the vacuum bottle is depressed. If the accordion valve is not depressed, there has been a loss of vacuum. DO NOT use the bottle if the accordion valve is not depressed (i.e., in up position).

12. Remove the plastic cover from the tip of the vacuum bottle tubing and open the slide clamp at the base of the vacuum bottle.
13. Pick up the catheter tubing end in your non-dominant hand and the vacuum tubing tip in your dominant hand. Insert the tip into the catheter end and twist to the right until a "click" is heard.
14. Open the pinch clamp and allow the drainage to begin.
15. Assess the patient for pain, shortness of breath or the development of a dry, hacking cough. If any of the above occurs, the drainage may be slowed by closing the pinch clamp and allowing the patient to relax.
16. After the drainage has stopped (no more than 2 vacuum bottles may be used equaling a total of 1,000 mL), close the pinch clamp securely and disconnect the vacuum tubing tip from the catheter end by turning it to the left until a "click" is heard. Discard the vacuum bottle and tubing in the waste receptacle and wipe the catheter end with an alcohol wipe.
17. Place the new cover cap on the catheter end.
18. Assess the catheter insertion site for signs/symptoms of infection. Clean the area with an alcohol pad, cleaning in a circular motion starting from the insertion site and working outward.
19. Place the split foam catheter pad over the insertion site and curl the tubing up over the pad.
20. Cover foam pad and curled tubing with 4x4's and then cover the entire area with the clear occlusive dressing from the kit. Make sure the edges of the occlusive dressing are secure.
21. Place all paper refuse in a waste receptacle, discard gloves and tie off waste bag.
22. Perform hand hygiene.

AFTERCARE:

1. Document in patient's record:
 - a. Time and date of the procedure.
 - b. Amount, color and quality of the drainage fluid.
 - c. The patient's tolerance/response to the procedure.
 - d. The condition of the insertion site and surrounding skin.
 - e. Instructions given to the patient/caregiver.
 - f. Communication with physician.

Strength of Evidence Level: 3**PURPOSE:**

To obtain specimen for the culture of respiratory pathogens by tracheal suctioning via nasopharyngeal route.

CONSIDERATIONS:

1. Sputum is a mucous secretion produced in the lungs and bronchi. There are several methods of obtaining specimens:
 - a. Expectoration.
 - b. Tracheal suction.
2. Mouth care is given prior to specimen collection to decrease contamination with oral bacteria and food, if specimen is obtained by expectoration. (Literature suggests that specimen should be collected prior to brushing teeth or using mouthwash, only using water to clean mouth.)
3. It is optimal to schedule specimen collection prior to breakfast.
4. Oxygen-dependent patients should receive oxygen before and after tracheal suctioning.
5. Specimen must be transported in appropriately marked leak-proof, unbreakable container.

EQUIPMENT:

Impervious trash bag

Sterile specimen container or in-line collection trap

Tissues

Basin

Cup with mouthwash

Suction catheter

Sterile gloves

Flashlight

Tongue blade

Normal saline

Gloves

Mask, goggles

[**Note:** Tracheal suction kit will include sterile suction catheter and gloves.]

PROCEDURE:

1. Adhere to Standard Precautions.
2. Expectoration:
 - a. Explain procedure to patient.
 - b. Position patient in high-Fowler's position.
 - c. Have patient rinse mouth with water.
 - d. Instruct patient to breathe deeply, cough and expectorate into sterile container. Instruct patient to avoid touching the inside of the container.
 - e. Cap and label container immediately. Note on label any antibiotic therapy patient is receiving or has recently completed.
 - f. Offer tissue to patient to wipe mouth.

