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Perspectives

Recovery Strategies from the OR to Home

Tracheostomy in the Mechanically Ventilated Patient

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CONTINUING EDUCATION FOR NURSING

In This Issue

A tracheotomy is performed in over 50% of ventilator-dependent patients. Some of the benefits attributed to tracheotomy versus prolonged intubation include improved patient comfort such as potential for speech and ability to eat orally, more effective airway suctioning, decreased airway resistance, accelerated ventilator weaning, and reduced ventilator-associated pneumonia. Disadvantages to the procedure are perioperative complications, long-term airway injury, and cost. In his article, Dr. Tim Op't Holt describes two types of tracheostomy procedures, the effect of timing of tracheostomy, weaning from ventilation, cost of care, and the incidence of nosocomial pneumonia related to tracheostomy.

More than 106,000 body contouring procedures were performed in 2004, up 77% over the last 5 years according to the American Society of Plastic Surgeons. Body contouring procedures have continued to increase due the popularity of bariatric surgery. Patients with massive weight loss accounted for nearly 56,000 procedures and continue to drive the growth in body contouring. Dr. Susan Gallagher, a bariatric specialist discusses documentation for reimbursement, surgical options and informed consent together with recommended clinical care and preplanning for unexpected outcomes.

Tracheostomy is a common procedure in the intensive care unit (ICU), often performed to facilitate long-term mechanical ventilation and tracheobronchial hygiene. There has been much discussion about the type of tracheostomy procedure (percutaneous dilational versus open surgical), the effect of timing of tracheostomy on length of stay, weaning from ventilation, cost of care, and the incidence of nosocomial pneumonia related to tracheostomy.

Indications

The major indications for tracheostomy are upper airway obstruction, facilitation of prolonged mechanical ventilation, and pulmonary hygiene. A recent review[1] of tracheostomy rates among 17,523 ICU patients, of whom 4,146 underwent tracheostomy, found a range of 0-59 tracheostomies per 100 patients, with a mean rate of 19.6%. Tracheostomy was more likely to be performed in older patients and those with preexisting chronic conditions (e.g., COPD, stroke, coronary artery disease, and neurologic disease).

According to May and Bortner, "A tracheostomy should be performed only after the clinical benefits and risks for the individual have been considered, not because a certain number of days of intubation have elapsed."[2] Factors to consider in switching from an endotracheal tube (ETT) to a tracheostomy include the projected time the patient will need an artificial airway, the patient's tolerance of the endotracheal tube, the patient's overall condition, the patient's ability to tolerate a surgical procedure (or the alternative percutaneous technique, discussed below), and the relative risks of continued tracheal intubation versus tracheostomy.[3]

Two techniques are commonly used: the open surgical technique and the percutaneous dilational technique. The percutaneous technique has several advantages over the open surgical technique, including a smaller skin incision, less tissue trauma, fewer wound infections and less bleeding. The percutaneous procedure is performed at the bedside, which eliminates the need for transport to the operating room and associated costs and hazards of such transport. The percutaneous procedure is also performed faster and decreases the use of valuable operating room resources. These techniques, performed by the surgeon or intensivist, are described elsewhere.[2,4,5]

There are many advantages to the tracheostomy over prolonged endotracheal intubation. Following the procedure, the tube tract will mature. This means that if the tracheostomy tube should come out of the trachea, it can be easily replaced at the bedside by the respiratory therapist or nurse. Since the tube does not contact or traverse the vocal cords, there is no damage to these structures. The tracheostomy tube is placed lower in the airway than an ETT, so a suction catheter can go farther into the airway for more effective suctioning. There is a lower incidence of tube obstruction, especially since the inner cannula may be removed and replaced as needed. Replacement of the inner cannula also eliminates biofilm, a leading cause

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Body contouring after massive weight loss

By Susan Gallagher Camden RN, CWOCN, PhD

Increasingly, people having bariatric surgery are requiring some type of reconstructive procedure to manage redundant skin that often remains after massive weight loss. Although the term bariatrics has recently become strongly associated with weight loss surgery, it holds a much broader meaning.[1] Bariatrics is derived from the Greek word baros and refers to the treatment of obesity and its associated conditions.[2] Therefore, the specialty of bariatrics includes weight loss surgery, medical weight loss programs, reconstructive surgery and more. The thread tying each of these specialties together is the uniqueness of this patient population. Many bariatric patients are embarrassed by their physical appearance and are often reluctant to accept care for a variety of reasons. Physical assessment, for instance, can be challenging. Equipment as common as a blood pressure cuff that is poorly fitted will affect accurate assessment.[3] Many individuals report emotional concerns related to past health care experiences. Categories of obesity are described along with commonly recognized etiologies. Documentation for reimbursement, surgical options and informed consent are reviewed. Clinical care is presented along with ideas for tools and resources, including preplanning for unexpected outcomes.

Demographics of obesity

Although obesity is thought to be predominantly an American problem, the United States ranks 14th worldwide in prevalence of obesity. Regardless, weight and issues around weight profoundly affect the US population. For example, the American Obesity Society reports 67% of Americans are overweight. Between 10% and 35% are obese (category I and II), and nearly 5% are morbidly obese (category III).[4] In teens, 25% of 14 to 17-year-olds are overweight, as are 40% of 60 to 69 year-olds and 30% of 70 to 79-year olds. While overweight children suffer a disproportion amount of emotional cruelty,[5] older obese Americans experience a disproportionate amount of disability, functional decline and dependency.[6] In the US, $117 billion are spent each year on weight and weight-related health issues, and an additional $33 billion are spent on the weight loss industry. Obesity is costly, both economically and emotionally.

