The ABCDs of Managing Morbidly Obese Patients in Intensive Care Units
Luis A. Berrios, DNP, MHA, ANP-BC, CCRN

More than one-third of the US adult population and 17% of the youth are now obese, and obesity is associated with more than $147 billion a year in health care costs. Critical care nurses should understand the physiological differences and practice guidelines for patients with a body mass index greater than 30. The ABCD approach encompasses key clinical concepts in the management of critically ill obese and morbidly obese patients, including management of airways and breathing, minimizing nurses’ back and other injuries, increasing awareness of bias, circulation problems, risks of decubitus ulcers and other skin breakdown, differences in drug calculations and metabolism, limitations in diagnostic equipment and imaging, diet and nutritional recommendations, and concerns with durable medical equipment. (Critical Care Nurse. 2016;36[5]:17-26)

As noted in various studies,1,2 obesity is a major public health concern that places a major strain on the entire health care system. More than one-third of the US adult population and 17% of the youth are now obese,3 and obesity is associated with more than $147 billion a year in health care costs.1 Obesity is defined as a body mass index (BMI; calculated as weight in kilograms divided by height in meters squared) greater than 30; extreme or morbid obesity is a BMI of 40 or greater.4 Obese patients, especially morbidly obese patients, have higher rates of resource utilization, intensive care unit (ICU) admissions, respiratory failure, and tracheostomy than do nonobese patients.5 Furthermore, obese patients are at higher risk for postoperative death and complications.6

This article has been designated for CE contact hour(s). The evaluation tests your knowledge of the following objectives:
1. Using the ABCD approach, list the key clinical concepts highlighted in this article for managing morbidly obese patients in intensive care units
2. Identify key physiologic differences in airway, breathing, and circulation in morbidly obese patients
3. Identify important considerations in diagnostic and general medical equipment in the management of morbidly obese patients

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Critical care nurses should understand the physiological differences and practice guidelines for patients with a BMI greater than 30. The following ABCD approach articulates key clinical concepts in the management of critically ill obese and morbidly obese patients, including management of airway and breathing, minimizing nurses’ back and other injuries, increasing awareness of bias, circulation problems, risks for decubitus ulcers and other skin breakdown, differences in drug calculations and metabolism, limitations in diagnostic equipment and imaging, diet and nutritional recommendations, and concerns with durable medical equipment.

A: Airway

Any patient can have an airway that is difficult to intubate, and various studies indicate that morbid obesity itself is not a predictor of a difficult intubation. However, studies on obesity as a risk factor for airway problems indicate that obesity is a statistically significant but weak predictor of difficult intubation. Compared with non-obese patients, obese patients have an increased tongue size, a smaller pharyngeal area, redundant pharyngeal tissue, an increased neck circumference, and an increased chest girth. These changes are associated with obstructive sleep apnea, obesity hypoventilation syndrome, and respiratory failure. Increased abdominal girth reduces diaphragmatic expansion, resulting in hypoventilation and a reduction in total lung capacity and functional residual capacity. As a result, morbidly obese patients tend to have higher rates of respiratory failure and subsequent intubation.

The recommended method for bag-mask ventilation and oxygenation before intubation in morbidly obese patients is to place the patient in a 25º head-up position or reverse Trendelenburg position to shift the weight of the chest wall inferiorly and improve diaphragmatic excursion. The head-up or “ramped” position is achieved by horizontally aligning the sternal notch with the external auditory meatus. The position can be accomplished by using multiple folded blankets under the upper part of the body, shoulders, or head. The 25º head-up and reverse Trendelenburg positions also facilitate visualization of the vocal cords during direct laryngoscopy.

Critical care units should have backup emergency airway tools such as supraglottic tubes (eg, laryngeal mask airways, King laryngeal tubes, esophageal tracheal airways or esophageal tracheal double-lumen airways) that can be inserted “blindly” as a temporary measure until a definitive airway can be established; optical and/or video laryngoscopes, which can result in fewer difficult intubations than direct laryngoscopy does; and standard cricothyrotomy kits with extra large tubes. Critical care units must have these items readily available in order for practitioners to follow the guidelines in the difficult airway algorithm of the American Society of Anesthesiologists.

