

Perspectives

Recovery Strategies from the OR to Home

ABSTRACT

Excess body weight is a threat to health, because it is associated with an increase of cardiovascular disease, type-2 diabetes, hypertension, infertility, stroke, hyperlipidemia, degenerative joint disease, gallstones, and some types of cancers. When hospitalized, very overweight patients are at risk for certain hazards of immobility that contribute to pulmonary complications such as atelectasis, pneumonia, and delayed or traumatic intubation, and that exacerbate pre-existing conditions, such as overweight hypoventilation syndrome or sleep apnea. In their article, Dr. Gallagher, an expert in the field of bariatrics, and David Seigel, a respiratory therapist, point out patient-care activities such as airway management can become more complex because of obesity.

Nurses and respiratory care professionals often care for patients with tracheostomy tubes in critical care settings and other patient care units. The need for a tracheostomy may extend to several months, and some patients may require a permanent tracheostomy. As a result, many patients are discharged from hospital to home before they are ready to be decannulated. When a patient requires a tracheostomy tube for an extended length of time, good home care management is essential. Ms. Dixon identifies three key phases of a program to facilitate the transition from acute care to home care: management, prevention and wellness.

Advisory Board

Cheryl Bressler, MSN, RN, CORLN

Oncology Nurse Specialist, Oncology Memorial Hospital, Houston, TX

Lois Dixon, MSN, RN

Adjunct Faculty, Trinity College of Nursing, Moline, IL
Pulmonary Staff Nurse, Genesis Medical Center, Davenport, IA

Jan Foster, RN, PhD, MSN, CCRN

Asst. Professor for Adult Acute and Critical Care Nursing
Houston Baptist University, TX

Mikel Gray, PhD, CUNP, CCCN, FAAN

Nurse Practitioner/Specialist, Associate Professor of Nursing,
Clinical Assistant Professor of Urology, University of Virginia,
Department of Urology, Charlottesville, VA

Victoria-Base Smith, PhD(c), MSN, CRNA, CCRN

Clinical Assistant Professor, Nurse Anesthesia,
University of Cincinnati, OH

Mary Sieggreen, MSN, RN, CS, NP

Nurse Practitioner, Vascular Surgery, Harper Hospital, Detroit, MI

Franklin A. Shaffer, EdD, DSc, RN

Vice-president, Education and Professional Development,
Executive Director, Cross Country University

Airway Management in Special Patient Populations

Obesity, the Lungs, and Airway Management

by Susan Gallagher, RN, CNS, PhD and David Seigel, RRT



Obesity is emerging as a major public health concern. Well-documented evidence shows that it is the second-leading cause of preventable, premature death, second only to cigarette smoking. More than 400,000 people in the U.S.A. die each year as the result of weight-related issues.¹

The word *obesity* originates from Latin and refers to the state of becoming “fattened by eating.” Obesity is most simply considered as a condition of excess energy stores in the form of fat. In reality, it is a very complicated phenomenon with a number of complex etiologies. The American Society of Bariatric Surgery (ASBS) describes obesity as a lifelong, progressive, life-threatening, genetic-related, multifactorial disease of excess fat storage with multiple comorbidities.²

Bariatrics is a term derived from the Greek word *baros* (*weight*), and it is used today to refer to healthcare relating to the treatment of obesity and associated conditions. The specialty of bariatrics is becoming more important as the number of obese Americans is increasing. The implication for healthcare providers is that patient-care activities, such as care planning, repositioning, airway management, and other tasks, can become more complex because of obesity.

Overweight and obesity are common health conditions, and their prevalence is increasing nationally and globally. Recent estimates suggest that over 67% of

U.S. adults are overweight, as indicated by a body mass index (BMI) greater than 25.² Of all Americans between the ages of 26 and 75, from 10% to 25% are obese—a rise of greater than 25% over the past three decades.² This increase has occurred regardless of age, gender, ethnicity, socioeconomic status, or race.

What is obesity?

To understand fully the meaning of these statistics, it is important to know how overweight and obesity are defined and measured. The value of standardized measurement and definition is that all stakeholders can speak the same language. Policy makers, insurance carriers, institutions, administrators, and clinicians who use standardized measurement and definition can use universal criteria to make changes and develop policies.

Overweight, by definition, refers to an excess of body weight as compared to set standards. The excess weight may come from muscle, bone, fat, and/or water. Obesity refers specifically to the abnormal proportion of body fat. One can be overweight without being obese; for example, the body builder or other athlete may have a greater than average muscle mass. However, many overweight people are also obese.

Body mass index (BMI) is the most common and widely accepted method of measuring overweight and obesity. BMI

Continued on page 4

Airway Management in Special Patient Populations

Tracheostomy: Easing the transition from hospital to home

by Lois Dixon, MSN, RN

Nurses and respiratory care practitioners often care for patients with tracheostomy tubes in critical-care settings and other patient-care units. The need for a tracheostomy may extend to several months or even years; some patients may require a permanent tracheostomy. As a result, many are discharged from hospital to home before they are ready to be decannulated.

When a patient requires a tracheostomy tube for an extended length of time, home care management is a reasonable goal. Fitton¹ identifies three key phases of a program to facilitate the transition from acute care to home care: management, prevention, and wellness. This article outlines the nursing care of patients with a long-term tracheostomy within this framework.

Management

The nurse plays an important role in assuring the continuity of care to patients after hospital discharge. The nurse reinforces the patient's previous learning about care and other aspects of airway maintenance, based on the assessed needs and level of family functioning.²

Respiratory assessment

Decision-making and the development of assessment skills are the primary focus of education, once the patient and family master the necessary technical skills. Because many home-care patients and their families are the primary care-

givers, they must be able to evaluate the patient's respiratory status and know how to act appropriately in response.