Despite the increasing numbers of larger, heavier people, research suggests they still frequently experience prejudice and discrimination in all areas of their lives.[7] Prejudice refers to a prejudgment, while discrimination is acting on that prejudgment. Most health care professionals and people in general agree that most of us hold some prejudices toward certain categories of individuals; however, in the health care setting acting on these prejudices is inappropriate on all levels, in the absence or presence of the patient. In order to develop a size friendly culture, discrimination has to be prohibited.

Etiologies of obesity

Although the etiologies of obesity are innumerable, there is one underlying fact: weight gain occurs when energy intake exceeds energy output. The challenge is balancing the many factors that influence the amount of food consumed and energy expended, including emotional, environmental and genetic factors, three of the major ones. Few people are obese due to emotional reasons alone; however, there is no doubt they create additional stress for those who struggle with weight and weight-issues. Environmental factors include threats to nutrition and activity. High fat, concentrated sugars and prepackaged foods are easily accessible but often fail to provide quality nutrition without a disproportionate amount of unwanted calories. A reasonable level of activity is difficult for people in some age groups to achieve. Safety, cost and limited time all serve as a threat to healthy living.[8] Many scientists support the theory that genetics play a part in the obesity crisis to some extent. All agree that obesity is a multifactoral disease and therefore weight loss and health promotion must be addressed in a multifactoral manner.

Treatment options for obesity

For the patient who experiences weight-related health problems, a number of tools are available. For example, diet and activity have been the mainstay for weight loss; however, research suggests that 97% of patients who lose weight in this manner will regain the weight and possibly more. Pharmaceutical intervention and behavioral counseling as part of a medically supervised weight loss program improve long term outcomes, but weight regain continues to be a lifelong struggle for most. In the past fifty years weight loss surgery has gained popularity for a number of reasons, one of which is its increasing success rate. Patient selection and preparation, surgical technique, size-appropriate equipment, special training of members of the allied health care team, and long- term follow-up have significantly improved outcomes. Patients report for the first time in years they are able to participate in ordinary activities of daily living. Tying one's shoes, fastening a seat belt, riding a bicycle and more, are new experiences for many people losing massive amounts of weight after weight loss surgery. However, for many patients, large weight loss is accompanied by a troublesome amount of redundant skin.

Problems of redundant skin

The problems of redundant skin are many. Patients, physical therapists and others attest to the fact that patients experience considerable problems with center of gravity, balance and stability. Patients report pain throughout the back and hips that interferes with activity and comfort in general. Maintaining good hygiene is difficult, particularly if the patient has a large abdominal pannus or redundant skin through the hips and upper thighs. Skin breakdown can occur within the intertriginous areas because of pressure or high bacterial load. Ulcers and other lesions can develop on and under the abdominal panniculus.[9] Some patients report excessive odor. Although many patients enjoy improved health and quality of life after massive weight loss, many are left with a different set of problems related to redundant skin.

The first barrier patients must overcome is the cost of reconstructive intervention. Clinicians best serve patients when they understand their role in documentation for reimbursement. Insurance carriers are interested in medical record entries and letters that describe functional concerns with redundant skin. Records of interest may come from the physician, wound care or pain expert, physical/occupational therapist, nurse practitioner and others. Photo documentation should include frontal and lateral views as well as areas between skin folds and underneath redundant skin. Specific direct and indirect costs of managing pain and skin ulcers should be documented along with functional limitations affecting quality of life.[10]

Options in body contouring

Body contouring is a term used to describe a number of reconstructive procedures that, when performed together,

create a functionally suitable approach to managing concerns of redundant skin. Common procedures alone or in conjunction with others could be brachioplasty, mastopexy, thigh lift, circumferential lift, panniculectomy and others.

A number of factors indicate the reconstructive options best suited for a particular patient. For example, genetics play a role in the quality of the skin and other individual differences; however, age and extent of weight loss influence the degree of tissue and skin laxity after massive weight loss. A number of patients have experienced what is described as tissue deflation. The term is used in this evolving specialty to describe loss of fatty tissue and is described categorically as: 1) deflated, 2) minimally deflated or 3) non-deflated (minimal loss of fat).[11] The degree of tissue deflation may dictate the best procedure to meet each patient's unique needs.

When multiple procedures are needed, the surgeon may choose to perform them all at the same time. Other surgeons report wanting to avoid a lengthy operative time and prefer staged procedures, perhaps working on the upper body first and later the lower body. For example, brachioplasty, mastopexy and facial procedures may be performed first, followed at another time with a body lift and thigh lift. By restricting surgery to the upper body, the patient has strength in the lower body to postoperatively conduct activities of daily living that would be prohibited if both arms and legs were affected. The order of procedures ultimately depends on many factors. Physician training, experience and preferences, and patient preference will influence the type of procedure selected or the order of procedures performed.

Preoperative preparation for realistic expectation

Education, informed consent and clear patient goals are all required to meet the patient's realistic expectations. Patients and their support person need to understand the risks and benefits of surgical procedures. Immediate postoperative risks might include poor wound healing, bleeding, pain, embolic episodes and many more. A patient exam or contract along with a comprehensive informed consent allows clinicians to be confident that patients understand what's involved.

Attention to nutritional status is important in a patient population that has recently lost massive amounts of weight. Although patients who have had weight loss surgery should have had nutritional assessment and education at that time, the at-risk patient may have disregarded or sacrificed this aspect of care with the hope of increased weight loss. Other patients may have misunderstood the importance of nutrition to wound healing and health in general. Adequate protein stores along with vitamins and minerals are critical to a successful recovery and overall good outcome. A nutritional consultation may serve as an important preoperative component.

