CONTINUING EDUCATION

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# Critical Care of the Morbidly Obese

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This article describes the special needs of the critically ill morbidly obese, with a focus on the care of the postoperative obesity surgery patient. The technique of surgery is described elsewhere in this journal. Details of nursing care complicated by obesity are discussed. Environment of care modifications required for routine care of the morbidly obese in critical care are detailed. Pharmacokinetic factors to be considered are reviewed. A case study is presented to coalesce concepts presented. **Key words:** *bariatric surgery*, *critical care*, *morbidly obese*, *post-operative care*, *weight loss surgery*

THIS ARTICLE describes the special needs of the critically ill morbidly obese, with a focus on the care of patients following obesity surgery. Most obesity surgery patients are admitted to the general surgical floor postoperatively. Patients who require critical care (either intensive or intermediate care) are considered a variance. These patients have had an unusual and unexpected outcome of surgery, or have significant comorbid disease related to obesity that warrants closer monitoring than can be provided on a general surgical floor. Morbidly obese patients who require critical care are especially challenging because all routine care is complicated by size. This article will review triage criteria, volume resuscitation in the initial postoperative period, body mechanics, unit modification, complications of immobility, alterations in drug therapy, and maintaining the artificial airway.

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## CASE STUDY

This case study presents one of the most complex cases one might encounter in the intensive care. His complications were a variance to the desired expectation, but constitute normal risks of the surgery. Mr CD is a 26-year-old white male who had gradually gained weight since his youth to 423 lb. He is 68 in. tall, which calculates to a body mass index of 64.5. At the time of his surgery his comorbidities included restrictive respiratory disease, sleep apnea, osteoarthritis of the lumbar spine and knees, and symptoms of depression.

After proper assessment and screening, he was admitted to the hospital for a Roux-en-Y gastric bypass, long limb. His intraoperative course was stable, but in the recovery room he could not tolerate extubation as demonstrated by respiratory distress and desaturation. He was reintubated after a short period of hypoxia and transferred to the ICU.

The first change in his status as observed by the nursing staff was persistent tachycardia at 120 beats per minute. Within 15 minutes it was appreciated that the patient was oliguric from the time of surgery, signaling dehydration and third space sequestration of fluids. Physical changes that followed in the next hour included a change in the compliance of the lung manifested by increased oxygen requirement and an increasing inspiratory pressure required for maintaining an acceptable tidal volume of 600 $cm^3$. He also developed a new temperature elevation to 100°F.

A nephrology consultation was obtained, and blood and urine chemistries were reevaluated. By

the third postoperative hour, he demonstrated a deterioration of his blood pressure to a level of 100/60 from 126/78, accompanied by a persistent tachycardia.

Two additional fluid challenges of 1000 $cm^3$ normal saline (0.9%) did not significantly improve the blood pressure, pulse rate, or urinary output. This was followed by a colloid infusion and diuretics without significant response. A dopamine drip was started at a rate of 4 $\mu$g/(kg min) and gradually increased to 12 $\mu$g/(kg min) as the need to maintain an acceptable systolic blood pressure. Blood chemistry demonstrated increased levels of BUN, creatinine, CK enzymes, and potassium. The patient regained consciousness within an hour postoperatively.

It was decided that the patient had either a septic process in the abdomen or an abdominal compartment syndrome. The surgeon had the option of either performing a gastrographen study or taking the patient directly back to the operating room for exploration. However, the CT scanner could not accommodate the patient's size. An indirect measurement of the patient's intraabdominal cavity could have been recorded by measuring the bladder pressure, however, because of the patient's critical condition, it was felt to be more prudent to open the abdomen. The patient was returned to the operating room for exploration of the abdomen 10 hours following the initial surgery after initial resuscitative measures failed. When the abdomen was opened, there was obvious intraperitoneal pressure, suggesting abdominal compartment syndrome. The organs were dusky. They rapidly became edematous and protruded from the abdominal cavity. Respiratory compliance improved immediately.

A careful exploration of all anastamoses sites showed no leak and there were no purulent collections in the abdomen. The abdominal contents were covered with a Marlex (Ethicon, Cincinnati) mesh laid over the omentum and attached under the edge of the fascia. The fascia and skin layers could not be closed because of the intraabdominal pressure.