B: Breathing

Changes in breathing related to obesity include increased respiratory rates, increased oxygen consumption and metabolic requirements of excess tissue, increased work of breathing, and decreased tidal volume. These changes can lead to decreased time to desaturation, increased oxygen requirements, and hypoventilation with supine spontaneous ventilation. Once a definitive airway is secured, and unless contraindicated, nurses should maintain patients in a reverse Trendelenburg position as tolerated to decrease intrathoracic pressure and reduce atelectasis, ventilation-perfusion mismatch, and hypoxemia. Ventilator settings should be set on the basis of the patient’s predicted body weight (PBW) or ideal body weight (IBW) and not on the basis of actual or total body weight (TBW) to avoid barotrauma. Formulas for estimating IBW and PBW vary slightly, and the terms are often used interchangeably. The Acute Respiratory

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Distress Syndrome Network (ARDSnet) uses the Devine formula and the term PBW where PBW = IBW (Table 1 shows how to calculate PBW and IBW).17-19

Because of a heavy, noncompliant chest wall, initial tidal volumes should be set to approximately 8 mL/kg of PBW in most morbidly obese patients and to 6 mL/kg of PBW in morbidly obese patients with ARDS or acute lung injury.11,20 Additionally, plateau pressures should be closely monitored and maintained at less than 30 cm H₂O.11 The addition of positive end-expiratory pressure (PEEP) may help improve lung compliance by reversing atelectasis and increasing functional residual capacity.11,20 The optimal amount of PEEP will vary and should be set according to the practitioner’s clinical judgment and the patient’s hemodynamic status. For patients with ARDS, the ARDSnet protocol clearly delineates recommendations for PEEP.

Exubating morbidly obese patients can be challenging because they often require prolonged weaning trials (prolonged duration of ventilation).20 Bridging extubated patients by using noninvasive positive pressure ventilation (NIPPV) such as continuous positive airway pressure and bilevel positive airway pressure can reduce the incidence of reintubation.10,22,23 Patients who experience hypoxemia despite NIPPV should receive supplemental oxygen; the amount of the supplemental gas should be titrated according to the results of pulse oximetry or arterial blood gas analyses. Supplemental oxygen alone is insufficient therapy for obesity hypoventilation syndrome.10,22

Practitioners should also consider treating all morbidly obese patients with NIPPV during the patients’ sleep to address obstructive sleep apnea and obesity hypoventilation syndrome and reduce the risk of respiratory failure.10,22,23 NIPPV may also be used initially in patients with respiratory failure as a method of preoxygenation before intubation or to delay or avoid intubation.22,23 However, the patients must be alert and able to maintain a patent airway, and anxiolytics may be required to help in compliance. Practitioners should not delay prompt tracheal intubation if NIPPV is unsuccessful in a morbidly obese

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### Table 1 Body mass index (BMI) classifications and weight-based calculations

<table>
<thead>
<tr>
<th>Classification</th>
<th>BMI&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
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<tbody>
<tr>
<td>Underweight</td>
<td>&lt; 18.5</td>
</tr>
<tr>
<td>Normal weight</td>
<td>18.5-24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25-29.9</td>
</tr>
<tr>
<td>Obesity (class 1)</td>
<td>30-34.9</td>
</tr>
<tr>
<td>Obesity (class 2)</td>
<td>35-39.9</td>
</tr>
<tr>
<td>Extreme obesity (class 3)</td>
<td>≥ 40</td>
</tr>
</tbody>
</table>