The patient and family should become familiar with the patient's normal respiratory pattern, so they can promptly and safely intervene to prevent or manage any abnormal changes.¹ The more that a patient or caregiver listens to respirations, the more able they are to determine changes from normal respiratory patterns. Encouraging other caregivers to spend time with the patient while still hospitalized will help to develop these assessment skills.³ Problem solving is fostered by the active participation of both patient and caregiver.⁴

Suctioning

In addition to learning proper suctioning technique, it is imperative that both patient and caregiver recognize the indications for suctioning (table 1). The nurse teaches them how to suction the airway, based on the assessment of the patient's pulmonary needs. The frequency of suctioning varies for each patient. The nurse evaluates the patient's ability to suction the tracheostomy and clean the inner cannula and reinforces the teaching, when necessary.

The purpose of changing the tracheostomy tube is to minimize infection and granulation tissue formation.¹ The frequency of changes varies but is usually at least once monthly.⁵ In most cases, patients can change the tracheostomy tube at home once they are proficient and confident in their ability.

The nurse involves the patient and caregiver in this process, offering encouragement and support, until they are able to change the tracheostomy tube and tracheostomy ties independently. Emphasis is placed on properly securing the tube to avoid accidental decannulation. While the use of twill tracheostomy ties is wide-

spread, a Velcro tracheostomy tube holder is usually easier for the patient to manipulate independently.

Humidification

Adequate humidification of the trachea is very important. Inspired air that bypasses the nose and enters directly through the tracheostomy tube is deprived of all natural moisturizing benefits of the upper airway passages. The importance of humidification in reducing the thickness of secretions and build-up of crusty formations should be discussed with the patient.⁵ Symptoms of insufficient humidity include⁶:

- increased, nonproductive sputum coughing
- a change of mucus from thin to a thick, sticky consistency and from clear to pale yellow or other color
- shortness of breath from a mucous-plug obstruction
- blood-streaked mucous
- noisy, labored respirations

For patients who are very young or bedridden, a tracheostomy collar and a warm humidification system is recommended.^{1,3} Adequate fluid intake (2000-2500 mL/day) will help moisten the tracheal tissues and thin secretions.³

Nutrition

The patient should be evaluated for nutritional well-being and wound healing. The nurse stresses the relationship between good nutrition, meticulous skin care, and the prevention of wound infection.⁵ The patient with a tracheostomy is at risk of nutritional deficiency, because of altered anatomy and decreased taste and smell sensations.⁵ To counter these problems, the patient is encouraged to maintain good oral hygiene and eat high-caloric snacks, if not medically contraindicated. Maintenance of weight is one objective measure of nutritional adequacy.

Activities of daily living

Most patients may resume usual activities within four to six weeks after hospital discharge.⁷ It is important that the patient understands any limitations of activity.⁸

Because of structural changes that occur with a tracheostomy, the airway is largely unprotected from natural elements—for example, water and dust. The nurse explains the importance of protecting the tracheostomy stoma from the aspiration of fluids or other irritating

Table 1. Indications for Suctioning

- Noisy or moist-sounding respirations
- Increased or labored respirations
- Nonproductive coughing
- Crackles or wheezes
- Patient request
- Tube changes

substances. Particular care must be taken during bathing and showering. The use of a shower shield or tracheostomy cap prevents the accidental entry of water into the trachea during bathing.

The patient with a tracheostomy is also vulnerable to respiratory tract infection because of the loss of filtration of inspired air through the nasal passages. The patient should be instructed to avoid powders, aerosols, and talcums. These substances may be accidentally inhaled through the trachea and cause tracheal damage, leading to infection.⁹ A specially designed latex-free tracheostomy tube holder (Dale Medical Products) can prevent latex hypersensitivity.

Prevention

Emergency care

The training of patients and primary caregivers in emergency procedures is an essential component of successful home management. Knowledge of resuscitation techniques is necessary in case of occluded tracheostomy tube, accidental decannulation, immersion in water, massive bleeding from the tracheostomy, or aspiration.¹ The basics of cardiopulmonary resuscitation (CPR) are universal to all protocols for emergency care: airway management, rescue breathing, and circulatory support.

The modification of skills for tracheostomy CPR involve airway management, the use and maintenance of tracheostomy tubes, and the comfortable use of respiratory support equipment.¹⁰ Often, teaching CPR to families of patients with tracheostomies is based on adaptation of basic life-support standards by individual CPR instructors.¹⁰ The major adaptation is learning mouth-to-mouth rescue breathing while the stoma is covered.

Equipment for tracheostomy emergencies should always be accessible. A portable oxygen source, a suction unit, a manual resuscitation bag, extra tracheostomy tubes, and an obturator are necessary. The family is encouraged to keep a list of emergency numbers by the telephone.

Infection control

Although the sterile technique is used in acute care, a clean technique that emphasizes good hand-washing and appropriate cleaning of respiratory equipment is recommended for home care.¹ The patient and family are instructed to change tracheostomy dressings that are soiled or moist. These dressings can harbor bacteria, which contribute to skin



Figure 1. Tracheostomy holder (Dale Medical)

breakdown and infection at the tracheal stoma site. Careful daily assessment of the stoma for the cardinal signs of infection (redness, drainage, swelling, pain) will alert the patient early of infection and will prompt treatment.

The patient with a tracheostomy is also at risk for infection of the pulmonary tree. Bronchopulmonary infections occur because the tracheostomy bypasses the protective upper airway mechanisms such as filtering, warming, and humidifying the inhaled air. Retained secretions due to decreased mucociliary action and an ineffective or absent cough reflex provide an excellent medium for bacterial growth. Proper suction technique reduces the chance of mucosal trauma that may lead to tracheal infection, and it prevents the introduction of bacteria into the trachea.

