Special Considerations in the Critically Ill Morbidly Obese Child

Karen Allison Bailey, BSc, MD, FRCSC

Obesity has been recognized as an increasing problem not only in North America but globally. With a significant rise in the prevalence of obesity amongst children and adolescents over the past 20 years, the comorbidities associated with obesity are also now emerging at an earlier age. These comorbidities cause specific concern and require special consideration when the morbidly obese child becomes critically ill.

In the United States the prevalence of obesity (body mass index [BMI] >95th percentile) was found to have increased among children aged 2 to 19 years with an age-related prevalence of 12.4% (aged 2–5 years), 17% (aged 6–11 years), and 17.6% (aged 12–19 years).1 The prevalence of children who are overweight (BMI >85th percentile) was found to be 33.3% to 34.1% based on the 2003 to 2006 National Health and Nutrition Examination Survey data.1 The International Obesity Task Force has estimated that among school-aged children worldwide, as many as 155 million children are overweight or obese.2

As with adults, the causes of obesity in children are multiple. Although weight gain is often viewed as simply being caused from taking in more calories than are expended there are many other factors that influence obesity. These factors include heredity, metabolic, behavior, environment, culture, and socioeconomic status. In children, medical conditions and rare syndromes, such as hypothyroidism, Prader-Willi syndrome, and Cushing syndrome, account for a small number of pediatric patients who are morbidly obese but must be considered as potential causes.3,4

The rising prevalence of obesity will no doubt cause many pediatric critical care units to face the challenges of managing children who are morbidly obese. Many units are not physically designed to accommodate patients who are morbidly obese and their staff has not been specially trained to care for these patients, which potentially places patients and staff at risk. Weight-appropriate beds, chairs, scales, lifts, and...
blood pressure cuffs may not be present to facilitate treatment of morbidly obese patients. Doorways and rooms may be too small to accommodate wider weight-appropriate beds, chairs, lifts, and equipment.

Radiologic imaging can also be problematic in patients who are morbidly obese. The patients' size can limit visualization with all modalities. Increased radiation may be required to adequately penetrate the tissues for plain films. Equipment specifications vary and typically have a maximum of 250 to 450 lb depending on the manufacturer's specifications, which may preclude patients who are morbidly obese from having a CT scan, MRI, or fluoroscopy depending on the equipment available. The gantry size of the CT and MRI scanner, or the space between the table top to the fluoroscopy image intensifier, may also limit the ability to obtain adequate imaging.

The comorbidities associated with morbid obesity have not been extensively studied or reported on specifically in the pediatric critical care population but they need to be carefully considered. Morbid obesity in childhood is clearly associated with increased problems with asthma, obstructive sleep apnea, hypertension, dyslipidemia, impaired glucose tolerance, gastroesophageal reflux, cholelithiasis, osteoarthritis, and liver dysfunction. These complications were once considered to be only long-term effects of obesity that appeared in adulthood, but pediatric studies have shown that they are clearly appearing in childhood.

The importance of addressing morbid obesity and the potential for reversing these comorbidities after excess weight is lost has been most clearly demonstrated in the literature in adolescents who have undergone bariatric surgery. Although diet, exercise, and behavioral therapy are essential components in preventing and addressing obesity, sadly they are often inadequate alone. Bariatric surgery, although still considered controversial in children, has been effective in improving and resolving obesity-related comorbidities.

Many critically ill children will require ventilatory support so it important to understand that respiratory mechanics may be altered from both a restrictive and obstructive component in patients who are morbidly obese. Chest wall compliance and diaphragmatic excursion may be decreased because of adiposity and its distribution. Atelectasis is a greater problem in the obese population that requires increased diligence to ensure adequate ambulation, pulmonary toilet, and chest physiotherapy as needed. Obese children are slower to recover after severe asthma exacerbations and have been found to require longer intensive care unit (ICU) courses and more supplemental oxygen, continuous albuterol, and intravenous steroids in comparison to their lean peers.

As with morbidly obese adults, the airway in morbidly obese pediatric patients may be more difficult to visualize and maintain. Intubation can be more challenging in young patients because of the more anterior position of the airway; this visualization can be further impaired by adiposity. In patients who are morbidly obese, practitioners should be prepared to have assistance readily called for and access to equipment for difficult airway intubation. Training in advanced airway and bronchoscopy skills can be life saving.

Obstructive sleep apnea may require patients to be given continuous positive airway pressure when lethargic or at rest. Some of these morbidly obese children may have had significant issues with night-time oxygen desaturations, which were not detected before hospitalization.

Obesity-related hypertension and insulin resistance may lead to significant renal dysfunction, although this usually presents later in life. Morbid obesity may be associated with abnormal liver enzymes; if untreated, it has been associated with nonalcoholic steatohepatitis that can lead to frank liver failure if obesity is not addressed.
Drug doses are often based upon age or weight in children. Some pharmacokinetics are well understood with doses adjusted for renal or hepatic dysfunction in children. In the face of significant excess weight, the resulting changes in pharmacokinetics for children with or without organ dysfunction are not as well defined. As described in the anesthesia literature, when obese pediatric patients receive medications, such as midazolam and fentanyl (which have an increased volume of distribution throughout the body), they are often best administered based upon total body weight. Some medications are distributed to lean tissues predominantly and are better administered to patients according to their ideal body weight.1,3

If supplemental enteral or parenteral nutrition is required it is important to consider that patients may require additional medications or liver-protecting strategies because of underlying insulin resistance and hyperlipidemia. Morbid obesity does not equate to adequate nutrition and, if tested, many patients will be found to be deficient in essential nutrients that are needed to promote healing and to fight infection. Although patients who are morbidly obese, adequate nutrition is essential to prevent muscle loss. The morbidly obese child may already have difficulty with ambulation and osteoarthritis. Rehabilitation and recovery will be impaired if there is further loss of normal muscle mass caused by inadequate nutrition. Early involvement of physical and occupational therapy should be considered in this patient population.1,10

In the pediatric trauma population, obese children and adolescents appear to have higher complication rates, with longer time on ventilation and longer ICU stays than lean pediatric trauma patients. Specific complications that have been identified as being higher in association with obesity in the pediatric trauma population include wound infection, sepsis, postoperative fistulas, decubitus ulcers, and deep venous thrombosis.15,16

The morbidly obese child often appears to be much older than their actual age. Although significantly larger in size than many of their peers, they are not more emotionally mature or able to cope with a critical illness. These patients may be less able to cope with the stresses of a critical illness because depression and psychiatric disease often present hand in hand with morbid obesity. It is important for the critical care team to remember this, so as to compassionately care for their emotional and psychological needs in an age-appropriate manner.17–19

A team approach is needed to address all of the special considerations in this patient population. As the severity and prevalence of obesity continues to rise, we must become aware and prepared to treat this patient population. The morbidly obese child is not merely a large child, but a child with many potential complexities and concerns that we must take into account within the critical care setting.

REFERENCES