<sup>a</sup> See below for how to calculate BMI by using pounds and inches. BMI can also be calculated by dividing weight in kilograms by height in meters squared.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Example calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI 1. Multiply weight in pounds by 703</td>
<td>350 x 703 = 246 050</td>
</tr>
<tr>
<td>2. Multiply height in inches by height in inches</td>
<td>62 x 62 = 3844</td>
</tr>
<tr>
<td>3. Divide answer in step 1 by answer in step 2</td>
<td>246 050/3844 = 64</td>
</tr>
<tr>
<td>Ideal body weight (IBW) or predicted body weight</td>
<td>50 kg + (2.3 kg x 2) = 54.6 kg</td>
</tr>
<tr>
<td>Males: 50 kg + 2.3 kg for each inch over 5 feet</td>
<td>45.5 kg + (2.3 kg x 2) = 50.1 kg</td>
</tr>
<tr>
<td>Females: 45.5 kg + 2.3 kg for each inch over 5 feet</td>
<td></td>
</tr>
<tr>
<td>Lean body weight (by using Duffull-Green formula&lt;sup&gt;17&lt;/sup&gt; and total body weight [TBW] in kilograms [lb/2.2])</td>
<td>[9270 x (350/2.2)]/[6680 + (216 x BMI)] = 71.93 kg</td>
</tr>
<tr>
<td>Males: [9270 x TBW]/[6680 + (216 x BMI)]</td>
<td>[9270 x (350/2.2)]/[8780 + (244 x BMI)] = 60.45 kg</td>
</tr>
<tr>
<td>Females: [9270 x TBW]/[8780 + (244 x BMI)]</td>
<td></td>
</tr>
<tr>
<td>Adjusted body weight</td>
<td>For a man, 54.6 + 0.4 x [(350/2.2) - 54.6] = 96.4 kg</td>
</tr>
<tr>
<td>Males and females: IBW + [0.4 x (TBW – IBW)]</td>
<td></td>
</tr>
</tbody>
</table>

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Nearly 50% of the reported injuries and illnesses among nurses in 2011 were musculoskeletal disorders.

B: Backs
Regardless of a patient’s BMI, nurses should be using safe patient handling techniques. According to data from the Bureau of Labor Statistics, workers in hospitals have injuries and illnesses at nearly twice the national mean rate. Nearly 50% of the reported injuries and illnesses among nurses in 2011 were musculoskeletal disorders. The Occupational Safety and Health Administration recommends the establishment of safe patient handling programs in all nursing units. The organization emphasizes that successful safe patient handling programs should involve a comprehensive assessment of the nature of patients’ and workers’ needs, full support from members of the hospital administration, involvement of employees, policies that encourage the safest patient handling techniques, the right equipment for the right job, adequate maintenance of equipment, education and training, and ongoing evaluation and improvement.

According to the lifting equation of the National Institute for Occupational Safety and Health, the maximum recommended weight a nurse should lift while providing patient care is generally 35 lb (16 kg). Assistive devices should be used if individually lifting more than this weight. Nursing units should establish policies that incorporate safe patient handling programs to address the transfer and repositioning of morbidly obese patients in order to reduce injuries to both nursing staff and patients. Policies should include information on weight limits for each piece of equipment, the minimum number of staff required according to the patient’s weight and equipment used, and specific protocols to address staff or patient injuries.

B: Bias
Bias against morbidly obese patients can be detrimental to their health. Patients’ perceptions of being stigmatized by health care providers, specifically nurses, can lead to feelings of shame, marginalization, and anxiety. Negative attitudes toward the morbidly obese can result in actions or lack of actions that may greatly affect a patient’s health. Not having standard supplies and equipment, such as hospital gowns, examination tables, or blood pressure cuffs large enough to accommodate morbidly obese patients, can create an uncomfortable environment. Moreover, health care personnel should avoid voicing their opinions about morbidly obese patients to avoid promoting an unprofessional working environment. Becoming aware of one’s personal biases is the first step in making sure these biases do not affect the care provided. Regardless of clinicians’ opinions or the reasons for the patients’ level of obesity, the priority is to provide the best quality nursing care while ensuring dignity and remaining compassionate and empathetic.

C: Circulation
Patients who are morbidly obese have notable changes in the circulatory system, including hyperkinetic circulation, increased blood volume, increased blood viscosity and fibrinogen, and decreased fibrinolysis. These factors increase the risk for deep vein thromboses and pulmonary emboli. Standard chemoprophylaxis, such as subcutaneous heparin in combination with sequential compression devices, should always be considered unless contraindicated (eg, bleeding or thrombocytopenia). Morbidly obese patients also have a higher incidence of heart failure, ventricular hypertrophy, and dysrhythmias because of the increased blood volume, preload, afterload, and myocardial work associated with morbid obesity.