The patient's neck is another common site of skin breakdown and potential infection, related to the tracheostomy-securing device—most often twill ties. Tissue damage occurs under the ties, which act as a constricting band that puts greater pressure on neck tissues. This pressure decreases the capillary blood supply (ischemia) and may eventually lead to tissue ulceration.³ An alternative to traditional twill ties is the Velcro neckband, which secures the tracheostomy tube. Because of its design (wide neck band and elastic insert to allow for movement or cough), this device helps to prevent skin breakdown by reducing the amount of pressure on neck tissue.

Wellness

Educational needs

Learning self-care is important for patients with long-term tracheostomies, because it provides them with a sense of self-control and reduces dependency on others. However, significant partners or family members must be able to provide all aspects of tracheostomy care and other facets of airway management in emergency situations or when the patient is not able to participate in self-care for any reason, such as age or lack of dexterity.

Education should begin well before hospital discharge to provide sufficient time for the patient and other caregivers to learn appropriate procedures. Because of the large volume of information to be learned, the patient and family are often anxious about home management. When the family assumes the role of primary caregiver, nurses and respiratory care professionals must emphasize the emotional aspects of this role in addition to skill development. Careful education and preparation for home management before discharge can reduce anxiety.

Stressors and supports

To promote successful home management, the nurse needs to be knowledgeable about current home-care trends. Nurses and respiratory care professionals should continually update their knowledge about home equipment, community resources, and nursing skills in preparation for acting as resources for patients and their families.

Once the patient is home, the community or home-health nurse is involved in monitoring and evaluating how well the patient and family are adapting to home care. The nurse addresses any adaptation problems that the patient or family may experience. The nurse listens when the patient expresses anxiety and frustration and offers appropriate support and encouragement.

The patient and family may view the illness and tracheostomy as a loss of independence and may need help to grieve this loss.¹¹ Grieving is a developmental task that the patient and family may need to address before they can psychologically cope with home-care education. The variety of emotions provoked by the patient with the tracheostomy tube influences all levels of family relationships.¹¹ The nurse plays a key role in helping the patient and family to explore their feelings, reassuring them when necessary, and making appropriate referrals for support when needed.

Support services for the patient and family can often be identified before hospital discharge. Help in locating vendors of medical supplies, respite services, or home-care professionals is important to offer to the patient and family. Early identification of alternative caregivers is important to assure that instruction in all aspects of tracheostomy care is given before the family assumes care of the patient. Providing this support often alleviates much of the family's anxiety about caring for the patient at home.

Conclusion

Caring for a patient with a tracheostomy in the home setting requires both patient and family to acquire many new skills. The nurse or respiratory care professional can help them to integrate these new skills into their daily lives. In this way, the patient and family learn the necessary skills and achieve a level of confidence that eases the transition to home care.

Author's note

Aaron's Tracheostomy Page,⁸ an award-winning Web site maintained by a registered nurse, is a comprehensive resource for the patient and family dealing with tracheostomy home care. It is primarily aimed at families with children, but much information crosses all age groups. It contains practical advice for oft-encountered problems as well as links for many tracheostomy-related resources, message boards, chat rooms, and product information. The site can be accessed at <http://www.tracheostomy.com/>

References

1. Fitton CM. Nursing management of the child with a tracheostomy. *Pediatr Clin North Am* 1994;41(3):513-523.
2. Barnes LP. Tracheostomy care: preparing parents for discharge. *MCN Am J Matern Child Nurs* 1992;17(6):293.
3. Craven RF, Hirnle CJ, eds. *Fundamentals of nursing: Human health and function*, 2nd ed. Philadelphia: Lippincott, 1996.
4. Bryant K, Davis C, Lagrone C. Streamlining discharge planning for the child with a new tracheostomy. *J Pediatr Nurs* 1997;12(3):191-192.
5. Minsley MA, Wrenn S. Long-term care of the tracheostomy patient from an outpatient nursing perspective. *ORL Head Neck Nurs* 1996;14(4):18-22.
6. Roberts NK. The selective approach to successful stomal management at home. *ORL Head Neck Nurs* 1995;13(4):12-16.
7. Ignatavicius DD, Workman ML, Mishler MA, eds. *Medical-surgical nursing: A nursing process approach*, 2nd ed. Philadelphia: W.B. Saunders, 1995.
8. Bissell C. Aaron's tracheostomy page. Available from: <http://www.tracheostomy.com/> Accessed: March 10, 2006.
9. Tuori J. Disorders of the larynx & tracheobronchial tree. In Burrell MJ, Gerlach M, Pless S, eds. *Adult nursing: Acute and community care*, 2nd ed. Stamford, CT: Appleton & Lange, 1996: pp. 730-766.
10. Buzz-Kelly L, Gordin P. Teaching CPR to parents of children with tracheostomies. *MCN Am J Matern Child Nurs* 1993;18(3):158-163.
11. Ronczy NM, Beddome MA. Preparing the family for home tracheostomy care. *AACN Clin Issues Crit Care Nurs* 1990;1(2):367-377.

Lois Dixon, MSN, RN, BC, is a Clinical Nurse Educator IV at the Genesis Medical Center, Davenport, Iowa. She has worked as an adjunct faculty member, assistant professor, and instructor at Trinity College of Nursing. Interested in practical and applied nursing, she has been involved in clinical instruction at several hospitals and community colleges in the Moline, Illinois area.

Obesity, the Lungs, and Airway Management – Continued

describes relative weight to height and makes an accurate correlation to total body fat content. Although appropriate for most adults, the accuracy of BMI among certain groups is not guaranteed. For example, calculating BMI in children, patients with edema or ascites, pregnant women, or people who are highly muscular may not work, as an elevated BMI will not accurately reflect excess adiposity.

