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Implementing a Pediatric Obesity Care Guideline in a Freestanding Children's Hospital to Improve Child Safety and Hospital Preparedness¹

Renee M. Porter, ND, MS^{a,b,*}, Jodi Thrasher, MS, RN^b, and Nancy F. Krebs, MD, MS^{a,b}

^aSection of Nutrition, Department of Pediatrics, University of Colorado Denver, School of Medicine, Aurora, CO

^bChildren's Hospital Colorado, Anschutz Medical Campus, CO

Abstract

Medical and surgical care of children with severe obesity is complicated and requires recognition of the problem, appropriate equipment, and safe management. There is little literature describing patient, provider, and institutional needs for the severely obese pediatric patient. Nonetheless, the limited data suggest 3 broad categories of needs unique to this population: (a) airway management, (b) drug dosing and pharmacology, and (c) equipment and infrastructure. We describe an opportunity at the Children's Hospital Colorado to better prepare and optimize care for this patient population by creation of a Pediatric Obesity Care Guideline that focused on key areas of quality and safety.

Keywords

Pediatric obesity; Pediatric safety; Care guideline; Severe obesity

Background

Childhood obesity rates have risen dramatically over the past 30 years with the greatest increase in numbers being in the severely obese (body mass index [BMI] 40 kg/m² or 99 percentile for age/gender; Ogden et al., 2006; Troiano & Flegal, 1998). This subset of the population in adults has quadrupled in number from 1986 to 2000 and now is estimated to represent 4% of children in the United States (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007; Sturm, 2003). The recent American Medical Association Expert Committee Recommendations on the Assessment, Prevention, and Treatment of Child and Adolescent Overweight and Obesity changed treatment guidelines to include children who are in the 99th percentile or higher for BMI (Barlow & Expert, 2007). These recommendations incorporate conclusions from the Bogalusa Heart Study (Freedman et al., 2007), which found that this group of children is more at risk of comorbidities than those between the 95th and 98th percentile and, therefore, in need of more intense treatment. As the number of severely obese patients increases, there will be more of this population to care for within health care systems, thus requiring preparation in freestanding children's hospitals (FCHs).

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* Corresponding author: renee.porter@childrenscolorado.org. .

The patient who is severely obese poses many challenges to health care providers based on their comorbidities (e.g., obstructive sleep apnea [OSA], orthopedic complaints, skin breakdown, Type 2 diabetes; Freedman et al., 2007; Lascano, Kaidar-Person, Szomstein, Rosenthal, & Wexner, 2006) and their body habitus (i.e., physical and constitutional characteristics; Hudson, 2005). There have been many reports on the equipment, safety, nursing care, emergency medications, and preparedness of hospitals for the adult with severe obesity (Brunette, 2004; Diconsiglio, 2006; Gallagher et al., 2004; Hudson, 2005; Hurst, Blanco, Boyle, Douglass, & Wikas, 2004). However, little is published on the safety of the pediatric patient with severe obesity, specifically related to the preparedness of FCHs. The few available reports on the pediatric patients describe the creation of a bariatric program (Haynes, 2005); safety related to environmental equipment and lifting restrictions (Gallagher, 2005); radiologic limitations (Inge et al., 2005); preoperative assessment (Schnur & Pierce, 2010); and airway management (Ray & Senders, 2001). Much of the attention has focused on specific equipment needed for these patients, such as wheelchairs, beds, gowns, and blood pressure cuffs to name a few.

This FCH felt that there were areas that had more urgent implications related to hospital care. Our Obesity Task Force conducted a survey as a needs assessment and possible tool for information sharing, a literature review to compile information on what is known about the safety issues related to this population, and to understand the gaps in best evidence and ultimately initiated the process of creation of a clinical guideline to compile and disseminate the information gathered in the literature review. The purpose of this article is to describe the efforts of the survey and to get a better understanding of the current evidence base and gaps and the creation of the guideline as a process that will ideally draw attention to the safety and care of the patient with severe obesity in an FCH. This article encompasses the above-stated process and also highlights three areas of major concern for this patient population: (a) airway assessment and management, (b) medication and pharmacology, and (c) infrastructure and equipment.