The patient underwent a significant fluid challenge during surgery, and ultimately required the addition of Levophed at the rate of 4 $\mu$g/(kg min) in addition to the dopamine, in order to maintain an acceptable systolic blood pressure ($>$100 mm Hg). A Quentin (Quentin, USA) dialysis catheter and pulmonary artery catheter were inserted. He was started on dialysis to correct the rapidly increasing BUN, creatinine, and potassium. There was a period of approximately 10 days where significant elevations of the CK, SGOT, SGPT, as well as BUN, creatinine, and potassium were noted. These values gradually returned to normal with the aid of dialysis. The kidney function began to improve at 14 days postdialysis and dialysis was discontinued with complete return of renal function at 21 days.

The inotropic agents were gradually weaned off after 18 days but the respiratory support required continuation for 3 months before weaning could be tolerated owing to lack of strength. The patient had had a tracheostomy performed on the 10th postoperative day.

The Marlex mesh was removed under sedation on the 32nd postoperative day, because it had become infected with pseudomonas and proteus, both which were resistant organisms. These same bacteria were cultured from the trachea on the 14th postoperative day until the 40th postoperative day. The abdominal wall defect was partially closed on the 86th postoperative day and the remainder grafted on the 95th postoperative day.

The patient was unconscious from following the second surgery until the 18th postoperative day. He gradually regained neurologic function and effective communication by writing. He received diprivan and morphine infusions in the ICU when necessary to control pain and anxiety.

Nursing interventions to prevent skin breakdown and improve activity tolerance were activated. The skin integrity was maintained by nursing the patient on an air pressure relief mattress, frequent turning, and daily cleansing with special attention to the skin folds. The mobilization to a sitting position was gradually instituted, first using reverse Trendelenberg and then with a Bariatric lift (UHS, New Jersey). As time went on, it was identified that he had marked peripheral neuritis with severe weakness of the arms and hands and paralysis from the waist down consistent with polyneuropathy of critical illness. The diagnosis of polyneuropathy was made with the help of a neuro consult and nerve conduction study. The neuropathy was felt to be related to a combination of disuse atrophy, neuromuscular blocking agents used intraoperatively, and vitamin B deficiency. With consultation by the dietitian, massive doses of B vitamins, Co-Q-10, and flax seed oils were administered and the patient's weakness and neuropathy gradually improved.[1–6] The nurses were extremely diligent in ensuring both passive and active range of motion (ROM).

He was first able to stand at 7 months, walk at 8 months with braces, and walk unaided at 12 months.

Total parenteral nutrition was started in the first week postoperatively and was continued until normal peristalsis returned at approximately 6 weeks. Feeding was started with protein shakes via the gastrostomy tube at 2 months postoperative. He was started on oral feedings at $2^1/_2$ months.

The emotional and psychological support from the nursing staff, physiotherapy department, and his family were significant components of maintaining his determination to return to independent living. He was discharged from the ICU to the IMC unit and then to a rehabilitation hospital 9 months following his initial surgery. He remained an inpatient for a period of 6 weeks and then continued as an outpatient for a further period of 4 months.

This most exceptional young man has now returned to independent living, including driving a stick shift, and was able to return to his regular employment 16 months postoperatively. Both he and his family accredit the care and attention given to him in the ICU as one of the major factors in his recovery.

## TRIAGE

### Intermediate care

There is no one standard protocol to follow. Factors that are considered for intermediate care placement postoperatively are as follows:

- Respiratory distress index (RDI) >20 (moderate to severe) or sleep apnea requiring CPAP (continuous positive airway pressure)
- Pre- or postoperative tracheostomy
- Difficult extubation in recovery
- Late cases that might be prone to nighttime resedation

All of these criteria warrant close respiratory assessment and frequent reassessment. The higher nurse-to-patient ratio in intermediate care provides closer monitoring for impending respiratory compromise. A 4:1 ratio for observation and treatment by a registered nurse (with a nursing assistant to assist with turning and ambulation) is generally sufficient to provide adequate respiratory monitoring. The weight of the chest complicates the ability to breathe deeply when sedated. Because most anesthetics are lipophilic (see discussion below), there is an added risk that the patient who recovers from anesthesia initially may "resedate" when the anesthetics redistribute from the fat cells into the bloodstream and reactivate sedating properties of the drugs. The RDI would have been measured prehospital if the patient was diagnosed with sleep apnea. Patients with a known abnormal RDI or known sleep apnea are at higher risk of respiratory difficulties related to sedation and anesthesia. In all of these cases the nurse monitors pulse oximetry, heart rate, rate depth and pattern of respiration, ability to keep the airway free of obstruction by the tongue, and ability to clear secretions. In patients with known sleep apnea the length and frequency of apneic intervals are monitored. The patient with sleep apnea is not generally roused unless other symptoms of hypoxia are present such as premature ventricular contractions, bradycardia, or oxygen saturation values lower than the documented normal for that patient. Many sleep apnea patients require nighttime nasal positive pressure ventilation (CPAP), which some facilities prefer to monitor in an intermediate care environment. The positive pressure helps to prevent atelectasis by improving tidal volume during sleep. Postoperative orders may include patient-specific $SpO_2$ thresholds for concern, when to apply or increase oxygen therapy, nighttime CPAP orders, and prn reversal agents in the event of oversedation or resedation.