3. Tracheal suction:
 - a. Explain procedure to patient.
 - b. Check suction machine to be sure that it is operating correctly.
 - c. Fill basin with normal saline.
 - d. Place patient in semi- to high-Fowler's position.
 - e. Connect in-line trap collection container to the suction tubing.
 - f. Put on gloves. Attach sterile suction catheter to tubing of specimen trap container.
 - g. Instruct patient to tilt head back. Lubricate catheter with normal saline and gently pass suction catheter through nostril.
 - h. If obstruction felt in nares, attempt other side.
 - i. As catheter reaches juncture of larynx, patient will cough. Immediately pass catheter into trachea. At this time, instruct patient to take several deep breaths to ease passage of catheter.
 - j. Apply suction for 5 to 10 seconds. Discontinue suction and remove catheter.
 - k. Detach catheter from specimen trap. Holding the catheter in gloved hand, remove glove, enclosing the catheter, and dispose in impervious bag.
 - l. Disconnect specimen container from suction machine, leaving tubing attached to lid. Seal container by looping tubing to other opening on lid.
 - m. Label container. Note on label any antibiotic therapy patient is receiving or has recently completed.
4. Discard soiled supplies in appropriate containers.
5. Transport specimen in an appropriate container.

AFTER CARE:

1. Document in patient's record:
 - a. Time, date and delivery of specimen to laboratory.
 - b. Color, consistency and odor of sputum.
 - c. Method of specimen collection.
 - d. Patient's response to procedure.
 - e. Communication with physician.

Strength of Evidence Level: 3**PURPOSE:**

To maintain oxygenation by removing the secretions from the trachea to prevent occlusion of the airway.

CONSIDERATIONS:

1. Whenever possible, the patient should be encouraged to clear airway by directed cough or other airway clearance technique. The need for suctioning procedure needs to be established (i.e., coarse breath sounds, noisy breathing, etc.).
2. Tracheal suctioning may be accomplished by means of a suction catheter inserted through mouth, nose, tracheal stoma, tracheostomy or endotracheal tube.
3. Nasotracheal and oral-tracheal suctioning are clean procedures. Tracheostomy suctioning is generally a clean procedure. If tracheostomy is new (within 4 to 6 weeks) or patient is immuno-compromised, sterile technique should be used. If both oral/nasal tracheal suctioning must be done during the procedure, begin with tracheal suctioning then continue with oral/nasal suctioning.
4. Suctioning removes not only secretions but also oxygen. If patient has oxygen ordered, patient should be hyperoxygenated with 100% oxygen before and after suctioning. Be sure to return oxygen to previously prescribed liter flow and concentration after procedure is completed.
5. If patient has a tracheostomy tube, keep extra sterile tracheostomy tubes of the same size and obturator on hand in case of accidental expulsion or blocked tube.
6. If patient has a cuffed tracheostomy tube, deflation prior to suctioning is not required.
7. Indications that the patient requires suctioning include:
 - a. Noisy, moist respirations.
 - b. Increased pulse.
 - c. Increased respirations.
 - d. Non-productive coughing.
 - e. More frequent or congested sounding coughs.
 - f. Visible secretions.
 - g. Increased shortness of breath.
8. Avoid unnecessary suctioning as the tracheal mucosa may become irritated and infection may be introduced.
9. If the patient is receiving nasotracheal suctioning, he/she should be instructed to take deep breaths as the catheter is advanced.
10. Tenacious secretions may be liquified by instilling 3-5 mL of normal saline into the trachea, if ordered by the physician. Humidification of the airway is essential to keeping secretions loose and easily removed. Keeping the patient well hydrated will also assist in maintaining loose secretions. Adequate humidification in the home environment is also important.

11. During performance of this procedure, the patient should be observed for:
 - a. Hypoxia.
 - b. Bronchospasm.
 - c. Cardiac arrhythmias.
 - d. Bloody aspirations.
 - e. Hypotension.
12. To avoid damage to the airways and hypoxia, suction should be applied intermittently for periods not to exceed 5 to 10 seconds. Suction catheter should not be left in trachea for longer than 10 seconds. Suction should be set at ≤ 120 mmHg. Intermittent suction is applied as catheter is withdrawn only. Reoxygenate between attempts. Maximum number of attempts should be 2 suction passes/episode.
13. Suction catheter size should be no more than 1/2 (one-half) the internal diameter of the artificial airway to avoid greater negative pressure in the airway and potentially minimize the PaO₂.
14. DO NOT force the suction catheter into the airway beyond resistance.