Gaining peripheral intravenous access in a morbidly obese patient can be challenging and often delays necessary phlebotomy for diagnostic tests. As a result, many morbidly obese patients require a central venous catheter (CVC). However, even CVC placement can be challenging, because anatomical structures may be difficult to locate and standard-sized catheters may not be long enough for appropriate placement. According to recommendations, practitioners should use ultrasound technology to accurately locate veins and minimize complications. Although the Trendelenburg position is the preferred position for placement of an internal jugular CVC because the position results in higher central venous volume and larger vein caliber and can prevent air embolus, this position could result in an acute deterioration of cardiopulmonary status due to reduced lung volumes, diminished pulmonary reserve, intra-abdominal
pressure, and elevated right ventricular pressures. The Trendelenburg position should be used with caution.

According to the Centers for Disease Control and Prevention, more than 30,000 central catheter–associated bloodstream infections occur in acute care facilities each year, resulting in serious infections, typically prolonging hospital length of stay and increasing costs and risk of mortality. Patients with morbid obesity may be at higher risk for these infections than are nonobese patients, and the higher risk may be partly due to the immune dysfunction associated with morbid obesity. However, the results of a recent study did not indicate any difference in the rates of central catheter–associated bloodstream infections between obese and nonobese patients.

Placing femoral CVCs in obese patients may increase the risk for infection. However, use of the femoral site may be unavoidable, depending on contraindications to placement in other sites. The Centers for Disease Control and Prevention recommend stringent education of personnel on proper placement and monitoring of CVCs, routine refresher training, and appropriate nurse staffing because elevated patient to nurse ratios and higher rates of “pool nurses” in units can increase the rate of central catheter–associated bloodstream infections.

Intraosseous cannulation is another vascular access option that can be emergently placed by nurses. Insertion sites include the sternum and the proximal or distal tibia and humerus, and nurses can infuse fluids up to 125 mL/min. The intraosseous catheter should be removed within 24 hours of insertion or as soon as intravenous or central venous access has been achieved. Contraindications include fractures or trauma at the insertion site, prosthetic joints near the site, site infection, osteoporosis, and inability to identify appropriate insertion landmarks. Potential complications include extravasation of fluids into the soft tissue, bony trauma from insertion, and osteomyelitis.

D: Decubitus Ulcers

Treatment of pressure ulcers is costly, and the development of pressure ulcers can be prevented by using evidence-based nursing procedures. Several factors predispose bariatric patients to loss of skin integrity, including decreased blood and oxygen supply due to increased adipose tissue and an increase in perspiration and skin moisture, increasing the risk for bacterial and fungal invasion. Nurses should conduct a thorough wound evaluation, especially in high-risk areas such as the sacrum, buttocks, elbows, and heels, and do a risk assessment by using an instrument such as the Braden Scale when an obese patient is admitted to the ICU. Although scores on the Braden Scale may have insufficient predictive validity and poor accuracy in identifying ICU patients at risk for pressure ulcers, the scale serves as a structured and standardized approach for assessing risk.

As of October 2008, hospitals no longer receive additional payments when stage 3 or 4 pressure ulcers develop in patients, and failure to prevent pressure ulcers can result in provider liability. The key to preventing decubitus ulcers is pressure redistribution, which involves appropriate use of pressure-reducing devices and positioning of patients. Determining the proper device for preventing decubitus ulcers involves a thorough assessment of the patient’s risk for ulcers, the ease of use of the device or equipment, accessibility, and costs (specialty beds can be costly to rent).

The frequency of repositioning should be based on the patient’s activity level and risk for skin breakdown. According to recommendations, patients should be turned within a 2-hour interval, because skin erythema and ischemic changes can occur in healthy adults in less than 2 hours on a standard mattress. Detecting and improving the quality of skin perfusion are important and include prompt treatment of hypotension, limiting vasoconstrictive agents, improving cardiac output, and revascularization of distal tissues.