A normal BMI falls in the range of 18.5 to 24.9.² A patient with a BMI ≥ 25 is considered as overweight. Obesity is classified according to grade²:

- Grade I: BMI ≥ 30
- Grade II: BMI ≥ 35
- Grade III: BMI ≥ 40

Occasionally, the term *clinically severely obese* is used to describe a specific category of morbid obesity.²

The threat of obesity

Excess body weight is a threat to health, because it is associated with an increase of cardiovascular disease, type-2 diabetes, hypertension, infertility, stroke, hyperlipidemia, degenerative joint disease, gallstones, and some types of cancers.² Excess abdominal adiposity, particularly visceral fat and excess triglyceride content in the liver, skeletal, and heart tissues, is associated with hepatic and skeletal muscle insulin resistance, impaired ventricular function, and increased coronary heart disease.³

When hospitalized, very overweight patients are at risk for certain hazards of immobility. These include skin breakdown, cardiac deconditioning, deep vein thrombosis, muscle atrophy, urinary stasis, constipation, pain management challenges, and depression. Immobility contributes to pulmonary complications such as atelectasis, pneumonia, and delayed or traumatic intubation and exacerbates pre-existing conditions such as overweight hypoventilation syndrome or sleep apnea.

The obese patient is more inclined to develop complications during lengthy hospitalization. Mobilizing the patient early and safely can reduce some immobility-related complications. A variety of strategies can promote safe, size-appropriate respiratory care, including a thorough understanding of pathophysiology, appropriate resources, equipment, and criteria-based protocols. These strategies will be discussed in this article.

Respiratory care

Issues of respiratory care continue to grow in importance as larger, heavier people access critical care. The incidence of respiratory problems has a direct relationship to BMI: the heavier the patient, the more likely respiratory problems will occur.

Obesity is associated with altered respiratory function. Excessive abdominal adiposity mechanically interferes with lung function, because the extra weight presses on the chest wall and rib cage. Obesity is also associated with obstructive sleep apnea (OSA) and obesity hypoventilation syndrome (OHS).

OSA is characterized by episodes of apnea and hypopnea during sleep. These episodes are caused by partial or complete upper airway obstruction. Episodes of oxygen desaturation cause a transient increase in pulmonary artery and pulmonary wedge pressures and myocardial perfusion defects. Subsequently, cardiac abnormalities and cardiac rhythm alterations, permanent pulmonary hypertension, right ventricular hypertrophy, and bilateral leg edema can develop.⁴

Many bariatric patients develop OHS because of their weight. In fact, some authors suggest this condition occurs primarily in the severely obese—those over 350 pounds. Recent studies indicate that, in an apparently vicious circle, not only can obesity interfere with sleep, but sleep problems may actually contribute to obesity.

Sometimes referred to as Pickwickian syndrome, OHS is related to obstructive sleep apnea. When it occurs, the very obese person does not ventilate or oxygenate adequately during sleep or while awake. This is most likely due to elevated intra-abdominal pressure, as weight and mass from the abdominal area prevent the diaphragm from dropping, thus reducing lung expansion. Risk factors include gender, mild sedation, and a BMI >30 ; in fact, oxygenation can decrease as BMI increases.

OHS is a disorder of both the brain's control over breathing and the inadequacy of chest wall musculature—that is, muscles are not strong enough to elevate the chest. As a result of both or either causes, inadequate ventilation may occur. The decreased ability to oxygenate the blood and the retention of carbon dioxide lead to chronic respiratory acidosis and hypoxemia, which is characterized by progressive symptoms of fatigue, weight gain, poor sleep quality, hypersomnolence, and depression.

Patients with OHS often exhibit signs of left-sided heart failure. The left side of the heart loses its ability to pump blood effectively. This condition is sometimes referred to as congestive heart failure; however, this broad term could refer to failure of the right, left, or both sides of the heart. Physical symptoms include swelling of hands and feet, fatigue, weakness, and irregular or rapid heartbeat. Any activity that places additional stress on the body can precipitate symptoms. Diagnostic tests may include electrocardiogram to assess signs of a thickened heart muscle or arrhythmias, echocardiogram to identify enlargement of the heart or other abnormalities, or chest x-ray to determine enlargement of the heart or other cardiopulmonary abnormalities.

Tests that confirm a diagnosis of OHS may include polysomnography in the sleep laboratory and arterial blood gas (ABG) analysis. Sleep centers around the country are increasingly involved with obese patients and serve as an important referral resource. ABG analysis measures the acidity (pH), as well as oxygen and carbon dioxide levels (P_{O_2} , PCO_2) of arterial blood. It provides information on how well the kidneys and lungs are functioning. Patients with OHS are often diagnosed with acute/chronic respiratory acidosis and/or hypoxemia.

Respiratory acidosis occurs when the lungs fail to remove sufficient carbon dioxide. A change in the acid-base balance occurs; subsequently, arterial blood becomes excessively acidotic. In OHS, a mild but chronic impairment of the lung's ability to remove carbon dioxide over a prolonged period leads to chronic elevation of arterial PCO_2 (hypercapnia). Over time, the patient might develop dependence on hypoxic drive (with low P_{O_2} levels) for ventilation, leading to acute respiratory failure. When the condition becomes severe it can cause clinical manifestations such as confusion, irritability, and lethargy, resulting in the immediate need for endotracheal intubation. ABG analysis can determine the extent of the respiratory acidosis.

Ventilation challenges

Morbidly obese patients may develop respiratory failure from seemingly most inconsequential insults. The increased mass of abdominal contents can alter lung volumes and capacities. A decrease in functional residual capacity (FRC) is seen with increasing BMI. Expiratory reserve volume and total lung capacity may both decrease. When the

patient is upright, FRC may be reduced to the extent that it falls within the range of closing capacity, with subsequent small airway closure, ventilation perfusion mismatch, right-to-left shunting, and arterial hypoxemia. Morbidly obese patients may desaturate rapidly after induction of anesthesia, despite preoxygenation, due to a smaller oxygen reserve and increase in oxygen consumption. Residual volume can remain normal or slightly increased due to increased air trapping and possibly preexisting obstructive airway disease.