Intraoperative care

Most surgical procedures require two nurses, e.g., a scrub nurse and circulating nurse. In caring for obese patients, some hospitals add a third nurse, especially at the beginning of surgery. The third nurse may be necessary for positioning. A task as simple as placing a catheter can be technically difficult and, as it is an unnecessary embarrassment to the patient, a nurse usually places the catheter once the patient has been properly sedated or anesthetized.[12]

Urinary catheters are used for several reasons. Assisting a female patient onto a bed pan postoperatively can be difficult for caregivers and uncomfortable for the patient. In addition, patients receiving an epidural catheter for pain control may require a urinary catheter because of associated urinary retention. Securing the foley catheter high on the patient's thigh with a foley catheter holder will significantly reduce the risk of tube dislodgement and thereby reduce the risk of UTI infection.

Another intervention of concern is the surgical scrub (preparation of the skin surface prior to surgery). The nurse must ensure that all areas are clean and painted vigorously. This can be especially difficult in the presence of deep-skin folds. A third nurse can help the circulating nurse to achieve this task.

Meaningful Postoperative Care

Routine monitoring of vital signs and physiologic progress that requires documentation includes blood pressure, pulse, quality and number of respirations per minute, temperature, coughing, and deep breathing.

Figure 1. Abdominal Binder (Dale Medical Products)

Patients seem to breathe more easily when the bed is at 30° (semi-Fowler position), as this angle reduces the weight of abdominal adipose tissue that presses against the diaphragm.[13] The patient may need encouragement to perform leg exercises and breathing and coughing exercises. Providing the patient with an abdominal binder (Dale Medical) can encourage deep breathing and coughing as well as post-operative mobility (Figure 1).[14] Early activity is encouraged, as it decreases the chances of immobility-related complications. In the acute setting, patients can experience complications related to immobility and physical dependence. Seroma formation, wound separation and other clinical problems can be controlled with a properly fitted binder.[15]

Wound healing can be problematic in some obese patients. Wounds are prone to dehiscence. In addition, blood supply to fatty tissues may be insufficient to provide an adequate amount of oxygen and nutrients, which can interfere with wound healing. A delay in wound healing may occur if the patient has a diet that lacks essential vitamins and nutrients. Wound healing can also be delayed if the wound is within a skin fold, where excess moisture and bacteria can accumulate. Furthermore, excess body fat increases tension at wound edges.[16] To reduce the occurrence of abdominal wound separation, some clinicians use a surgical binder to support the area. The binder will need to be large enough to comfortably fit the patient. Commercially available abdominal binders can accommodate waist sizes of up to 94 inches (Dale Medical Products, Inc.).

Creating a plan of care

Although many patients admitted for reconstructive surgery have experienced massive weight loss, some will still be categorically obese. Careful patient selection is thought to control the incidence of postoperative complications; however, clinicians must plan for unforeseeable risks of reconstructive procedures after massive weight loss. Obese patients who are hospitalized reportedly are at a higher risk for certain common and predictable complications simply because of their body weight and size.[17] Criteria-based protocols, policies or procedures are designed to provide a meaningful standard of care for complex, costly patient groups by delivering care based on consistent criteria such as weight, functional limitation and others.

The goal of standardized care is to provide a reproducible, predictable outcome. In managing the complex needs of the bariatric patient, preplanning for equipment is thought to be the first step for intervention as equipment improves mobility; however, by itself, it is simply not enough. Rather, a comprehensive interdisciplinary patient care approach specifically

addressing the needs of the patient having reconstructive surgery may be necessary, and should include the following: 1) a task force, 2) a criteria-based protocol, which includes preplanning for size-appropriate tools and resources, 3) competencies/skill set evaluation, and 4) outcome measurement efforts.

The value of an interdisciplinary task force in the initial phase of planning cannot be overlooked. It is designed to address ongoing issues and ideas, and could include pharmacists, physical/occupational and respiratory therapists, physicians, clinical nurse specialists, ET/WOC nurse, and others. The inclusion of a patient representative is essential in that he/she understands the experience of being a larger, heavier patient. Each member of the team brings a unique and important perspective.[20] Together they improve the quality of patient care by offering expertise from a variety of disciplines.[18]

Hospitals and other health care facilities should have a plan in place for the patient's special needs.[19] This could include resources such as equipment or clinical experts.[20] A criteria-based protocol is simply preplanning based on specifically designated criteria such as the patient's weight, BMI, body width, and clinical condition.[21] Actual weight is an important consideration because if the weight limit of equipment is exceeded then the equipment can break, fail to function properly, or result in patient/caregiver injury. Body width and circumference are important to further understand size-sensitive needs. Body width is described as the patient's body at his/her widest point, which could be at the hips, shoulders or across the belly when the patient is on his or her side. Body width and circumference can be important when ordering a wheelchair or bed frame because if the equipment fails to accommodate the patient's full width, ulcers can develop where the soft tissue rubs the wheelchair arm or frame siderail. Seat depth can be inadequate if the patient's body circumference is excessive. Any clinical condition that interferes with mobility such as pain, sedation, fear, or resistance to participate in care places the patient at risk. Criteria-based protocols should be designed to meet the needs of the patient by ensuring access to resources, such as specialty equipment and clinical experts, in a timely, cost-effective manner.

Education to ensure basic skills or competencies of clinicians is imperative for complex reconstructive surgery to succeed. Consider conducting a survey to determine the actual learning needs of clinicians. The value of a diverse, interdisciplinary task force is that it serves to provide a pool of experts to develop lesson plans/education addressing clinical needs. For example, if clinicians are seeking information pertaining to sensitivity, then a social worker, chaplain, nurse expert, and patient member of the task force could develop a one hour module to teach these skills.[22]

In order to ensure the long-term success of a comprehensive reconstructive bariatric program, it is essential to understand and participate in outcome studies. Cost, clinical, and satisfaction research can be conducted to measure the value of an organizational improvement effort. Studies examining time from admission to equipment availability, expert consultation, incidence of skin injury and other performance measures document, from a quality perspective, the value of change.[23]

Risk Management

Part of the preplanning effort must include provision for communication, especially if the postoperative course takes an unexpected course. Although sometimes difficult to arrange, a face-to-face interdisciplinary conference may prevent costly clinical intervention and patient/family disappointment later.[24]. This important risk management strategy includes documentation of meetings, individual patient care goals, and corresponding intervention, which also improves consistency and accountability. This level of accountability more fully defines each clinician's rights and responsibilities, and the rights and responsibilities of the patient and family members.