EQUIPMENT:

Oxygen source, if patient has oxygen ordered

Suction machine and suction catheter

Distilled water

Gloves

Clean suction catheter with control valve or Y connector (diameter should be no larger than half the diameter of tracheostomy tube)

Clean solution container

Impervious trash bag

Sterile, water-soluble lubricant, if catheter is to be inserted through the nasal passage

Tissues

PROCEDURE:

1. Verify physician's order for suctioning.
2. Adhere to Standard Precautions.
3. Explain procedure to patient.
4. Prepare suction machine according to manufacturer's instruction.
5. Set suction pressure between 100-120 mm Hg.
6. Evaluate lung fields by auscultation.
7. Place patient in semi-Fowler's position to promote lung expansion.
8. Prepare suction catheter:
 - a. Set up clean work field.
 - b. Obtain clean suction catheters.
 - c. Pour distilled water or sterile saline into clean solution container.
 - d. Put on gloves.
 - e. Connect suction catheter to suction machine and turn on machine.

Strength of Evidence Level: 3

9. Place catheter tip in distilled water, occlude catheter port with thumb and suction a small amount of water through the catheter.
 10. Encourage patient to take several deep breaths prior to start of suctioning.
 11. Suctioning procedure - Mouth, Throat:
 - a. Dip catheter tip into sterile normal saline/sterile water to lubricate outside and facilitate insertion.
 - b. Insert catheter into mouth and/or back of throat.
 - c. Cover suction catheter port with thumb and suction intermittently while rotating catheter.
 - d. Perform procedure intermittently until secretions are cleared.
 12. Suctioning procedure - Nasal insertion:
 - a. Lubricate tip of catheter with sterile, water-soluble lubricant.
 - b. Remove oxygen delivery device, if applicable, and insert catheter into the nares during inhalation and gently advance the catheter without applying suction.
 - c. Insert catheter about 20 cm in adults, 14-20 cm in older children, 14-20 cm in young children and 8-14 cm in infants.
 - d. Cover suction catheter port and suction intermittently while rotating catheter. Apply intermittent suction while withdrawing the catheter.
 - e. Perform procedure until secretions are cleared. Allow time between suction passes for ventilation and oxygenation. Avoid tiring patient or precipitating hypoxia.
 - f. Rinse the catheter and connection tubing with normal saline or water until cleared. Dispose of the catheter once suctioning is completed.
 13. Suctioning procedure - Tracheostomy:
 - a. Check tracheostomy tube to make sure it is tied securely.
 - b. Dip catheter tip into sterile, normal saline to lubricate outside and facilitate insertion.
 - c. Insert catheter into tracheostomy or trach tube.
 - d. DO NOT force catheter beyond point of resistance.
 - e. Cover suction catheter port intermittently.
 - f. Slowly withdraw and rotate catheter to clear secretions. DO NOT exceed 10 seconds.
 - g. Before reinserting catheter allow patient to rest and encourage taking 2 or 3 deep breaths. Re-oxygenate patient, if needed.
 - H If fenestrated tracheostomy, change inner cannula without hole.
 14. Rinse the suction catheter with distilled water between insertions.
 15. Monitor patient's respiratory status during procedure. If patient becomes short of breath, agitated, or hypoxic, discontinue suctioning and oxygenate the patient.
 16. At conclusion of procedure, instruct patient to take several deep breaths. Hyperoxygenate for several minutes if a patient has oxygen ordered.
 17. Return oxygen liter and concentration rate to normal, if patient is on continuous oxygen.
 18. Auscultate lungs; assess pulmonary status, skin color, and vital signs. Monitor the patient for adverse reactions.
 19. Clear catheter and connecting tubing by aspirating remaining water solution.
 20. Turn off suction. Disconnect catheter.
 21. Discard soiled supplies in appropriate containers.
- AFTER CARE:**
1. Disassemble suction catheter and solution container and clean suction lines and reservoir bottle. (*See Cleaning and Disinfection of Respiratory Therapy Equipment.*)
 2. Clean hands per appropriate hand hygiene procedure.
 3. Document in patient's record:
 - a. Patient's response to procedure.
 - b. Amount, viscosity, odor and color of secretions.
 - c. Findings of cardiopulmonary assessment before and after treatment.
 - d. Oxygenation before, during and after treatment.
 - e. Instructions given to patient/caregiver.
 - f. Patient/caregiver understanding of instructions using the 'teach back' method.
 - g. Communication with physician.