### Intensive care

Intensive care is reserved for those who

- are not extubated in recovery
- require mechanical ventilation

Other postoperative complications that may require intensive care include the following:

- Anastomotic leak
- Abdominal compartment syndrome and resulting bowel necrosis/respiratory compromise
- Sepsis/septic shock secondary to anastomotic leak or wound infection

## Problems/interventions related to case study

| | |
|---|---|
| Airway management | Suction |
| | Maintain position of endotracheal tube |
| | Trach care after trach insertion |
| | Frequent repositioning |
| Mechanical ventilation | Monitoring |
| | Tidal volume |
| | Minute ventilation |
| | End expiratory pressure |
| | Arterial blood gas results |
| | SpO2 |
| DVT/PE prophylaxis | Frequent turning |
| | Anticoagulation |
| | Venous compression |
| Cardiac output | Vasopressors guided by pulmonary artery readings, SBP, HR, UO |
| | Volume resuscitation |
| | PA catheter site care |
| Fluid/electrolyte balance | Volume resuscitation |
| | Hourly intake and output monitoring during critical period |
| | Monitor daily labs (basic metabolic panel) |
| | Monitor response to dialysis |
| | Dialysis catheter site care |
| Skin integrity | Frequent turning |
| | Frequent skin care/inspection |
| | Antifungal topical ointments to skin folds |
| | Increased activity as condition permitted |
| Nutrition | TPN then Gastric feedings then PO nutrition |
| | Monitor blood sugar during artificial feedings |
| | Dietary consult |
| | Dietary supplements |
| Alteration in activity | Increase activity as condition permits |
| | Nutritional supplements |
| | Physical therapy |
| | Passive and active range of motion |
| | Teaching family to assist with care |
| Wound care | Maintain clean open wound |
| | Wound care |
| | Wet to dry NS bid dressing changes |
| | When infected: wet to dry Dakin's solution |
| | When culture negative and skin closed with graft: Xeroform[Kendall] q3d dsg change |
| Infection | Monitor temp and daily labs (white blood count) |
| | Monitor type/color/amount drainage from tubes/sites |
| | Monitor line sites, duration of indwelling catheters/lines |
| | Serial abdominal reassessment/palpation |
| | Surgical wound inspection |
| | Skin inspection |
| Pain management | Administer analgesic therapy |
| | Serial pain reassessments |
| Anxiety/emotional support | Sedation |
| | Psychologist consult |
| | Antidepressants |
| | Active listening |
| | Encouragement |
| | Advocate visiting |
| | Encouraged patient use of laptop to increase socialization once consciousness regained |
| | Patient/family conferencing at routine intervals |

- Acute respiratory distress syndrome (ARDS)
- Aspiration pneumonia
- Excessive blood/volume loss requiring volume resuscitation
- Oversedation requiring reversal and/or reintubation
- Renal insufficiency related to insufficient volume resuscitation
- Deep vein thrombosis (DVT), pulmonary embolus (PE), and respiratory failure

Only complications that are unique to the morbidly obese are described further.

Anastomotic leak, abdominal compartment syndrome, internal bleeding, or sepsis may be suspected when the abdomen becomes rigid, hemogram falls, potassium rises, nonincisional abdominal pain occurs, or metabolic panel reveals metabolic acidosis. Fever, tachycardia, and increased need for fluid resuscitation point to a concern for sepsis related to leak or sepsis syndrome. To confirm the diagnosis of anastomotic leak, a Gastrografin study may be ordered by the surgeon. In this procedure contrast is administered via the nasogastric tube or by mouth, as well as via the gastric tube. The resultant radiographic images will demonstrate a flow of contrast out of a suture line if a leak is present. Some leaks are difficult to see even with a Gastrografin swallow study. In a negative study accompanied by positive and persistent symptoms, the surgeon considers reexploration and laparotomy.[7] Sequential abdominal palpation is a routine component of postoperative nursing assessment. Bloated, rigid, or firm abdomen, vomiting, retching, persistent tachycardia, and fever are reported to the physician.