Conclusion

As the need for sound reconstructive surgery increases, clinicians across practice settings and in many areas of expertise seek opportunities to provide care to this emerging patient population. Specialty programs, clinical experts and properly-sized equipment help achieve this goal.[25]

References

1 Gallagher S. Shedding weight with bariatric surgery. Nursing 2004;34:58-64.

2 Gallagher S. Panniculectomy: implications for care. Perspectives 2001;3:1-3.

3 Maxwell MH. Errors in blood pressure measurement due to incorrect cuff size in obese patients. Lancet. 1982;2:33-36

4 Kenkel JM, et al. The obesity epidemic. Plast and Reconstructive Surg. 2006;117:5S – 7S.

5 Puhl R & Brownell KD. Bias, discrimination and obesity. Obesity Research. 2001;12:788-805

6 Camden SG & Gates J. Obesity: The changing face of geriatrics. Ostomy/Wound Manage 2006;52:50-57.

7 Gallagher S, Sensitivity. In: The Challenges of Caring for the Obese Patient. Matrix Medical Communication: Edgemont, PA. 2005.

8 Gallagher S, Medical weight loss. In: The Challenges of Caring for the Obese Patient. Matrix Medical Communication: Edgemont, PA. 2005.

9 Gallagher S & Gates J. Obesity, panniculitis, panniculectomy, and wound care: Understanding the challenges. JWOCN. 2003;30:334-341.

10 Gallagher S. Panniculectomy, documentation, reimbursement and the WOC nurse. Journal of Wound, Ostomy and Continence Nursing 2003;30:34-38.

11 Boriani F, Taveggia A, Cravero L. Obesity and body contouring: contemporary lessons from a historical example. Obes Surg. 2005;15:1218.

12 French G, Galbraith JL, Dietel M. The nurse's role in bariatric surgery. In: Deitel M. Surgery for the Morbidly Obese Patient. FD-Communications: North York, Canada, 1989.

13 Lasater-Erhard M. The effect of patient position of arterial oxygen saturation. Crit Care Nurs 1995;15:31-36.

14 Gallagher SM. Postoperative Care in the Bariatric Patient. Perspectives 2003,2-6

15 Baroudi R, Affonso Ferreira CA. Seroma: How to avoid it and how to treat it. Aesth Surg J 1999; 18:439-41.

16 Gallagher S. Nursing management of the patient having panniculectomy surgery. Nursing 2004;34:52-62

17 Medical care for obese patients: Advice for health care professionals. National Task Force on the Prevention and Treatment of Obesity. Am Fam Physician 2002;65:81-88.

18 Gallagher S, Arzouman J, Lacovara J et al. Criteria-based protocols and the obese patient: planning care for a high-risk population. Ostomy/Wound Management 2004;50:32-44.

19 Gallagher S. Bariatrics: Considering mobility, patient safety, and caregiver injury. In: Charney W. & Hudson A. Back Injury Among Healthcare Workers. Lewis Publishers: Baton Rouge. 2004.

20 Gallagher S, Langlois C, Spacht D, Blackett A, Henns T. Preplanning protocols for skin and wound care in obese patients. Advances in Skin and Wound care: The Journal for Prevention and Healing.2004;17:436-443.

21 Gallagher S. Restructuring the therapeutic environment to promote care and safety for the obese patient. JWOCN. 1999;26:292-97.

22 Gallagher S. The challenges of obesity and skin integrity. Nurs Clin N Am 2005;40:325 – 335.

23 Matarasso A: Abdominoplasty. In: Achauer BW, Eriksson E, Vander Kolk C, Coleman JJ, Russell RC, eds. Plastic Surgery: Indications, Operations, and Outcomes. St. Louis, MO: Mosby; 2000: 2783-821.

24 DeRuiter H-P, Meitteunen E, Sauder K. Improving safety for caregivers through collaborative practice. Journal of Heathcare Safety, Compliance, and Infection Control. 2001;5:61-64.

25 Revis D. How to develop a post-bariatric body contouring practice. Bariatrics Today. 2005;3:16-21.

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of ventilator/airway-associated nosocomial pneumonia. Since the tube does not traverse the mouth, there is no damage to the palate, lips, or teeth, and oral care is much easier. Patients with a tracheostomy are more comfortable; they do not gag, so less sedation is needed. They are able to communicate better, since they are able to mouth words. In addition, a speaking valve such as a Passy-Muir valve may be employed to allow speech by patients with intact gag reflex. The glottis is competent, so there is less risk of aspiration and less risk of nosocomial pneumonia. Swallowing is preserved, so oral feeding, which is preferred for optimal nutrition is possible. Since the tube is shorter and may be larger in diameter, there is less resistance to gas

flow, less dead space, and decreased work of breathing. Many believe there is more rapid weaning, which is discussed below.

Percutaneous versus surgical: complications and outcomes

Higgins et al[6] performed a meta-analysis to determine if there were any differences in complications between percutaneous and surgical tracheostomies. In their study of 15 papers with 973 patients in which there were 490 percutaneous tracheostomies and 483 surgical tracheostomies, pooled odds ratios revealed statistically significant results against percutaneous tracheostomy for the complication of decannulation/obstruction (p = .009). There were significantly fewer complications in the percutaneous group related to wound infection (p = .0002) and scarring (p = .01). They also found that the weighted mean difference for the cost of the percutaneous procedure was $456 less than the surgical technique (95% CI: -$482 to -$430), and it took less time (p <.0001). There was no difference in hemorrhage, stenosis, death, or false passage.