Other approaches to preventing decubitus ulcers include daily inspection, documentation, frequent skin care, and use of proper assistive devices. The primary goal is to keep the skin clean and dry while avoiding excess dryness and scaling; the risks for infection and skin abnormalities in skin folds is higher in morbidly obese patients than in nonobese patients. Deep skin folds such as those under pendulous breasts, groin folds, or under a pannus must be closely monitored, dried thoroughly, and kept as open to air as possible. This goal can be achieved by using soft cloths in between skin folds, special drying products such as moisture-wicking fabric with antimicrobial silver, and fungus-inhibiting powders. Bariatric weight mechanical lateral
transfer devices, ceiling lifts, air-assist devices, and friction-reducing devices should be used to prevent skin shearing.38

Also important is correcting malnutrition, because most likely adequate nutrition helps both prevent formation of pressure ulcers and promote healing of early-stage ulcers.38 Promoting early mobility is probably the most important prevention strategy.40

D: Drugs

Moderate pharmacokinetic and pharmacodynamic variations are associated with obesity, but obese subjects are often excluded from clinical trials. Consequently, appropriate dosing for obese patients is based on data on “normal weight” nonobese patients.31 Various weight-based formulas are used to calculate dosages to avoid unsuccessful treatment, toxic effects, and antibiotic resistance.42 Examples of the weights used are IBW; lean body weight or weight devoid of almost all adipose tissue; and adjusted body weight, which includes an adjustment factor of 40% for patients who are more than 20% of their IBW (Table 1 describes calculations for these formulas).

Differences in proportion of adipose and lean muscle tissue and fluid status can greatly affect pharmacokinetics, absorption, distribution, metabolism, and excretion of drugs.42 Obesity can increase total blood volume and cardiac output and cause alterations in plasma protein binding. Hepatic clearance is usually normal or even increased in obese patients, and renal clearance can increase because of increases in kidney weight, renal blood flow, and glomerular filtration rate.43 Volume of distribution in obese patients can be dramatically different than that in normal-weight patients, and the extent of change is based on the intrinsic characteristics of a medication, such as molecular size, degree of ionization, extent of lipid solubility, protein binding, and ability to cross biological membranes.42

Additionally, obesity can alter activity through the cytochrome P-450 pathway, affecting drug clearance. Standard creatinine clearance values may also be inaccurate in morbidly obese patients, and depending on whether IBW or TBW is used in calculations, the values may be overestimated or underestimated.42 Dosing of renally excreted drugs should be adjusted on the basis of measured, not calculated, creatinine clearance.41

Active involvement of clinical pharmacologists in the dosing of medications is highly recommended. Important actions include using the appropriate weight-based calculations, educating nursing staff, and establishing protocols for medications used in emergent situations (eg, quick reference guides in medication rooms).

D: Diagnostics

Radiology departments face increasing challenges in their ability to perform imaging studies with acceptable diagnostic quality in obese patients.43 Because of thick layers of adipose tissue, computed tomography, magnetic resonance imaging, ultrasound, radiography, and even nuclear medicine studies often yield distorted images with limited diagnostic value.43 These factors can delay or distort data, placing the health care staff in a diagnostic predicament. Adjustments in radiological techniques to acquire better images can also increase exposure to radiation.43

The scanners commonly used for computed tomography and magnetic resonance imaging have gantry aperture diameter (chest and abdominal girth) restrictions and table load limits. Patients must be able to freely move in and out of the machine’s opening during the procedure. In addition, size restrictions exist to prevent structural damage to the equipment and subsequent injury to the patient. However, devices are now available that accommodate patients weighing up to 650 lb (292 kg), but the patient must meet the aperture diameter standards.43 Nurses should become familiar with the girth and weight restrictions of their facilities’ diagnostic equipment. Nurses should also understand hospital protocols for those occasions when patients do not meet criteria for in-house imaging and for alternative imaging locations. Moreover, hospitals should promote collaboration between nursing and radiology staff to ensure safe transfer, positioning, and monitoring of morbidly obese patients.

D: Diet

One incorrect assumption is that morbidly obese patients do not need nutritional support while in the ICU. On the contrary, obesity is associated with increased energy expenditure, insulin resistance, protein breakdown, rapid deterioration in muscle mass, and deconditioning.44

Hospitals should promote collaboration between nursing and radiology staff to ensure safe transfer, positioning, and monitoring of morbidly obese patients.
Nutritional support should be initiated within 48 hours of admission, with enough calories to prevent metabolic derangements and protein breakdown, unless contraindicated.44