Strength of Evidence Level: 3**PURPOSE:**

To minimize infection and maintain airway.

CONSIDERATIONS:

- Generally in homecare, tracheostomy care is a clean procedure. If the tracheostomy is new (within 4 to 6 weeks) or patient is immuno-compromised, sterile technique should be used. Sterile technique is also recommended if infection is present (until infection resolved) or if the caretaker has an infection.
- Tracheostomy tubes should be changed every 3 to 4 weeks in adults and every 1 to 2 weeks in children. Verify physician order to change trach tube.
- It is recommended that suctioning equipment be kept available for an emergency, especially for patients with new tracheostomy tubes or when the patient's condition requires suctioning to control secretions.
- Keep two extra sterile tracheostomy tubes and obturators on hand in case of accidental expulsion of the tube or blocked tube. One tube should be the same size the client currently has and one tube should be one size smaller.
- Outer cannula can only be changed:
 - After obtaining physician's order.
 - After outer cannula has previously been changed without problems at doctor's office, hospital or clinic.
- Cuff should only be inflated with a minimally occlusive volume to maintain seal. A cuff pressure measuring device may also be used to check the cuff pressure.
- Many masks/mouthpieces distributed for protection while performing artificial respiration are not adaptable for use with a tracheostomy tube. When a patient has a tracheostomy tube and has not been designated as do not resuscitate, special equipment such as a manual bag-valve-mask resuscitator or a mask/mouthpiece that can be used with a tracheostomy tube should be available to protect the nurse, if artificial ventilation is needed.
- It is recommended that patient be given nothing by mouth (NPO: Nulla Per Os) or has tube feedings held for at least 1 hour before procedure.

EQUIPMENT:

Gloves and other personal protective equipment, as needed (including face shield)

2 sterile tracheostomy tubes (1 being the size of the one in place and 1 a size smaller)

Obturator

Water-soluble lubricant

Scissors

Normal saline

Distilled water

Mirror

4x4 pre-cut gauze tracheostomy or pre-cut surgical sponge dressing

Twill tape or Velcro tracheostomy tube holder.

Magic slate or pad for messages

4x4 gauze sponge soaked with normal saline

5-10 mL syringe for cuffed tracheostomy tube

Suctioning equipment

PROCEDURE:

- Adhere to Standard Precautions.
- Explain procedure to patient and caregiver.
- Prepare new tracheostomy tube for insertion:
 - Test - inflate the cuff on cuffed tubes.
 - Fold one end of twill tape up 1/2 (one-half) inch and make a 1/4-inch slit; prepare two pieces, one larger than the other, in this manner.
 - Slip slit end through side of outer cannula and pull twill tape through slit. Repeat on other side with second piece of twill tape.
 - If client has a Velcro tracheostomy tube holder, place narrow ends of ties under and through the faceplate slits. Pull ends even and secure with Velcro holders.
 - Remove inner cannula.
 - Insert obturator in outer cannula.
 - Apply a thin film of water-soluble lubricant to the surface of the outer cannula and the tip of the obturator.
- Suction patient via tracheostomy tube. If cuffed tube is in place, suction orally.
- Check to see if patient has cuffed tracheostomy tube in place. If he/she does, deflate by attaching a 5-10 mL syringe into the cuff balloon and slowly withdrawing all air from the cuff. Note amount of air withdrawn.
- Prepare to remove the old tube (allow patient to use mirror if he/she is learning to perform this procedure). Use scissors to cut the twill ties on the old tube. If patient has Velcro tracheostomy tube holder, undo the tabs attached to the Velcro fastener.
- Remove the old tube by the neck flange using an outward and downward motion. Removal of the tube may trigger a coughing spasm. If coughing produces secretions, cleanse stoma with gauze soaked with normal saline before inserting new tube.
- Tell patient to take a deep breath and insert new outer cannula with obturator while pushing back and then down. The tube will slide into place as gentle, inward pressure is applied.
- Once the cannula is properly inserted, immediately remove the obturator and hold tube in place until the patient's urge to cough subsides.
- Ensure that there is air exchange through the tube.

Strength of Evidence Level: 3

11. Instruct the patient to flex his/her neck and bring twill ties around to the side of the neck to tie them together in a square knot. Closure on the side will allow easy access and prevent necrosis at the back of the neck when patient is supine. Check ties to make sure they are tight enough to avoid slippage but loose enough to avoid jugular vein constriction or choking. If the patient has a Velcro tracheostomy tube holder, maintain secure hold on tracheostomy tube. Align strap under patient's neck and secure with Velcro fastener. You should be able to slip only one or two fingers between the collar and neck.
12. If tube is cuffed, reinflate:
 - a. Attach 5 mL syringe filled with air to the cuff pilot balloon.
 - b. Slowly inject amount of air (usually 2-5 mL) necessary to achieve an adequate seal.
 - c. Use a stethoscope during cuff inflation to gauge the proper inflation point. During inspiration, place the stethoscope on one side of patient's trachea. Use either minimal leak technique (small air leak or rush of air heard over larynx during peak inspiration) OR minimal occlusive cuff inflation technique (no air leak) for adequate cuff inflation.
 - d. No air should be coming from mouth, nose or around tube.
 - e. If the tubing does not have a one-way valve at the end, clamp the inflation line with a hemostat.
 - f. Remove syringe.
 - g. Check for air leaks from cuff. Air leaks may be present if you cannot inject the same amount of air withdrawn, if the patient can speak, and/or if the ventilator fails to maintain adequate tidal volumes.
13. Insert inner cannula and lock in place.
14. Check air exchange by holding hand over cannula.
15. If patient is ventilator dependent, connect to ventilator and observe for chest excursion.
16. Apply tracheostomy dressing around tracheostomy tube, if desired.
17. Discard soiled supplies in appropriate containers.

AFTER CARE:

1. Clean reusable equipment. (*See Cleaning and Disinfection of Respiratory Equipment*)
2. If tracheostomy tube is disposable, discard per agency policy.
3. Document in patient's record:
 - a. Date and time of the procedure.
 - b. Size and type of tube inserted.
 - c. Quality and quantity of secretions.
 - d. Assessment of the stoma site and surrounding skin.
 - e. Patient's respiratory status.
 - f. Duration of cuff deflation.
 - g. Amount of air used for cuff inflation.
 - h. Patient's response to procedure.
 - i. Complications.
 - j. Instructions given to patient/caregiver.
 - k. Patient/caregiver understanding of instructions.
 - l. Patient's response to procedure.
 - m. Communication with physician.

Strength of Evidence Level: 3**PURPOSE:**

To deliver large volumes of wetting agents to the lungs for the purpose of mobilizing thick secretions and creating productive coughing.