It is not unusual for patients recovering from large abdominal surgeries to require up to 6 L of fluid during the recovery phase to achieve a euvolemic state in normal circumstances. If the patient returns from the operating room tachycardic (HR > 100), with low urine output (<30 $cm^3$/h) and marginal blood pressure (<100 systolic), volume replacement is considered first prior to vasopressor agents as the therapy of choice. Postoperative orders that allow the nurse to administer fluid challenge as needed based upon physiologic parameters will decrease calls to the physician, decrease delay to care, and enhance renal protection.

The morbidly obese are at higher risk of DVT and PE than the general population because of immobility stasis in addition to polycythemia related to chronic respiratory insufficiency.[8] Pharmacologic prevention is described below. In addition, thigh high pulsatile venous compression and venous compression stockings are not easily fitted to the morbidly obese. Most do not tolerate the claustrophobic effects of thigh high compression. Below the knee or foot devices fit better and are better tolerated. Preoperative orders routinely include DVT prophylaxis with anticoagulation plus leg compression. Compression may continue through the operative period, recovery and out to critical care. Patients who have been immobile warrant venous leg studies prior to application of compression devices.

## RESPIRATORY ISSUES

The respiratory system of morbid obesity patients is altered. Compliance of the respiratory system has been shown to be 35% lower because of either lung or chest-wall compliance. There is also a decrease in expiratory reserve volumes present to a greater or lesser amount because of the continuous weight gain.[9–11] Another consideration prior to bariatric surgery is whether the patient has any underlying obstructive sleep apnea present, which can be of a greater frequency in this population. It is important to screen bariatric patients for daytime sleepiness and other symptoms of sleep apnea preoperatively. If clinical suspicion is present, polysomnography is warranted before proceeding with the surgical procedure. The preoperative screening will alert the surgeon as to whether continuous positive airway pressure (CPAP) or bi-level positive airway pressure (BiPAP) would be helpful either preoperatively or in the initial postoperative

period.[9,10,12] Patients who have previously been tested positive for sleep apnea and use CPAP or BiPAP devices at home are instructed to bring their equipment with them to the hospital. The patient informs the health care team what settings the machine is programmed for and any other specifics of their normal requirement and tolerance of BiPAP or CPAP. It has been found that many patients who are ordered to use CPAP or BiPAP at home do not really follow through with the treatment owing to lack of tolerance for the mask and perceived claustrophobia. Even still, they may find that the treatment is quite helpful to maintain adequate tidal volumes postoperatively with which to clear anesthesia and maintain a wakeful state. Patients who use CPAP or BiPAP prior to surgery may need to be on the therapy immediately after extubation instead of just at night. The CPAP or BiPAP will overcome obstruction of the airway by the tongue and improve oxygenation, which are both affected by the sedative effects of anesthesia and resultant decreased minute ventilation. Research has shown that prophylactic use of BiPAP at a level of 12/4 postoperatively reduces pulmonary dysfunction and accelerates preoperative pulmonary function in obese patients undergoing gastroplasty.[12]

Preoperative respiratory patient teaching includes the importance of the deep breathing and coughing techniques. Presurgical instruction in the use of incentive spirometry and documentation of the pre-surgical threshold achievable assists the nurse and respiratory care practitioner to see how close to baseline the patient is postsurgery. Education also includes warning the patient of the risk regarding failure to wean from mechanical ventilation in the recovery period.