To perform the percutaneous technique, the midline neck structures (thyroid and cricoid cartilages, sternal notch) must be palpable; otherwise the procedure will be blind, making the percutaneous method less safe. Contraindications to the use of the percutaneous technique are morbid obesity, repeated tracheostomy, high positive end expiratory pressure, severe coagulopathy, and unusual neck anatomy.[4] However, a chart-review study[7] of percutaneous tracheostomy in 143 morbidly obese patients (body-mass index >35) determined that the procedure was safe in these individuals.

It is puzzling that Higgins et al found a greater incidence of decannulation/obstruction with the percutaneous technique. Our experience has shown that the same tracheostomy tube is used regardless of technique. With appropriate tube securing, there should be no difference in decannulation. Since a tracheostomy tube with a removable/disposable inner cannula is used, it is unclear how there could be an increase in obstruction. Perhaps the authors of the studies used in this analysis used dissimilar tracheostomy tubes between the two tracheostomy techniques. In Rana's review[4] of these two techniques, it was determined that perioperative complications were more common during percutaneous than surgical tracheostomy (10% vs. 3%), whereas there were more complications postoperatively following surgical tracheostomy (10% vs. 7%).

Timing of tracheostomy and outcomes

There is considerable debate about whether the timing of a tracheostomy speeds the process of liberation from the ventilator, or if tracheostomy decreases the incidence of nosocomial pneumonia (so-called ventilator-associated pneumonia), decreases ICU length of stay, etc. An examination of several reviews, meta-analyses, and retrospective and prospective studies yields varied results, depending on method, outcome variable, and patient population. For example, in one study,[8] tracheostomy had no positive impact on survival when performed on unselected mechanically ventilated patients. The timing of tracheostomy (early versus late) made no difference in mortality. The risk of pneumonia was not modified by tracheostomy, and tracheostomy increased length of mechanical ventilation and ICU and post-ICU stays. In addition, tracheostomy increased post-ICU mortality in patients weaned from mechanical ventilation who did not have their tracheostomy reversed prior to discharge. The authors noted that it was not that the tracheostomy tube increased length of stay and mortality, but rather that patients with a greater severity of illness were likely to undergo tracheostomy. Patients undergoing tracheostomy required a greater use of resources after leaving the ICU, so it was concluded that every effort be made to wean the patient from mechanical ventilation without tracheostomy. In an observational study[9] of 5,081 patients in 361 ICUs over 12 countries, it was found that patients with a tracheostomy had a longer length of stay in the ICU and in the hospital; ICU mortality was lower in patients with a tracheostomy, but there was similar hospital mortality among those with and without a tracheostomy.

Tracheostomy can reduce the work of breathing, improve oral and tracheobronchial hygiene, and improve patient comfort and communication. In patients with severely limited reserves, tracheostomy may provide enough relief from secretion accumulation and the increased work of breathing that weaning may be easier and faster. We have seen on many occasions rapid weaning and ICU discharge only because a tracheostomy provides a patent airway, especially in patients with altered mental status who cannot otherwise maintain a native airway. However, most of these patients require increased intensity of post-ICU airway care and are prone to infection.

Early tracheostomy is supported by those who cite the risks to the patient of prolonged intubation, such as sinusitis, soft-tissue irritation, poor oral hygiene, discomfort, and the need for additional sedation. In 1989, the American College of Chest Physicians recommended[10] tracheostomy after 21 days of intubation. In an analysis of 992 intubated trauma patients, Goettler et al[11] developed a system to rate a patient's risk for tracheostomy that included factors such as Glasgow coma scale, injury severity score, anatomic injury scores, and age, and they concluded that patients with >90% risk for tracheos-

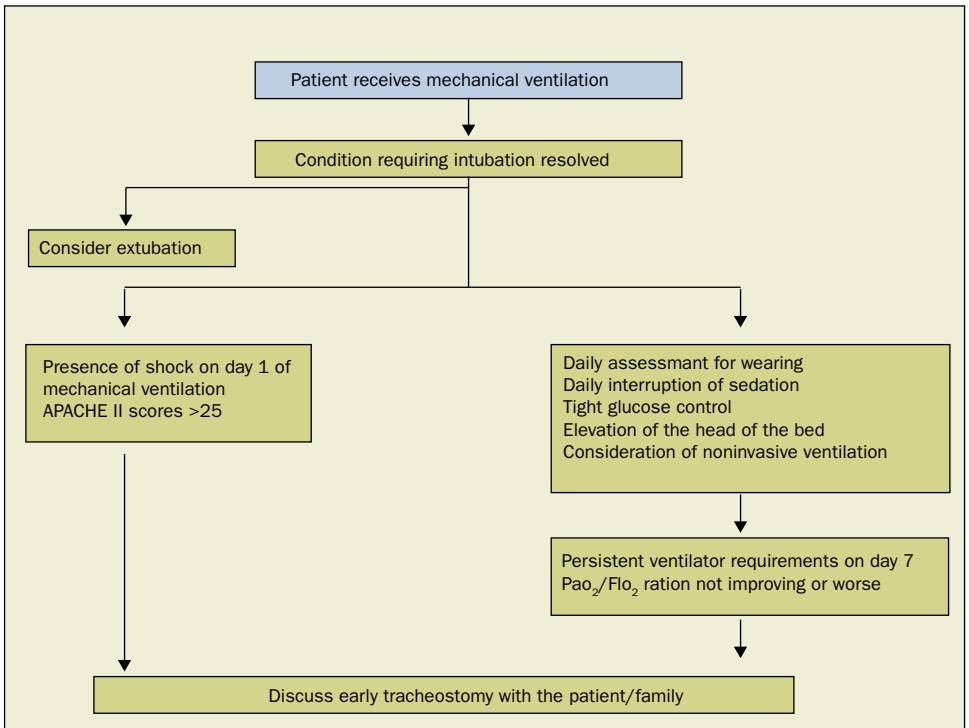

Figure 1. Approach to the timing of tracheostomy in critically ill patients on mechanical ventilation