The association between improved mortality and obesity is confounded by malnutrition status, and critically ill obese patients with malnutrition have worse outcomes than do obese patients without malnutrition.45 However, the commonly used markers for malnutrition, prealbumin and albumin, may not accurately reflect malnutrition. Serum levels of prealbumin and albumin decrease promptly with injury or illness regardless of nutrient intake, and this decrease cannot be assumed to reflect nutritional deprivation. These markers also may not reflect malnutrition until extreme starvation occurs. Therefore, nutritional support should be based on evidence of meaningful benefit from treatment rather than on nutritional markers.46

Data on the dietary recommendations of critically ill morbidly obese patients in the ICU is limited. However, the Society of Critical Care Medicine and the American Society for Parenteral and Enteral Nutrition recommend that obese, critically ill patients with a BMI of 30 to 50 receive 11 to 14 kcal/kg per day of enteral feedings based on actual body weight and that those with a BMI greater than 50 receive 22 to 25 kcal/kg per day based on IBW.47 Contraindications include patients with severely unstable hemodynamic status and patients who have not had adequate fluid replacement because such patients may be predisposed to bowel ischemia. A unstable hemodynamic status by itself is not a contraindication if evidence indicates adequate volume replacement and tissue perfusion.48 Other contraindications include bowel obstruction, severe and protracted ileus, major bleeding in the upper part of the gastrointestinal tract, intractable vomiting or diarrhea, gastrointestinal ischemia, and a high-output fistula.

For critically ill patients who have contraindications to enteral nutrition, early parenteral nutrition is not recommended, and evidence suggests that use of the parenteral route may be associated with an increased risk of nosocomial infections.49 No consistent evidence suggests that early parenteral nutrition decreases the number of ventilator-free days, length of stay, or mortality. When to start parenteral nutritional support is unclear, but parenteral feedings are typically not started before 7 days.49,50 Contraindications to parenteral feedings include hyperosmolality, severe hyperglycemia, electrolyte abnormalities, volume overload, and inadequate attempts to feed enteral.49,50

Dieticians should be consulted to calculate appropriate enteral or parenteral intake on the basis of multiple factors, including renal function and hemodynamic status, and to closely monitor nutritional status.

D: Durable Medical Equipment

Morbidly obese acutely ill patients require specialized nursing care, including techniques, levels of staffing required, and the use of specialized equipment.51 Nurses must be aware of potential hazards to patients and themselves by becoming familiar with the weight and size restrictions of commonly used equipment such as beds, bedside commodes, toilets, showers, doorways, hallways, elevators, and emergency transport equipment.52 Nursing staff should receive routine in-service training on equipment commonly used to support morbidly obese patients (eg, bariatric beds and lifts) in order to prevent injuries of patients and nursing staff. Nurses should also be familiar with the protocols for procuring bariatric equipment within a reasonable amount of time after a patient’s admission. This information is especially important when resuscitative equipment is needed. Moreover, nurses should be proactive in establishing protocols, developing safe lifting policies, using proper assistive equipment, insisting on multidisciplinary teamwork and effective communication, and adopting an effective staff education program.53

Conclusion

As the rates of obesity and morbid obesity continue to increase, critical care nurses must understand the factors involved in managing patients with a BMI greater than 30. Failure to understand the ABCDs—airway, breathing, back, bias, circulation, decubitus, drugs, diagnostics, diet, and durable medical equipment (Table 2)—could lead to catastrophic events for either patients or nurses. Health care facilities must also be prepared to care for patients of any weight and size. This preparation includes conducting structural assessments of facilities, ensuring that support equipment is readily available and that nursing staff are trained to use the equipment, and providing adequate education on the clinical differences between obese and nonobese patients in medical and nursing management.
### Table 2: Key points