Postoperatively, the patient is maintained in a position with the head of the bed being at least 30° or 45° (without a hip gatch) for several days to reduce abdominal pressure on the diaphragm and thereby maximize tidal volume. Postoperative patients are encouraged to cough and deep breathe with incentive spirometry to assist in setting goals and measuring effort as soon as they awake. Bariatric patients who require mechanical ventilation postoperatively are also maintained with the head of the bed at 30° to 45°. There is mixed information in the literature as to tidal volume settings. Some literature suggests 5 to 7 mL/kg of ideal body weight and others suggest ventilation with tidal volumes as great as 15 to 20 mL/kg of ideal body weight.[13] Literature does suggest that positive end expiratory pressure of 10 cm $H_2O$ shifts the pressure–volume curves in a favorable direction in obese patients.[14] Weaning of these patients usually does not require overcoming an underlying chronic respiratory condition (such as in chronic obstructive pulmonary disease) but dealing with the lung function issues stated above and/or prolonged effects or complications of anesthesia. It should be noted that when making the decision to extubate, extra caution may be prudent as obese patients can be very difficult to reintubate. The use of CPAP, BiPAP, or intermittent positive pressure breathing may ease the transition of these patients postextubation.

Intubation is difficult because of the bull-neck configuration of the head and neck. The head is difficult to reposition into the standard intubation angle. Because of the increased degree of difficulty of the procedure, many physicians prefer to intubate using a fiberoptic laryngoscope. Emergency tracheostomy tube and tray are kept readily available. To prevent accidental extubation, extra caution is taken and may require additional personnel for safety during the following vulnerable periods of time:

a. In transport of the intubated morbidly obese (see the section on "Road Trips")
b. When turning to provide personal care
c. When obtaining the morning chest radiographs

To additionally complicate the situation, most bariatric patients requiring intubation are intubated orally. The oral route is easier for most physicians to achieve, but then it becomes harder for the nursing and respiratory staff to maintain. The tongue is large and strong. Morbidly obese patients can literally

tongue out the tube if not sedated adequately. The forceful cough is also stronger than in a small person. The force of the cough can migrate the tube out of position. The challenge of sedating enough so that they do not fight the tube, but maintaining as wakeful a state as possible to enhance efforts at weaning and extubation, is magnified in the morbidly obese. Vigilance at monitoring the depth of insertion and secure taping/tying of the tube is indicated. The respiratory therapist is encouraged to take responsibility for maintaining the airway when the patient is being moved, even if they wouldn't normally be present with average weight patients.

## DRUG THERAPY

Both the nurse and pharmacist share responsibility for screening physician orders prior to administration. Obesity can change the absorption, distribution, metabolism, and excretion of drugs—the pharmacokinetic properties of drugs. Of these, distribution and excretion are most affected.[15,16]

Changes in distribution may require a smaller or larger dose. A drug that distributes well into fatty tissue will be dosed using the patient's total body weight (TBW). A drug with a low affinity for fatty tissue is restricted to the blood and other tissues. Such a drug would require a calculated ideal body weight (IBW) or a dosing weight (DW). An IBW reflects a person's "lean" body weight and incorporates gender and height in its calculation.

Changes in excretion may require a shorter or longer dosing frequency. Renal elimination has been found to increase in obese patients taking several drugs. This is often attributed to greater kidney mass.[15] The following information provides the background a critical care nurse may need for patient assessment. Particular emphasis is placed on drug classes most likely to be seen in the critical care setting.

### Intravenous unfractionated heparin

Prior to weight-based heparin nomograms, a standardized dose of 5000 U bolus and 1000 U/h was common for dosing intravenous unfractionated heparin in myocardial infarction and treatment of venous thrombosis. The early 1990s popularized the use of weight-based nomograms after studies found weight was at least one factor that predicted heparin's final dose. Other factors include smoking and possibly gender. An unanswered question was whether TBW, IBW, or a DW best correlates with the final dose. Yee and Norton designed a study to retrospectively calculate which weight best correlated with the final dose.[17] They found TBW was the best determinant. The authors still cautioned against overdosing morbidly obese patients by setting maximum starting doses. A nurse could be instrumental in recommending a cap bolus of 10 000 U and initial infusion rate of 1500 U/h. Careful attention would be needed to adjust the dose by using activated prothrombin times (aPTTs) every 6 hours.

### Low-molecular-weight heparins

Since the approval of low-molecular-weight heparins, there has been debate regarding the capping of weight-based doses in obese patients. Of the 3 available products in the United States, only dalteparin (Fragmin) recommends a capped dose of 10 000 IU when patients reach 83 kg. Tinzaparin (Innohep) and enoxaparin (Lovenox) do not have maximum doses. Recent studies support normal dosing without capping in obese patients.[18–22]