In regard to intervention, consider non-invasive, positive-pressure ventilation (NPPV) before mechanical ventilation. A clinician trained in ventilatory support must be available early enough to stop the progression of acute respiratory failure. If a trial of NPPV for the morbidly obese patient with acute respiratory failure is unsuccessful, mechanical ventilation should be initiated with a tidal volume in the range of 5–7 mL/kg, based on ideal not actual body weight. Tidal volume should then be titrated to the patient's ventilation demands.⁵ The concern is that calculating the initial tidal volume on actual body weight can lead to high tidal volumes and airway pressure and alveolar distension, with the potential for barotrauma.

In a classic study, Suzanne Burns suggested that the 45-degree-upright and reverse Trendelenburg positions were associated with better respiratory mechanics than were the 90-degree-upright and supine positions.⁶ Patients reportedly preferred the former positions. Researchers report that supine is probably the worst position for large patients, because it reduces pulmonary compliance and increases airway resistance.⁶ Further evidence suggests that the prone position can improve functional residual capacity, pulmonary compliance, and oxygenation⁶ and is associated with lower ventilator-associated pneumonia (VAP) rates.

Placing morbidly obese patients in a prone position is not impossible, just difficult. Patients are often afraid of treatments and procedures. Clinician confidence in using hydraulic lifts, lateral transfer products, oversized wheelchairs, binders, tracheostomy tubes and ties, and other special equipment facilitates patient confidence. A positive caregiver attitude and preplanning patient care, despite size constraints, are essential.⁶

Management of the airway from a procedural perspective must be planned. Clinical skills coupled with access to specially designed equipment can smooth critical procedures. Airway management

requires giving special thought to equipment, intubation, airway securement, secretion control, and proper positioning. Take care to tailor equipment to best serve the actual needs of the patient and caregivers. Equipment designed to support respiratory care includes the Combitube (Tyco-Kendall) and wider and longer tracheostomy tube holders by Dale Medical Products, wheelchair, walker, frame with support surface, trapeze, lateral transfer device, abdominal binder, arm board, nasogastric tube holder, sequential compression device, peripherally inserted central catheter, intravenous arm board, and gown and long gloves.

Certain risk factors are predictors of difficult airway placement. Airway placement should include assessment for the following risk factors: obesity, short or thick neck, facial edema, swollen or thick tongue, receding mandible, protruding/missing maxillary incisors, irregular jaw movement, mandibular size, erratic head and neck movement, or prominence of the upper incisors. Further assessment should include measurement of the distance from the sternal notch to the tip of the chin in neutral and maximally extended position. With extension, an increase of 5 cm should occur. Intubation may prove more challenging in obese patients due to difficulty in visualizing airway landmarks. The Combitube, an esophageal-tracheal double-lumen airway, is recognized by the American Heart Association and the American Association of Anesthesiologists as an alternative to the endotracheal tube when obesity-related technical difficulties arise.

If a tracheostomy is required, secretions must be controlled to prevent threat to the patient's airway. The trachea is usually close to the skin surface and easily accessible. For those patients with a thick short neck and excessive parapharyngeal fat deposits, it becomes more difficult for the surgeon to perform the tracheotomy as the trachea may be buried deep in the tissue. A resultant wound must be managed like any other open wound. A non-adhesive, absorbent, 1-inch foam dressing will absorb excess wound drainage, protect the wound, and prevent injury from adhesives. Tracheostomy ties should be longer and wider to prevent trauma within skin folds. A specially designed tube holder (Dale Medical Products) incorporates stretch material to accommodate any edema around the neck. An extension piece ensures a proper fit for obese patients and helps to prevent pressure ulcers from occurring under the tracheostomy tie.

Challenges of immobility

Many obese patients report a feeling of bias against them in all areas of their lives. Research suggests this feeling is accurate. Along with hospitalization, depression and dependency can exacerbate these feelings. When admitted, the obese patient may have pre-existing emotional concerns, which manifest as fear or reluctance to participate. Passive behaviors or perhaps anger and acting out are sometimes observed. Caregivers express reluctance to provide manual lifting and moving because of the realistic fear of personal injury. An interdisciplinary team comprised of psychologist, social worker, ergonomist, respiratory therapist, physical/occupational therapist, and others may address some concerns associated with a longer length of stay.

If turning and repositioning patients manually accomplishes the same task as specialty beds, it seems logical that the added cost of these automated products is unnecessary. However, a recent study suggests that the widely accepted standard of care that mandates repositioning every two hours is seldom met. Of those subjects responding to the survey, the majority agree that the standard is turning every 2 hours. They believe that this standard helps to prevent the hazards of immobility, including secretion retention and atelectasis, yet half of critical-care clinicians reported that the standard was met only 50% of the time, even with hospital-mandated protocols.⁷

A BMI >29 may increase the prevalence of pulmonary embolism. Deep vein thrombosis appears twice as often in obese patients as it does in their non-obese counterparts. Thromboembolic events are the most common complication of bariatric surgery (incidence: 2.4% to 4.5%) and result from prolonged immobility, venous stasis, polycythemia (which is associated with OHS), and increased intraabdominal pressure, which increases pressure on deep veins. To encourage earlier ambulation and to maintain good respiratory function, specially designed



Figure 1. Abdominal binder (Dale Medical)

abdominal binders for the larger patient may be used (figure 1).

Pneumonia is the most common cause of death from nosocomial infection, with a prevalence of 5 to 10 per 1,000 admissions. Although it can develop in any hospitalized patient, it occurs more often in patients receiving mechanical ventilation. In recumbent or supine patients, tidal volume diminishes during sleep and mucociliary transport is reduced; both can result in varying degrees of atelectasis and can lead to lower respiratory tract complications. Infectious and inflammatory complications of the lower respiratory tract lead to increased morbidity, mortality, and cost in the intubated, ventilated patient who is critically ill.⁸

The patient most at risk for pneumonia is immobile and institutionalized with multisystem involvement and a history of previous pneumonia. Patients with nasogastric tube feedings are at increased risk for aspiration pneumonia, especially in the presence of elevated intraabdominal pressure, as seen in morbidly obese patients. In making a diagnosis, a chest x-ray demonstrates aspirate in the lungs and the onset and location of infiltrate. Clinically, pneumonia is characterized by elevated temperature, chest congestion, decreased lung sounds, and the appearance of acute illness.