Table 1. **Potential obstacles to successful clinical studies on tracheostomy and weaning**

- Inability to blind investigators (and clinicians) as to groupings
- Bias of clinicians managing patients
- Inability to predict which patients will require prolonged ventilatory support
- Varying weaning protocols
- Varying criteria for weaning success and failure
- Funding and reimbursement factors
- Varying specialties performing procedure
- Varying levels of training and experience among operators

tomy undergo early tracheostomy (within 72 hours of admission). However, in a systematic review and meta-analysis, Dunham[12] concluded that early tracheostomy had no influence on mortality, pneumonia or laryngeal pathology rates in trauma patients. Furthermore, he found that patients with severe brain injury may be more rapidly liberated from mechanical ventilation with early tracheostomy. This is consistent with our own observation. If a patient with severe brain injury can breathe, and a patent airway is maintained with a tracheostomy, there are fewer ventilator and ICU days. Clearly, this is a topic of interest, as an additional prospective study[13] confirmed the results of both the Goettler and Dunham papers. This study enrolled 60 trauma patients and was stopped at the interim analysis, since there was no difference in length of ventilator support, frequency of pneumonia, or death.

On the other hand, Arabi et al[14] found that duration of mechanical ventilation was significantly shorter ($p < .0001$) with early tracheostomy (<7 days from admission) than later tracheostomy (>7 days from admission) in a group of 136 trauma patients who underwent tracheostomy. These patients were matched for injury severity score (ISS), Acute Physiology and Chronic Health Evaluation (APACHE II) scores, and Glasgow Coma Scale (GCS) scores. The time from tracheostomy to weaning was the same, as was the number of days from tracheostomy to discharge; what delayed discharge was the delay in tracheostomy. Rana's review[4] of several studies of the timing of tracheostomy, including that of Arabi, concluded that the duration of mechanical ventilation and the total cost of hospitalization were significantly lower when tracheostomy was performed early rather than late (5.9 versus 16.7 days of ventilation). In the only study specifically of patients in the medical ICU, Rumbak et al[15] showed that the length of ICU stay, days of ventilation, and mortality were significantly lower in their early percutaneous tracheostomy group (<48 hours or 14-16 days). Furthermore, in a recent Cochrane meta-analysis, Griffiths et al[16] found that with early tracheostomy there was no difference in mortality or risk of hospital acquired pneumonia, and there were significantly fewer ventilator and ICU days. Patients who had an early tracheostomy underwent less sedation and had increased mobility.

The APACHE II score seems to be a good predictor of the need for tracheostomy during the first several days of ventilation. The combination of a score >25 and shock at the time of admission is a predictor of poor outcome, and early tracheostomy should be discussed with the patient and/or family (Figure 1). This is consistent with Heffner's conclusion[17] that critically-ill patients should first undergo stabilization and a trial of therapy to determine if extubation will be likely within the first several days of ventilation. If the patient remains dependent on the ETT for a week, tracheostomy should be considered, and the decision will be based on the likelihood of benefit and the anticipated duration of need for ventilation.

Pierson's review[18] of tracheostomy and weaning considered many of the studies cited here, and my conclusions are consistent with his. He notes that studies of the effect of tracheostomy on weaning are subject to many methodological problems (Table 1) and the tendency to treat patients with a tracheostomy differently from those with an endotracheal tube. Healthcare professionals tend to look at a patient with a tracheostomy and have a "feeling" that he or she is ready for weaning, but we don't have that same opinion when we see an ETT. We proceed to promote spontaneous breathing trials more often when we see a tracheostomy tube than when we see an ETT. Based on these references, it appears that there is a benefit to early tracheostomy, when careful consideration is made regarding the patient's acuity and wishes, and the decision should never be arbitrary, based only on a finite number of ETT-dependent days. There seems to be a trend towards fewer ventilator days, length of stay, and a lower cost of hospitalization when tracheostomy is performed early.

Figure 2. Tracheostomy tube holder (courtesy of Dale Medical): Padded neck band circles the neck. Velcro-type tabs hold the neck band to the tracheostomy tube.

Incidence of ventilator-associated pneumonia and tracheostomy

A 2004 evidence-based guideline[19] for the prevention of ventilator-associated pneumonia (VAP) did not recommend early tracheostomy as a way of preventing VAP. The authors stated that there was no difference in the incidence of VAP subsequent to early tracheostomy versus late tracheostomy, and that the trials they reviewed were methodologically flawed.

Subsequently, two studies of 856 patients and another review concluded that there was a decrease in VAP when tracheostomy was performed early. In a retrospective study by Möller et al,[20] the incidence of VAP was significantly higher in the late tracheostomy group (42.3% vs. 27.2%). In addition, the authors found that in the late tracheostomy group there was a decrease in ventilator days, ICU length of stay, and hospital length of stay. In a prospective study of VAP, Ranes et al[21] identified the factors associated with hospital mortality from VAP as diagnosis on admission, the need for vasopressors during hospitalization, and not undergoing a tracheostomy. Tracheostomy performed during the hospitalization was associated with better hospital survival. In a recent review, Leong and Huang[22] noted that some studies confirmed previous findings of a decrease in VAP, ICU length of stay, and days requiring mechanical ventilation, while others did not. Variability in patient population and defining early versus late contribute to the lack of consensus. Regardless, none of these studies concluded that late tracheostomy decreased the incidence of VAP.