While dose capping is an issue for the treatment of a thrombus, fixed doses are used for thrombosis prophylaxis. It is not well understood whether larger fixed doses are needed to prevent thrombosis in obese patients. Multiple regimens exist for dalteparin (2500–5000 U daily) and enoxaparin (40 mg daily and 30 mg q12h). The nurse may assess patients for their degree of thrombosis risk and recommend the higher of the dosing regimens in high-risk patients. However, one study of an agent used in Europe found lower doses to be sufficient.[23]

### Antibiotics

Only a handful of antibiotics are weight-based. The remainder generally achieve sufficient blood levels in both obese and nonobese patients. Aminoglycosides (gentamicin, tobramycin, amikacin) have about 40% penetration into fatty tissues. In obese patients a DW is calculated that is between the IBW and TBW. Vancomycin is well-distributed and TBW is used. Other common antibiotics such as fluoroquinolones, cephalosporins, and penicillins do not have recommendations for higher doses. However, one study of cefazolin for surgical prophylaxis found a single 2-g dose rather than 1 g decreased infections from 16.5% to 5.6%.[24,25]

### Sedatives/neuromuscular blockers

Benzodiazepines such as lorazepam, diazepam, and midazolam may be used in the intensive care setting for sedation. These drugs distribute well in the obese patient. Clearance is also increased. TBW should be used for weight-based doses.[15,16] Propofol has changes in distribution and clearance, but no clinically important changes have been reported.[26] All sedatives, especially when infused continuously, should be titrated to response. Daily awakening from sedation is advocated. A nurse assisting in daily awakening communicates delayed arousal to the physician to advocate for a decrease in dose. Results of daily awakening are documented and communicated with subsequent shifts.

Atracurium and vecuronium both have limited distribution and would be expected to be bolused using IBW. While this is true for vecuronium, atracurium has an unexplained hyposensitivity in obese patients that requires the drug to be dosed using TBW.[15] After an infusion is hung, train-of-four monitoring is more important than body weight for further titration. The extra tissue and fat in the wrist may induce a need for higher milliampere needed to produce the desired result. Because of the risk of polyneuropathy of critical illness and the devastating effect on muscle strength, ability to move, and complications of immobility, neuromuscular blocking agents are used as a last resort and for as short a time as possible.

### Activated protein C (Xigris)

Although studies of activated protein C for severe sepsis did not admit patients greater than 135 kg, the clearance and distribution in the highest 10% and lowest 10% of body weights was similar.[27] While there is some risk extrapolating data for more obese patients, TBW should be used to calculate a dose. All patients should be closely monitored for bleeding.

Overall the nurse assesses an obese patient's clinical response to drug therapy as with any patient. Not all changes have been studied, and every patient has a different set of features (age, gender, genetics, disease states) that may confound expected changes due to obesity.

## OBTAINING A STANDING POSITION IN THE CONSCIOUS PATIENT

The majority of extra work created by caring for the morbidly obese centers around moving and repositioning the patient safely. When making a morbidly obese patient stand for the first time, more than one person is available in case of orthostatic changes or unsteady gait. Abort the move if instability occurs. Caregivers need to be prepared with the fact that if the patient starts to slip toward the floor, they won't be able to break the fall. Most nurses will by instinct try to brace the patient to prevent them from falling, which would surely result in employee injury when dealing with the morbidly obese. Secure a walker, or a wheelchair turned backwards, in front of the patient prior to asking the patient to stand. If the bed has been elevated so that the patient can walk out of the bottom, one employee stands on each side of the walker, bracing the foot of the walker with their own feet. The patient is instructed to use their own strength to obtain the standing position. Straining to pull the patient to a standing position will not work. For all intermediate care patients, early

standing and ambulation decreases pain, decreases the risks of immobility (below), and improves recovery. One standard is to walk within 2 hours of admission postoperatively and every 2 hours while awake thereafter. Encouraging a family member to stay and assist with ambulation decreases employee strain. The motivation given by a family member will also help with patient compliance to meet goals.