CONSIDERATIONS:

1. The nebulizer converts an electric current to sound waves. These sound waves transform water into fine mist particles, which form a dense fog.
2. Since the nebulizer delivers a large volume of fluid to the lungs, the patient must be observed for signs of over hydration:
 - a. Pulmonary edema.
 - b. Rales.
 - c. Electrolyte imbalance.
 - d. Weight gain.
3. Ultrasonic treatments might trigger bronchospasms in patients with asthma.
4. To prevent mechanical hazards, only equipment recommended by the manufacturer should be used. If any defect is suspected or observed in the device, the medical equipment supplier should be notified immediately.
5. The electrical equipment should be properly grounded. Extension cords should not be used unless the use and type of cord is approved by the manufacturer or supplier.
6. Nebulizer should be placed where there is adequate ventilation to prevent unit from overheating.
7. If nebulizer is powered by an oxygen source, all oxygen precautions should be observed.
8. Since a large volume of mist is delivered directly into the lungs, scrupulous attention must be given to cleaning and care of equipment to reduce bacterial contamination.

EQUIPMENT:

Ultrasonic nebulizer
 Oxygen tubing
 Mouthpiece or mask
 Sterile distilled water
 Suction equipment (optional)
 Cleansing agent
 Wetting agent
 Gloves and other protective equipment, as necessary

PROCEDURE:

1. Adhere to Standard Precautions.
2. Explain procedure to patient.
3. Review order for use of ultrasonic nebulizer, which should include:
 - a. Type of wetting agent.
 - b. Frequency of use.
 - c. Mode of aerosol delivery (mouthpiece or mask).
 - d. Duration of use, i.e., one month, six months.
 - e. Length of treatment.
4. Prepare nebulizer for use:
 - a. Fill nebulizer cup with prescribed wetting agent or sterile distilled water; attach to nebulizer.
 - b. Attach breathing tubing to ultrasonic nebulizer or oxygen source.
 - c. After solution has been added to nebulizer cup, turn nebulizer on and observe for visible mist production.
 - d. If no visible mist is produced:
 - (1) Check electrical connection.
 - (2) Check to verify that all switches are on.
 - (3) Check water levels in reservoir and coupling chamber.
 - (4) Check air supply and check for obstruction in breathing tubing or mouthpiece.
5. Apply mask or mouthpiece.
6. Encourage patient to breathe slowly and deeply with a brief pause (2 to 3 seconds) before breathing out, so the mist can penetrate to the lower bronchial tree.
7. Assess vital signs, observe for rales and wheezes.
8. At conclusion of treatment, encourage coughing and expectoration of secretions. Suctioning may be required.
9. Discard soiled supplies in appropriate containers.

AFTER CARE:

1. The ultrasonic nebulizer cup, delivery tubing, mask and/or mouthpiece should be disinfected daily. (*See Respiratory - Cleaning and Disinfection of Respiratory Equipment.*)
2. Medications should be stored in a cool, dry place. Teach patient to check them often for change in color or formed crystals.
3. Document in patient's record:
 - a. Date, time, duration of therapy.
 - b. Medication administered.
 - c. Findings of respiratory assessment.
 - d. Patient's response to procedure.
 - e. Mucous viscosity and production.
 - f. Instructions given to patient/caregiver.
 - g. Patient/caregiver understanding of instructions and equipment set up and maintenance.
 - h. Patient and caregiver understanding of safety practices.
4. Refer to manufacturer's instructions for equipment maintenance.