<table>
<thead>
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<th><strong>ABCDs</strong></th>
<th><strong>Key points</strong></th>
</tr>
</thead>
</table>
| **Airway** | Anatomical changes in oropharynx, neck circumference, and chest girth  
Increased risk for respiratory failure, obstructive sleep apnea, and obesity hypoventilation syndrome  
Place patients in the 25° head-up or reverse Trendelenburg position (unless contraindicated)  
Potentially higher risk for difficult intubations  
Have backup emergency airway kits readily available |
| **Breathing** | Increased respiratory rates, oxygen consumption, and work of breathing  
Increased oxygen requirements, hypoventilation when supine, and decreased time to desaturation  
Place intubated patients in reverse Trendelenburg to maximize ventilation (unless contraindicated)  
Ventilator tidal volumes generally 6 to 8 mL/kg of predicted body weight  
Maintain plateau pressures at less than 30 cm H₂O to prevent barotrauma  
Generally prolonged weaning trials  
Bridge/place patients on noninvasive positive pressure ventilation (eg, bilevel positive airway pressure) after extubation to minimize reintubation  
Noninvasive positive pressure ventilation during hours of sleep to address obstructive sleep apnea and obesity hypoventilation syndrome |
| **Backs** | Establish safe patient handling programs in all nursing units (Occupational Safety and Health Administration standards)  
Provide routine education on safe patient handling and implement policies  
Do not lift more than 35 lb (16 kg) without an assistive device  
Ensure adequate staffing ratios to handle patients safely |
| **Bias** | Remain objective and recognize personal biases, which may hinder patient care  
Avoid verbalizing your personal opinions of patients’ obesity |
| **Circulation** | Increased risk for deep venous thrombosis, pulmonary embolism, dysrhythmias, and heart failure  
May be difficult to obtain peripheral intravenous access as well as central venous access  
Ultrasound guidance in obtaining central venous access is recommended  
Develop central venous catheter bundle for morbidly obese patients  
Patients may be at higher risk of central catheter–associated bloodstream infection, avoid femoral placement of central venous catheter if possible  
Nurses can emergently place intraosseous catheters and infuse fluids at a maximum rate of 125 mL/h |
| **Decubitus ulcers** | Decreased blood and oxygen supply to skin due to increased adipose tissue  
Increases in perspiration and skin moisture increase risk for bacterial and fungal invasion  
Conduct thorough wound evaluation on admission and routinely monitor (unit specific)  
Reposition patients with minimal mobility or who are immobile at least every 2 hours  
Monitor skin perfusion, provide appropriate skin care, address malnutrition  
Keep skin folds dry—use soft cloths, drying products such as moisture-wicking fabric with antimicrobial silver and antifungal powders; keep open to air  
Promote early mobility |
| **Drugs** | Altered volume of distribution and pharmacokinetics  
Alterations in metabolism and renal excretion  
Be mindful of weight-based calculations such as ideal, adjusted, and lean body weight depending on drug  
Clinical pharmacologists should assist in calculating drug dosages on the basis of the patient’s weight |
| **Diagnostics** | Computed tomography, magnetic resonance imaging, radiography, ultrasound, and nuclear medicine images may be distorted and of limited diagnostic value  
Be familiar with weight, chest girth, and abdominal girth restrictions for imaging equipment and alternatives  
Promote collaboration between nursing and radiology staff to ensure safe transfer, positioning, and monitoring |
| **Diet** | Increased energy expenditure, insulin resistance, protein breakdown, rapid muscle mass deterioration  
Consult dietary services and start enteral nutrition within 48 hours of admission (unless contraindicated)  
For body mass index 30-50: 11-14 kcal/kg per day enteral nutrition according to actual body weight  
For body mass index >50: 22-25 kcal/kg per day enteral nutrition according to ideal body weight  
Early parenteral nutrition is not recommended |
| **Durable medical equipment** | Be familiar with weight and size restrictions of beds, emergency transport equipment, commodes, toilets, showers, doorways, and other commonly used equipment  
Establish in-service training sessions on bariatric equipment and safe handling techniques  
Understand policies and protocols for acquiring specialized bariatric equipment |
| **Recommendations** | Establish admission bundles for morbidly obese patients, including specialized equipment, alerts to administration and department leaders (eg, pharmacy, physical and occupational therapy, radiology), and clinical management and documentation alerts in electronic medical records |
Recommendations for facilities to ensure optimal patient care include designing a special admissions bundle for morbidly obese patients that includes necessary supplies and equipment (and/or a quick guide on how to procure supplies and equipment); educational handouts for staff; alerts to nursing administration, clinical leaders, and diagnostic departments (eg, pharmacy, radiology); a needs assessment for adequate staffing and training on specialized equipment; and clinical management and documentation alerts in the electronic medical records. CCN

Financial Disclosures
None reported.

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