## REPOSITIONING THE UNCONSCIOUS OR FULL CARE MORBIDLY OBESE PATIENT

Added strain to the bedside staff is unavoidable. Monitor back injury closely prior to and following the start of an obesity surgery program to identify need for additional equipment or resources. Provide instructions for the staff on available equipment and techniques and the importance of securing help prior to lifting the obese. In the unconscious or full care patient it may require 5 people to safely lift and reposition. One person is dedicated to monitoring the artificial airway. One person lifts the head. One person is positioned on each side and finally someone at the foot of the bed lifts the heels to reduce drag/resistance. Gravity will decrease the resistance against lifting by placing the bed in Trendelenberg prior to the lift. The unspoken truth about needing all of this help is that in moderate-sized departments, 5 people may be most or all of the available staff. To reduce the likelihood of staff avoiding the situation (because it is exhausting) and leaving the primary nurse without enough help to execute the move safely, it may be beneficial to announce during change of shift report that the patient will be turned by the whole team on the even hours and that everyone will help. Rotate, leaving one person out in the department to monitor the alarms of the other patients. If your department has many employees on duty at once, a predetermined rotational system will ensure compliance with turning/lifting/inspection and personal care. Secure the assistance of the respiratory therapist and ask that he be responsible for the airway during all of the moves. Because the care of the unconscious morbidly obese requires more time per patient, adding hours per care to the acuity system is warranted. An estimated additional 1.5 hours of care is required per unconscious or full care morbidly obese patient.

A transfer device is essential despite the cost. The HoverMatt® (Patient Handling Technologies, Allentown, Pa) is a transfer device that looks like a thin plastic air mattress. It is hooked to an air compressor (which is noisy, yet efficient). The mattress is placed under the patient like a sheet. Then the air compressor hose is hooked up to a connection in the corner. When the compressor is turned on, the patient is literally levitated on a cushion of air. In the supine flat position, the patient can be easily lifted to the top of the bed, even if unconscious, with little effort. The transfer device may also be used to move patients from the bed to the procedure table by using the same procedure. The mattress is deflated before elevating the head of the bed. If the head of the bed is elevated with the mattress inflated, it would transform the bed into a slide and the patient could slip out of the bed.

## COMPLICATIONS OF IMMOBILITY

Complications of immobility are of primary importance in the unconscious patient and include pneumonia, atelectasis, deep vein thrombosis, pulmonary embolism, and pressure ulcer prophylaxis. All of these can be minimized by attention to details in nursing care. A rigid routine of turning and repositioning is adhered to. Do not rely on rotational mattresses to relieve pressure and prevent pneumonia. Manual turning is necessary, yet difficult. Unconscious, immobile patients are prone to yeast infections in the skin folds, which warrant proactive monitoring and treatment at the first sign of a problem. With each turn to the side, posterior skin folds are assessed, cleansed, and dried as needed. The anterior skin folds (including under the breasts) are inspected at the same time. The most difficult areas to inspect are

the folds behind the neck, the posterior skin to endotracheal tube tape or tie interface, and the occiput. These areas may become macerated from the posterior collection of sputum, saliva, and constant pressure. The bullhead configuration of the head and neck in the morbidly obese makes manual turning of the head with each repositioning necessary and difficult. If the head is not manually repositioned, it will stay in one place and an occipital pressure ulcer will result. The same is true of the heels. The body weight of morbid obesity imposes increased pounds per square inch of pressure against the bed, resulting in early pressure ulceration. Folds of fat can cause pressure ulceration when immobile. All lines and tubes (ie, foley drainage tube, gastric tube) are visually inspected to make sure they are not trapped in a skin fold that would become a nidus for infection and ulceration. Pharmacologic DVT/PE prophylaxis has been described above. If the patient is kept moving, fewer complications related to immobility will occur. When extubated, ambulation is considered immediately. Prior to extubation, frequent turning, repositioning, and special attention to keeping the skin folds dry are imperative measures to prevent complications.

## UNIT MODIFICATIONS

When preparing to start an obesity surgery program, the environment of care will require the following modifications and equipment:

- Obesity commodes
- Obesity wheelchairs
- Obesity gowns
- Large and extra large blood pressure cuffs
- Beds that accommodate morbidly obese in girth as well as weight
- Bedside chairs the size of loveseats
- Floor mounted toilets
- Bolstered waiting room furniture
- Obesity tested patient transfer device (described above)
- Fans

The best place to locate the vast array of appropriate obesity-related equipment for purchase is the vendor display at the American Society of Bariatric Surgery (ASBS) national convention each year. Hill-Rom®, KCI®, SizeWize® Rentals, all have lines of obesity-specific products.

Regular blood pressure cuffs are too small for traditional placement on the upper arm, but it is not always an easy answer just to place a large or extra large cuff in the same position. The upper arm is triangular in shape and the cuff will not always fit snugly when wrapped. It is often easier to obtain the blood pressure using a regular-sized cuff on the forearm instead. In some cases, the lower leg is used. In all cases, when a patient comes out from the operating room it will save time to ask the anesthesiologist what method was used to obtain the blood pressure during surgery before he leaves the building.