Securing the tracheostomy tube

Once through the trachea, the tracheostomy tube is often secured in place by suturing the flange of the tube to the skin. This is followed by tying the tube in place using cotton twill tape: The end of the tape is folded over onto itself and a short horizontal slit is made. The twill tape is threaded through the slot in the flange adjacent to the sutures (if present). The loose end of the tape is threaded through the slit. The loose end is then pushed under the patient's neck and threaded through the slot in the other side of the flange and tightened to allow a finger or two behind the tie. When the twill tape becomes soiled, it is replaced.

Another way of securing the tracheostomy tube is with a commercial device. These devices feature a padded neck band and Velcro®-type tabs, so the therapist or nurse does not have to tie knots. The neck band is in two pieces. Each piece has a

Velcro-type tab to place through one slot of the flange. The longer of the two neck bands is brought behind the patient's neck and is pressed onto the short neck band once tightened. One product features moisture-repellant neck bands and some elastic to allow for edema and coughing (Figure 2).

Conclusion

Following the initiation of mechanical ventilation, tracheostomy is performed in up to 59% of patients, with a reported mean of 19.6%. It is often performed to facilitate continued mechanical ventilation, to facilitate weaning and oral feeding, and is better tolerated by the patient than the endotracheal tube. The percutaneous route is preferred over the surgical route, as it is accomplished faster, at less expense and with fewer complications. There is considerable debate about the timing of tracheostomy —early versus late—and the outcomes of studies vary widely in terms of post-tracheostomy cost of care, days of mechanical ventilation, and days in the ICU. There is no clear consensus about the timing of tracheostomy, and there are obstacles to successful clinical studies on tracheostomy and weaning. It seems that early tracheostomy is associated with a decreased incidence of ventilator/artificial airway-associated pneumonia. The tracheostomy tube may be secured with sutures or a commercially available device that incorporates Velcro to facilitate tube security. A tracheostomy should be performed only after the clinical benefits and risks for the individual have been considered, not because a certain number of days of intubation have elapsed.

References

1. Nathens AB, Rivara FP, Mack CD, et al. Variations in rates of tracheostomy in the critically ill trauma patient. Crit Care Med. 2006;34(12):2919-2924.
2. May RA, Bortner PL. Airway management. In: Hess DR, MacIntyre NR, Mishoe SC, Galvin WF, Adams AB, Saposnick AB, eds. Respiratory Care Principles and Practice. Philadelphia, PA: Saunders; 2002:711.
3. Simmons KF, Scanlan CL. Airway management. In: Wilkins RL, Stoller JK, Scanlan CL, eds. Egan's Fundamentals of Respiratory Care. 8th ed. St. Louis, MO: Mosby; 2003:675-676.
4. Rana S, Pendem S, Pogodzinski M, Hubmayr R, Gajic O. Tracheostomy in critically ill patients. Mayo Clin Proc. 2005;80(12):1632-1638.
5. Durbin CG. Techniques for performing tracheostomy. Respir Care. 2005;50(4):488-496.
6. Higgins KM, Punthakee X. Meta-analysis comparison of open versus percutaneous tracheostomy. Laryngoscope. 2007;117(3):447-454.
7. Heyrosa MG, Melniczek DM, Rovito P, Nicholas GG. Percutaneous tracheostomy: a safe procedure in the morbidly obese. J Am Coll Surg. 2006;202(4):618-622.
8. Clec'h C, Alberti C, Vincent F, et al. Tracheostomy does not improve the outcome of patients requiring prolonged mechanical ventilation: A propensity analysis. Crit Care Med. 2007;35(1):132-138.
9. Frutos-Vivar F, Esteban A, Apezteguia C, et al. Outcome of mechanically ventilated patients who require a tracheostomy. Crit Care Med. 2005;33(2):290-298.
10. Plummer AL, Gracey DR. Consensus on artificial airways in patients receiving mechanical ventilation. Chest. 1989;96(1):178-180.
11. Goettler CE, Fugo JR, Bard MR, et al. Predicting the need for early tracheostomy: A multifactorial analysis of 992 intubated trauma patients. J Trauma. 2006;60(5):991-996.
12. Dunham CM, Ransom KJ. Assessment of early tracheostomy in trauma patients: A systematic review and meta-analysis. Am Surg. 2006;72(3):276-281.
13. Barquist ES, Amortegui J, Hallal A, et al. Tracheostomy in ventilator dependent trauma patients: A prospective, randomized intention-to-treat study. J Trauma. 2006;60(1):91-97.
14. Arabi Y, Haddad S, Shirawi N, Al Shimemeri A. Early tracheostomy in intensive care trauma patients improves resource utilization: a cohort study and literature review. Crit Care. 2004;8(5):R347-R352.
15. Rumbak MJ, Newton M, Truncale T, Schwartz SW, Adams JW, Hazard PB. A prospective, randomized study comparing early percutaneous dilational tracheotomy to prolonged translaryngeal intubation (delayed tracheotomy) in critically ill medical patients. Crit Care Med. 2004;32(8):1689-1694.
16. Griffiths J, Barber VS, Morgan L, Young JD. Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation. BMJ. 2005;330(7502):1243-1247.
17. Heffner JE. Tracheotomy application and timing. Clin Chest Med. 2003;24(3):389-398.
18. Pierson DJ. Tracheostomy and weaning. Respir Care. 2005;50(4):526-533.
19. Dodek P, Keenan S, Cook D, et al. Evidence-based clinical practice guideline for the prevention of ventilator-associated pneumonia. Ann Intern Med. 2004;141(4):305-313.
20. Möller MG, Slaikeu JD, Bonelli P, Davis AT, Hoogeboom JE, Bonnell BW. Early tracheostomy versus late tracheostomy in the surgical intensive care unit. Am J Surg. 2005;189(3):293-296.
21. Ranes JL, Gordon SM, Chen P, et al. Predictors of long-term mortality in patients with ventilator-associated pneumonia. Am J Med. 2006;119(10):897.e13-19.
22. Leong JR, Huang DT. Ventilator-associated pneumonia. Surg Clin North Am. 2006;86(6):1409-1429.