The stress of pneumonia threatens wound healing. Healing will generally plateau, fail to progress, or deteriorate until pneumonia resolves. Timely, appropriate introduction of full-body lateral rotation therapy (FBLRT) may best serve the patient in reducing interface pressures, promoting improved respiratory function, and providing therapeutic positioning.

Prevention of wound trauma and further skin breakdown are goals for the obese critically ill patient with pneumonia and skin injury such as pressure ulcers. Trauma and breakdown result from pressure, friction, and shear. In addition to immobility, contributing factors include moisture, dehydration, and malnutrition. Pressure ulcers typically occur over a bony prominence and develop because of inadequate repositioning of the patient.

Pressure-ulcer staging depends on the depth of damage to underlying tissue. Obese patients can be at risk for atypical or unusual pressure ulcers arising from pressure within skin folds by tubes or catheters or from an ill-fitting chair or wheelchair.

In the event that the patient has a large abdominal panniculus adiposus, it too must be repositioned to prevent pres-

sure injury beneath it. Alert patients can physically lift the pannus off the suprapubic area, but dependent, weak, or unconscious patients can be placed on their sides so that the nurse can lift the pannus away from the underlying skin surface to allow air to flow to the regions while relieving pressure.

Rotation therapy is often used for certain pulmonary conditions; however, it can also ensure sufficient repositioning for a very large patient who otherwise may pose a realistic challenge to frequent turning. With increasing interest in rotation therapy for preventing thromboembolic disease, pneumonia, skin injury, and caregiver injury, it becomes more important to understand fully its terminology, cost, and indication. Questions need to be asked to determine the actual value of this therapy.

Both FBLRT and continuous lateral rotation therapy (CLRT) are designed to prevent some physical hazards of immobility and to manage the difficulty of appropriate turning and repositioning in a cost-appropriate manner. Despite the value of rotation therapy in preventing and treating skin injury among obese patients, it is necessary to take precautions to prevent friction and shear. Correct pressure settings, fitting the patient to the appropriate-sized surface, and assessment for skin changes are some precautions.⁹

Equipment

A number of studies reveal the increasing incidence, cost, and number of back-injury claims associated with patient care.¹⁰ More than half of strains and sprains can be attributed to manual lifting while assisting dependent patients with their mobility needs. Manual lifting and transferring of patients are among the most frequent causes of nurses' injuries.¹¹

Standard hospital equipment such as chairs or bed frames may pose safety risks for obese patients and their caregivers. On the other hand, equipment (such as lifts) specially designed for overweight patients can improve quality of care, reduce length of stay, and make it easier and safer for caregivers to perform and patients to receive care. Healthcare facilities must have plans in place to meet these special needs.

Policy formation

Preplanning with manufacturers and vendors is essential, and institutional policies and procedures to obtain equipment must be available. Criteria-based protocols ensure appropriate, timely, and cost-

sensitive use of specially designed equipment. Performance improvement teams can aid in developing and implementing appropriate policies and resources for bariatric equipment needs.¹²

BMI, actual patient width at the widest point, and factors such as pain, immobility, sedation, or lack of cooperation pose challenges to care. Therefore, when developing criteria-based protocols or preplanning based on patient needs, these factors must be considered. Preplanning best serves the goal of patient safety and caregiver injury when intervention meets the actual needs of the patient.¹³

A policy that mandates respiratory care, physical therapy, nurse experts, pharmacy, specialty equipment, or other resources based strictly on patient criteria should be developed to prevent complications and therefore improve clinical, cost, and satisfaction outcomes. For example, a patient might be provided with an extra-wide bed, heavy-duty walker, lateral-transfer product, respiratory care and physical therapy consultation, wound ostomy continence nurse (WOCN) assessment, and clinical social worker evaluation based on a patient weight of 320 pounds, hip width of 25 inches, and shortness of breath on ambulation. The needs of each patient will vary, yet the protocol must be written in such a way as to recognize the needs of obese patients before an adverse outcome develops.

Clinical experts to involve in a task force might include a respiratory care practitioner, physical or occupational therapist, bariatric surgeon, medical doctor, pediatric clinical nurse specialist, bariatric clinical nurse specialist, WOCN, pharmacist, patient representative, and/or vendor. Each healthcare organization will have a different structure for team planning; however, what is important is that the team is diverse and each member is knowledgeable in providing critical care for the obese patient.¹⁴

References

1. Mokdad AH, Marks JS, Stroup DF, et al. Actual causes of death in the United States, 2000. *JAMA* 2004;291:1238-1245. Erratum in: *JAMA* 2005;293:293-4. *JAMA* 2005;293:298.
2. American Society of Bariatric Surgery. Rationale for the surgical treatment of morbid obesity. November 29, 2001. Available at <http://www.asbs.org/html/rationale/rationale.html>. Accessed April 13, 2006
3. Alpert MA. Obesity cardiomyopathy: pathophysiology and evolution of the clinical syndrome. *Am J Med Sci* 2001;321:225-236.
4. Marrone O, Bonsignore MR. Pulmonary haemodynamics in obstructive sleep apnoea. *Sleep Med Rev* 2002;6:175-193.
5. Begany T. ICU management of the morbidly obese. *Pulmonary Reviews.Com* 2002;7(4). Available at: <http://www.pulmonaryreviews.com/apr02/icu.html> Accessed March 10, 2006.
6. Burns SM, Egloff MB, Ryan B, et al. Effect of body

position on spontaneous respiratory rate and tidal volume in patients with obesity, abdominal distention and ascites. *Am J Crit Care* 1994;3:102-106.