Airway Assessment and Management

Airway assessment and management is one of the most important safety concerns for the pediatric patient with severe obesity, particularly in the event of emergent resuscitation for a patient with OSA or a patient undergoing a surgical procedure. It is also important to recognize that when using pulse oximetry monitoring, care providers might consider using the earlobe for best accuracy and also that lung sounds may be difficult to assess and that positioning can be crucial for optimal respiration. It is critical to anticipate difficulties with mask ventilation because obese patients have reduced pulmonary compliance, increased chest wall resistance, increased airway resistance, abnormal diaphragmatic position, and increased upper airway resistance (Brunette, 2004). Tracheal intubation is challenging in this population, although probably less difficult than previously thought, when using proper positioning. The difficulty can be surrounding laryngoscopy because of increased neck circumference (Brodsky, Lemmens, Brock-Utne, Saidman, & Levitan, 2003; Brunette, 2004; Neligan et al., 2009). Care providers must also be prepared in the event of a failed oral intubation of the obese child and have a laryngeal mask airway (LMA) or an intubating LMA readily available.

Obesity also is an important and increasingly common risk factor for OSA in children (Schwengel, Sterni, Tunkel, & Heitmiller, 2009). It is not uncommon that a pediatric patient with severe obesity may require the use of noninvasive positive pressure ventilation (NIPPV), with or without oxygen, as a treatment strategy for their OSA (Gross et al., 2006). Obese children are also at increased surgical risk for complications related to their OSA, anesthesia, and obesity-related comorbidities in general. Children with OSA have a

diminished ventilatory response to CO₂ stimulation compared with children without OSA symptoms, which is further altered by sedatives and anesthetic medications (Strauss, Lynn, Bratton, & Nespeca, 1999). Therefore, supplemental oxygen with NIPPV should be administered continuously to all patients who are at increased perioperative risk from OSA until they are able to maintain their baseline oxygen saturation while breathing room air unless contraindicated by their surgical procedure (Gross et al., 2006). Patients at increased perioperative risk from OSA should have continuous pulse oximetry monitoring during recovery and, if possible, should be placed in a nonsupine position throughout the recovery process and for as long as they remain at increased risk (Gross et al., 2006).

Medication/Pharmacology

Similar to airway management, medications are a challenge in the pediatric patient with severe obesity. Because medication dosages in children are based on weight, there are questions regarding dosing limits for these patients, thus creating a need to incorporate safety features when ordering medications as well as maximum doses for resuscitation medications. Lewis, Johnson, Nebbia, and Dunlap (2011) reported that in some cases, maximum doses in severely obese children may not meet therapeutic requirements. Brunette (2004) provided a comprehensive outline related to pharmacology of the pediatric patient with severe obesity, including alteration in pharmacokinetics, altered volume of distribution (need to determine loading doses based on the hydrophilic or lipophilic properties), and potential decreased hepatic metabolism. Brown, Laferriere, Lakheeram, and Moss (2006) also reported that recurrent hypoxemia in children with OSA predisposes them to increased analgesic sensitivity to opiates, often requiring half the usual dose.

Infrastructure and Equipment

Hospital infrastructure and equipment are other challenging aspects of care for the pediatric patient with severe obesity. In 2007, the U.S. Department of Veterans Affairs (VA) published a *Safe Bariatric Patient Handling Toolkit*, which currently is the most comprehensive description of the special institutional needs of the adult with morbid obesity (Affairs, 2007). In this toolkit, the authors describe the “special handling” aspects of the adult bariatric patient, defined as a patient more than 300 lb or BMI greater than 50 kg/m², mostly based on weight restrictions on equipment and include room selection, transfer algorithms, and the need to buy or rent equipment. An American Disability Act (ADA) room would potentially meet the criteria described above, having wider doorways, more spacious restrooms, and shower stalls, instead of small tubs. Several articles have been published on the equipment needs in hospitals related to the severely obese patient (Collignon, n.d.; Lautz et al., 2009), but few of these address FCHs and their specific needs to house or rent this equipment (i.e., storage, cost, and small patient population). A recent publication by Camden (2009) outlined the needs of the acute care institution for the pediatric patient with obesity and appears to be the first of its kind in the literature. However, there is a lack of specific information about emergency cardiopulmonary resuscitation equipment and procedures or guideline for the pediatric patient with severe obesity (Camden, 2009). Gallagher (2005) recognized the need for “criteria-based protocols” to be created for this specific pediatric population in anticipation of adverse events.