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1. Identify the prevalence of obesity
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3. Outline pre-, intra- and post-operative care for patients having reconstructive surgery
4. Discuss the evidence for performing a tracheotomy on a mechanically ventilated patient earlier, rather than later in the course of ventilation, as it relates to outcomes and liberation from mechanical ventilation.
5. Explain the differences between the two types of tracheostomy procedure percutaneous dilation and open surgical

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1. **What is the percentage of American adults who reportedly are morbidly obese (category III)?**
   a. 27%
   b. 2%
   c. 5%
   d. 12%

2. **Which of the following statements are true about bariatric weight loss surgery?**
   a. Weight loss surgery was first introduced in 1980
   b. About 12,000 people had weight loss surgery last year
   c. Massive weight loss following bariatric weight loss surgery could lead to symptomatic redundant skin
   d. Early weight loss surgery involved resection of the esophagus

3. **Many patients regain weight after loss due to diet and activity. What is the percentage?**
   a. 25%
   b. 32%
   c. 97%
   d. 12%

4. **Postoperative care of the patient having reconstructive surgery includes**
   a. assessment of pain, vital signs, repositioning every 4 hours
   b. vital signs, repositioning every 4 hours, properly sized equipment
   c. vital signs, physiologic progress, bed at 30°
   d. assessment of pain, vital signs, keeping the bed flat

5. **Reconstructive surgery(ies) to remove excess abdominal skin is referred to as**
   a. brachioplasty
   b. mastopexy
   c. panniculectomy
   d. all of the above

6. **Problems associated with redundant skin are**
   a. pain and excessive perspiration
   b. pain, skin lesions, hygiene challenges, odor
   c. sexual dysfunction
   d. hygiene, center of gravity and orthopedic challenges

7. **Tissue deflation refers to loss of**
   a. vascular support
   b. underlying structures
   c. fatty tissue
   d. muscular atrophy

8. **Immediate postoperative risks might include**
   a. poor wound healing, bleeding, pain, embolic episodes
   b. reluctance to participate in care
   c. poor wound healing, bleeding, subphrenic pain
   d. inadequate protein intake

9. **Which of the following are indications for a tracheotomy?**
   I. upper airway obstruction
   II. facilitate long-term mechanical ventilation
   III. facilitate tracheobronchial hygiene
   IV. anorexia
   a. I, II, III only
   b. II, III, III only
   c. I, II, IV only
   d. I, III, IV only

10. **According to a large, multicenter study, what percentage of mechanically ventilated patients receive a tracheostomy?**
    a. 10%
    b. 20%
    c. 25%
    d. 30%

11. **Which of the following are advantages of a tracheostomy over endotracheal intubation?**
    I. absence of tracheal stenosis
    II. no vocal cord damage
    III. ability to suction deeper into the tracheobronchial tree
    IV. oral feeding is possible
    a. I, II, III only
    b. I, III, IV only
    c. I, II, IV only
    d. II, III, IV only

12. **Advantages of the percutaneous tracheotomy over the surgical tracheotomy include all of the following EXCEPT:**
    a. decreased incidence of decannulation
    b. lower cost
    c. fewer wound infections
    d. takes less time

13. **Nurses and respiratory therapists believe that patients with a tracheostomy can be weaned from the ventilator faster because:**
    a. the literature has substantiated that belief
    b. they look at a patient with a tracheostomy and have a "feeling" that he or she is ready for weaning
    c. that is their experience
    d. the patients tend to be less acutely ill by the time they receive a tracheostomy

14. **Which of the following are used to secure a tracheostomy tube?**
    I. adhesive tape
    II. a commercial tracheostomy tube securing device
    III. sutures
    IV. cloth twill tape
    a. I, III, IV only
    b. I, II, IV only
    c. I, II, III only
    d. II, III, IV only

What is the highest degree you have earned (circle one) ? 1. Diploma 2. Associate 3. Bachelor's 4. Master's 5. Doctorate

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.

	Strongly Disagree					Strongly Agree
1. Identify the prevalence of obesity	1	2	3	4	5	6
2. List surgical options available in managing issues of redundant skin	1	2	3	4	5	6
3. Outline pre-, intra- and post-operative care for patients having reconstructive surgery	1	2	3	4	5	6
4. Discuss the evidence for performing a tracheotomy on a mechanically ventilated patient earlier, rather than later in the course of ventilation, as it relates to outcomes and liberation from mechanical ventilation.	1	2	3	4	5	6
5. Explain the differences between the two types of tracheostomy procedure percutaneous dilation and open surgical	1	2	3	4	5	6

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Mark your answers with an X in the box next to the correct answer

	A	B	C	D		A	B	C	D
1	☐	☐	☐	☐	9	☐	☐	☐	☐
2	☐	☐	☐	☐	10	☐	☐	☐	☐
3	☐	☐	☐	☐	11	☐	☐	☐	☐
4	☐	☐	☐	☐	12	☐	☐	☐	☐
5	☐	☐	☐	☐	13	☐	☐	☐	☐
6	☐	☐	☐	☐	14	☐	☐	☐	☐
7	☐	☐	☐	☐	15	☐	☐	☐	☐
8	☐	☐	☐	☐	16	☐	☐	☐	☐

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