Agency Name (ZONE tool utilized by HomePlus in Elkins, WV)

Self-Management for COPD

<p align="center">GREEN ZONE = ALL CLEAR</p> <ul style="list-style-type: none"> • No cough, wheeze, chest tightness, or shortness of breath during the day or night • No decrease in your ability to maintain normal activity 	<p align="center">GREEN ZONE MEANS:</p> <ul style="list-style-type: none"> • Your symptoms are under control • Continue taking your medications as ordered • Follow low salt diet • Keep all physician appointments
<p align="center">YELLOW ZONE = CAUTION</p> <ul style="list-style-type: none"> • Sputum (phlegm) that increases in amount or color or becomes thicker than usual • Increased cough or wheezing even after you take your medication and it has time to work • Increased swelling of ankles or feet • Increased shortness of breath with activity • Weight loss or gain of 3 lbs. • Fever of 100.5F oral or 99.5F under your arm • Increased number of pillows needed to sleep or need to sleep in chair • Anything else unusual that bothers you • Call your Home Health Nurse and/or Physician if you are in the yellow zone. 	<p align="center">YELLOW ZONE MEANS:</p> <ul style="list-style-type: none"> • Add "Quick Relief Medicine" _____ • Your symptoms may indicate that you need an adjustment in your medication • Call your Home Health Nurse or Physician <div align="right" data-bbox="1570 673 1759 857"> </div> <p>Agency Name Agency Phone Number</p>
<p align="center">RED ZONE – "MEDICAL ALERT"</p> <ul style="list-style-type: none"> • Unrelieved shortness of breath • Unrelieved chest pain • Wheezing or chest tightness • Increased or irregular heart beat • Change in color of your skin, nail beds, or lips to gray or blue • Mental changes • Chest pain or pain that worses when you breathe or cough <p>CALL YOUR PHYSICIAN AND/OR HOME HEALTH NURSE IF YOU ARE IN THE RED ZONE IN AN EMERGENCY SITUATION CALL 911</p>	<p align="center">RED ZONE MEANS</p> <p>This indicated that you need to be evaluated by a physician right away.</p> <p>Primary MD _____ Telephone _____</p> <p>Agency Name Agency Phone Number</p> <p align="center">IN AN EMERGENCY SITUATION CALL 911</p>

Agency Name (ZONE tool utilized by HomePlus Elkins, WV)
Self Management Plan for Respiratory Disease

Name: _____

Date: _____

<p align="center">Green Zone = "All Clear"</p> <ul style="list-style-type: none"> • No shortness of breath • No need to use your rescue inhalers • No decrease in your ability to maintain normal activity level 	<p align="center">Green Zone Means:</p> <ul style="list-style-type: none"> • Your symptoms are under control • Continue taking your medications • Continue using your inhaler and / or nebulizer • Keep your Home Care Nurse appointments • Keep physician appointments
<p align="center">Yellow Zone = "Caution"</p> <p>If you have any of the following signs or symptoms</p> <ul style="list-style-type: none"> • Increased shortness of breath, which is relieved with fifteen minutes of rest • Increased cough and / or your mucus changes in color, consistency or amount • Increased shortness of breath with activity • Increased tiredness without any reason • Irritability, confusion and / or headaches • Increased number of pillows needed to sleep or need to sleep in a chair • You have a temperature of 100.5° or greater 	<p align="center">Yellow Zone Means:</p> <ul style="list-style-type: none"> • Your symptoms indicate that you may need an adjustment in your medications and / or treatments • You may have a Respiratory infection • Call your Home Health Nurse and/or your physician <p align="center">Agency Name 24 hour phone number is: Agency Phone Number</p> <p>Primary MD: _____ Phone Number: _____ <i>(Please notify your Home Care Nurse if you contact or go see your MD)</i></p>
<p align="center">Red Zone = "Medical Alert"</p> <ul style="list-style-type: none"> • Unrelieved shortness of breath even after taking your medication and treatments • Increased confusion • Wheezing or chest tightness at rest • You have trouble walking • Mental changes • You have trouble staying awake • Your lips or fingernails are blue or gray 	<p align="center">Red Zone Means:</p> <p align="center">Call 911 immediately</p> <p>Primary MD: _____ Phone Number: _____ Agency Name 24 hour phone number is: Agency Phone Number</p> <p><i>(Please notify your Home Care Nurse if you go to the emergency room or are hospitalized)</i></p>

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