A bed that allows the patient to be raised to a sitting position, then remove the footboard and walk out of the bottom, decreases the energy expended by both the patient and the nurse. Walking out of the end of the bed eliminates the step of twisting the patient over the side of the bed just prior to standing. The act of assisting a patient to turn sideways to sit on the side of the bed is an awkward position that causes extra back strain to the employee. Coming straight out of the bottom of the bed reduces this strain. Beds, walkers, wheelchairs, and commodes can be rented if the expected volume of business is low.

There have been anecdotes to caution that if the toilets are wall mounted, the wall strain imposed by sitting on them may actually pull down the wallboard behind the toilet. To reduce this risk and strain, wedges may be placed under the neck of the toilet to displace the weight. Future toilet purchases are planned as floor mounted.

Many morbidly obese patients find that a fan helps to decrease the discomfort associated with perspiration and also decreases the sensation of breathlessness. Installing a fan over the head of the bed in each patient room increases patient comfort and decreases nursing time to locate a fan.

The families of obesity surgery patients are often obese themselves. After routine use by

many obese customers, the reupholstering cycle for waiting room furniture and bedside chairs can be expected to drop from every 5 years down to every 3 years.

## ROAD TRIPS

Prior to sending a morbidly obese patient to another department for a test, procedure, or surgery the radius and weight limit of the procedure or operating table is evaluated. Common tests needed when complications occur are computerized tomography, nuclear medicine red blood cell scan (to look for a source of bleeding), white blood cell scan (to identify the source of an infection), or rarely, angiography. It is helpful if the weight limits for each table and radius are posted in the critical care department so that patient selection may be screened before expending the energy and risk of transporting the patient out of the department.

Most outlying departments decrease staffing after normal business hours. Because of the number of people necessary to safely move the obese patient from the bed to the procedure table, it is wise to set a standard that these patients are triaged to receive tests early in the day when the largest number of staff are available to move and secure the patient. The use of a HoverMatt® as described above, or an equivalent device, is advocated to reduce employee back injury and streamline the transfer process. It goes without saying that to decrease the total effort of the move, the patient is transported in the bed instead of transferring from the bed to the gurney and then to the table, thereby eliminating 2 lateral transfer procedures.

In normal circumstances respiratory therapists leave the nurse alone in radiology and nuclear medicine while a mechanically ventilated patient is being tested and come back for the return transport to the department. It is advocated to request the constant presence of the respiratory therapist when the morbidly obese patient requires mechanical ventilation outside the department. Because of the difficulty involved in reintubation and potential lethal effect of the loss of an artificial airway, constant surveillance of the airway while en route and during procedure is indicated for patient safety.

## OBESITY BIAS

The subject of caring for the obese cannot be concluded without addressing obesity bias amongst the staff. These patients have failed many attempts to lose weight and are sensitive to the way that they are addressed publicly. They know they are difficult to care for. A successful program will survive through word of mouth of satisfied customers and their families. The staff has an obligation to understand, accept, and project a professional attitude towards the patient and the decision to have surgery. The surgery is much more than cosmetic. Most patients successfully demonstrate improvement of comorbid factors such as hypertension, heart disease, diabetes, joint disease, gastric reflux, and sleep apnea with surgically produced weight reduction.[28] Strategies to decrease staff bias against the obese may include the following[29,30]:

- Provide equipment and staff to care for the patients without strain
- Provide a routine orientation regarding care of the morbidly obese to new employees
- Have staff attend educational sessions regarding the benefits of the surgery with prospective patients
- Verbalize importance of professional bedside demeanor
- Actively solicit patient feedback ("Were you treated with respect during your hospital stay?") and provide results to staff
- Invite successful patients to speak to staff at an inservice program in a panel forum

## CONCLUSION

In conclusion, critical care of the morbidly obese is multiplied by the effect of body size on routine nursing procedures, effect of fat tissue on drug distribution, absorption and clearance of medications, and increased complications of immobility. Careful planning to equip the department with the resources to

decrease body strain improves the ability of the nurse to provide care without injury. The care is not technically difficult, or cognitively difficult, but instead physically difficult. Attention to detail and teamwork are key factors to success. When a morbidly obese survivor of critical illness returns to thank the staff after losing weight and regaining total health, the results are professionally rewarding beyond expectation.

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