7. Krishnagopalan S, Johnson EW, Low LL, et al. Body positioning of intensive care patients: clinical practice versus standards. *Crit Care Med* 2002;30(11):2588-2592.
8. Gallagher S. Obesity and the skin in the critical care setting. *Crit Care Nurs Q* 2002;25(1):69-75.
9. Gallagher S. Panniculectomy: more than a tummy tuck. *Nursing*. 2004;34(12):48-50.]
10. Charney W, Hudson A, eds. *Back Injury Among Healthcare Workers: Causes, Solutions, and Impacts*. Boca Raton, FL: Lewis, 2004.
11. Gallagher S. Bariatrics: Mobility, considering safety, patient safety, and caregiver injury. In Charney W, Hudson A, eds. *Back Injury Among Healthcare Workers: Causes, Solutions, and Impacts*. Boca Raton, FL: Lewis, 2004.
12. Kramer KL. WOC nurses as advocates for patients who are morbidly obese: a case study promoting the use of bariatric beds. *J Wound Ostomy Continence Nurs* 2004;31(6):379-384.
13. Gallagher S. Issues of caregiver injury: addressing the needs of a changing population. *Bariatric Times* 2005;2(1):1-5.
14. Gallagher S, Langlois C, Spacht D, et al. Preplanning with protocols for skin and wound care in obese patients. *Adv Skin Wound Care* 2004;17(8):436-441;quiz 442-443.1.

Susan Gallagher RN, PhD, CWOCN has been active involved in the field of obesity for over 15 years. Dr. Gallagher has written over 50 articles, lectured internationally, and has conducted research on the topics of obesity, ethics, and outcomes. She is a contributing editor for *Ostomy Wound Management*, a consulting editor for the *Journal for Wound, Ostomy, Continence Nursing*, and a member of the editorial review board for the *Southern Medical Journal*.

David Seigel RRT, BS, currently directs all aspects of respiratory care services for Peace-health Lower Columbia Region. He has over 20 years experience as a director of cardiopulmonary and respiratory care services for several healthcare organizations. Mr. Seigel's recent focus is on respiratory care education in his facility and he is a clinical instructor at Lower Columbia Community College.

Perspectives, is an education program distributed free-of-charge to health professionals. *Perspectives* is published by Saxe Healthcare Communications and is funded through an educational grant from Dale Medical Products Inc. *Perspectives'* objective is to provide health professionals with timely and relevant information on postoperative recovery strategies, focusing on the continuum of care from operating room to recovery room, ward, or home.

The opinions expressed in *Perspectives* are those of the authors and not necessarily of the editorial staff or Dale Medical Products Inc. The publisher, and Dale Medical Products Inc. disclaim any responsibility or liability for such material.

Please direct your correspondence to:

Saxe Healthcare Communications
P.O. Box 1282, Burlington, VT 05402
Fax: (802) 872-7558
sshapiro@saxecomcommunications.com

© Copyright: Saxe Communications 1998-2006

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 how overweight and obesity are defined and measured.
2. Identify at least two types of altered respiratory function associated with obesity
3. List three types of prevention strategies to minimize the risk of respiratory failure in the obese patient.
4. Identify at least three topics that are essential to home management of the patient with a tracheostomy tube.
5. Discuss two wellness issues that the RTs needs to address to assure successful adaptation to the home environment.

To receive continuing education credit, simply do the following:

1. Read the educational offering (both articles).
2. Complete the post-test for the educational offering. Mark an X in the box next to the correct answer. (You may make copies of the answer form.)
3. Complete the learner evaluation.
4. Mail, or fax, the completed learner evaluation and post-test to the address below.
5. To earn 1.5 contact hours of continuing education, you must achieve a score of 75% or more. If you do not pass the test, you may take it again one time.
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, 2006.

1. **The patient and family should become familiar with the patient's normal respiratory pattern so that they can:**
 - a. eat a meal in a restaurant
 - b. determine changes from normal
 - c. prevent or manage problems
 - d. be more comfortable with the tracheostomy
2. **The purpose of changing the tracheostomy tube is to:**
 - a. minimize infection and granulation tissue formation
 - b. decrease the amount of secretions
 - c. help the patient accept altered body image
 - d. maintain manual dexterity skills
3. **Symptoms of insufficient humidification of the trachea include all of the following except:**
 - a. noisy, labored respirations
 - b. shortness of breath
 - c. change in mucous consistency
 - d. increased productive coughing
4. **Good oral health is important because of the risk for:**
 - a. weight gain
 - b. nutritional deficiency
 - c. halitosis
 - d. dental caries
5. **Patients with tracheostomies are vulnerable to respiratory infections because of:**
 - a. loss of filtration and warming of inspired air
 - b. too much moisture in inspired air
 - c. tracheostomy tubes expediting secretion removal
 - d. suctioning removing normal tracheal flora
6. **Self-care education for the patient with a tracheostomy begins:**
 - a. within 48 hours prior to discharge
 - b. the day of discharge
 - c. at post-discharge outpatient classes
 - d. well before hospital discharge

7. **Nursing interventions that facilitate successful home management of a patient with a tracheostomy include all the following except:**
 - a. monitoring and evaluating adaptation to home care
 - b. making appropriate referrals for additional emotional support
 - c. locating local vendors of needed medical supplies
 - d. ensuring the patient is independent in all aspects of care
8. **Indications for suctioning include all the following except:**
 - a. noisy moist respirations
 - b. loose productive cough
 - c. patient requests suctioning
 - d. increased labored respirations
9. **Approximately what percentage of Americans is considered overweight?**
 - a. 10%
 - b. 90%
 - c. 67%
 - d. 15%
10. **In the US each year, what number of premature deaths is related to obesity?**
 - a. 200,000
 - b. 1 million
 - c. 400,000
 - d. not available
11. **More than half of strains and sprains among healthcare workers are attributed to:**
 - a. incontinence and skin care
 - b. manually lifting tasks
 - c. lack of patient and family motivation
 - d. overweight clinicians caring for overweight patients

12. **Healthcare facilities must have a plan in place to care for the special needs of the morbidly obese patient. This plan should specifically include:**
 - a. family therapy
 - b. institutional policies and procedures to serve as a guide to access specially designed equipment and clinical care
 - c. individualized care
 - d. pain management
13. **Hospitalization can lead to:**
 - a. peer pressure
 - b. deep vein thrombosis, cardiac conditioning, and muscle atrophy
 - c. social instability
 - d. abdominal distention, calf pain, and weight gain
14. **Immobility contributes to:**
 - a. atelectasis and pneumonia
 - b. weakness and falls
 - c. family conflict and economic concerns
 - d. weight gain and depression
15. **Obesity Hypoventilation Syndrome can lead to:**
 - a. atelectasis
 - b. sleep apnea
 - c. weakness
 - d. weight gain
16. **Obstructive Sleep Apnea is characterized by episodes of:**
 - a. pneumonia and daytime sleepiness
 - b. apnea and hypopnea during sleep
 - c. spasms of the mid and upper airway
 - d. coronary artery occlusion

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) ? 1. Diploma 2. Associate 3. Bachelor 4. Master 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 style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Strongly Disagree</th> <th style="width: 10%; text-align: center;">Strongly Agree</th> </tr> </thead> <tbody> <tr> <td>1. Describe how overweight and obesity are defined and measured.</td> <td style="text-align: center;">1 2 3 4</td> <td style="text-align: center;">5 6</td> </tr> <tr> <td>2. Identify at least two types of altered respiratory function associated with obesity</td> <td style="text-align: center;">1 2 3 4</td> <td style="text-align: center;">5 6</td> </tr> <tr> <td>3. List three types of prevention strategies to minimize the risk of respiratory failure in the obese patient.</td> <td style="text-align: center;">1 2 3 4</td> <td style="text-align: center;">5 6</td> </tr> <tr> <td>4. Identify at least three topics that are essential to home management of the patient with a tracheostomy tube.</td> <td style="text-align: center;">1 2 3 4</td> <td style="text-align: center;">5 6</td> </tr> <tr> <td>5. Discuss two wellness issues that the RT needs to address to assure successful adaptation to the home environment.</td> <td style="text-align: center;">1 2 3 4</td> <td style="text-align: center;">5 6</td> </tr> </tbody> </table> <p>Name & Credentials _____ Position/Title _____ Address _____ City _____ State _____ Zip _____ Phone _____ Fax _____ License# _____</p>		Strongly Disagree	Strongly Agree	1. Describe how overweight and obesity are defined and measured.	1 2 3 4	5 6	2. Identify at least two types of altered respiratory function associated with obesity	1 2 3 4	5 6	3. List three types of prevention strategies to minimize the risk of respiratory failure in the obese patient.	1 2 3 4	5 6	4. Identify at least three topics that are essential to home management of the patient with a tracheostomy tube.	1 2 3 4	5 6	5. Discuss two wellness issues that the RT needs to address to assure successful adaptation to the home environment.	1 2 3 4	5 6	<table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">1</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>2</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>3</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>4</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>5</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>6</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>7</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>8</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table> </td> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">9</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>10</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>11</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>12</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>13</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>14</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>15</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>16</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table> </td> <td style="width: 50%;"></td> </tr> </tbody> </table> </td></tr></tbody></table>	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">1</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>2</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>3</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>4</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>5</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>6</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>7</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>8</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table>	1	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			2	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			3	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			4	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			5	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			6	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			7	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			8	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">9</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>10</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>11</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>12</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>13</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>14</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>15</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>16</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table> </td> <td style="width: 50%;"></td> </tr> </tbody> </table>	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">9</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>10</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>11</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>12</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>13</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>14</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>15</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>16</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table>	9	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			10	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			11	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			12	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			13	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			14	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			15	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			16	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
	Strongly Disagree	Strongly Agree																																																																																																																																																					
1. Describe how overweight and obesity are defined and measured.	1 2 3 4	5 6																																																																																																																																																					
2. Identify at least two types of altered respiratory function associated with obesity	1 2 3 4	5 6																																																																																																																																																					
3. List three types of prevention strategies to minimize the risk of respiratory failure in the obese patient.	1 2 3 4	5 6																																																																																																																																																					
4. Identify at least three topics that are essential to home management of the patient with a tracheostomy tube.	1 2 3 4	5 6																																																																																																																																																					
5. Discuss two wellness issues that the RT needs to address to assure successful adaptation to the home environment.	1 2 3 4	5 6																																																																																																																																																					
<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">1</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>2</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>3</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>4</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>5</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>6</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>7</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>8</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table>	1	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			2	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			3	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			4	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			5	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			6	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			7	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			8	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">9</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>10</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>11</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>12</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>13</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>14</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>15</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>16</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table> </td> <td style="width: 50%;"></td> </tr> </tbody> </table>	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">9</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>10</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>11</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>12</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>13</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>14</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>15</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>16</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table>	9	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			10	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			11	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			12	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			13	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			14	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			15	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			16	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																							
1	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
2	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
3	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
4	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
5	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
6	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
7	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
8	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 25%;">9</td><td style="width: 25%; text-align: center;">A B C D</td><td style="width: 25%;"></td><td style="width: 25%;"></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>10</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>11</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>12</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>13</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>14</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>15</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> <tr><td>16</td><td style="text-align: center;">A B C D</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></td><td></td><td></td></tr> </table>	9	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			10	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			11	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			12	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			13	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			14	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			15	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			16	A B C D				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																									
9	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
10	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
11	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
12	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
13	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
14	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
15	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						
16	A B C D																																																																																																																																																						
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																																																																																																																																																						