Needs Assessment

In 2006, a task force was appointed by hospital nursing leadership and was charged with improving the safety of the pediatric patient with severe obesity. Because of the limited literature on the subject and to meet the needs of the hospital, a survey was undertaken in 2007 of FCH using the National Association of Children’s Hospitals and Related Institutions

Web site. The participating institutions were willing to share information and in fact wanted feedback and lessons learned from the survey. This survey also complied with institutional quality improvement and institutional review board rules. From this member list, those outside of the United States and a single primary research hospital were excluded. Contact persons at the FCHs were queried ($n = 45$) via telephone or e-mail to identify the person who could answer most or all of our questions, which tended to be the coordinator of the weight management clinic, nutrition, or obesity-related subspecialty nurse or doctor. Some information was obtained directly from the hospital Web sites. The telephone survey asked if a hospital had a weight management program or a bariatric surgery program; if they had made accommodations for the pediatric patient with severe obesity, including equipment, crash cart, trained staff, obesity clinical pathway/protocol; and if they had a system in place for resuscitation of the severely obese pediatric patient. The ultimate goal of the survey was to identify other institutions that may have already begun the process of preparation for the pediatric patient with severe obesity, including possibly sharing information or guidelines with our FCH or others.

Survey Findings

Of the 45 FCHs that were identified, contact was established with an individual at 28 hospitals (62%) that could completely answer the questions in our survey. Of these, 6 were dietitians, 10 were nurses, 7 were physicians, and 5 were a combination of RN/MD responses. Of the 28 FCHs, 21 (75%) reported having weight management programs, and 7 (25%) had bariatric surgery programs. From the hospitals that were not able to complete the survey but provided information via Web sites or partial contacts, 11 FCHs were identified as having weight management programs, one of which also had a bariatric surgery program. These 11 institutions were excluded from further analysis.

Through the simple analysis of the data, our group found that those institutions with a weight management program but without a bariatric surgery program are perhaps less prepared for the pediatric patient with severe obesity. Of the 20 FCHs without a bariatric program, 3 (15%) had made equipment accommodations in preparation for the care of pediatric patient with severe obesity. In contrast, 5 of 7 (71%) FCHs with a bariatric surgery program had made accommodations with regard to equipment (Table 1). It was also interesting to discover that not all hospitals that perform bariatric surgery had created systems or education around the potential resuscitation of these patients. All other elements of the survey are listed in Table 1 but follow the same trend of the FCHs without bariatric surgery being less prepared than those who perform the surgery.

The purpose of collecting survey data from FCHs was to examine the preparedness of the hospital systems and staff in the event of a pediatric patient with severe obesity with rapidly deteriorating health. Despite providing medical services to children with severe obesity, most of those FCHs without bariatric surgery programs have one or more areas for improvement, with less than 20% having sufficient readily available equipment and trained staff.

As the numbers of pediatric patients with severe obesity increase, greater attention to education, equipment, and staff training will be needed. Our original purpose of initiating the survey was to find resources from other institutions and therefore only adjust guidelines or policies as they fit our institution. These survey results suggest that many FCHs are not adequately prepared to care for these patients and may benefit from the development of institutional guidelines or a clinical protocol. Our results were surprising and underscored the need for our FCH to support the development of a Pediatric Obesity Care Guideline (POCG).

Clinical Care Guidelines

Clinical Care Guidelines (CCGs) are often developed as a tool to facilitate the implementation of evidence-based care with the goal of improving patient outcomes (Wallin, Profetto-McGrath, & Levers, 2005). CCGs offer a quick and effective way for nurses and other health care providers to increase their use of evidence-based practice and serve as a tool to educate providers on updated medical knowledge (Davis & Taylor-Vaisey, 1997; Wallin et al., 2005). This FCH identified that there was a significant lack of resources and literature on caring for the pediatric patient with severe obesity in a FCH. By incorporating the available literature and best practice, consulting with clinical experts, and surveying other FCHs, this FCH determined that the creation of a POCG would be beneficial to ensure the safety of this patient population and improve hospital preparedness.

Development of the POCG

To better prepare for the pediatric patient with severe obesity, nursing leadership at this FCH initiated the development of the POCG with contributions from several subspecialist physicians and a pharmacist. One element of the POCG creation was to understand our population better. Despite being the leanest state for adults, Colorado has quickly dropped from 2nd leanest in 2003 to currently being ranked 23rd in the nation for obesity in children, thus creating a large demand on resources for obesity treatment in our outpatient clinics (The Colorado Health Foundation, 2009; National Initiative for Children's Healthcare Quality, 2007). Our FCH serves a five-state region, with 318 beds, 13,000 inpatient admissions, 408,000 outpatient visits, and 85,000 emergency visits annually (Colorado, 2010). Through the process of our guideline creation, we concluded that between 3-5% of our patients were considered to be severely obese, demonstrating a need to pursue safety measures for these patients. Our current data do not include hospital events or mortality numbers related to this patient population.

The goal for developing the POCG was to have a quick, readily available reference to improve the care of the pediatric patient with severe obesity including safe management, assessment, and infrastructure considerations. In addition, the POCG provided a tool to disseminate evidence-based or best-practice information to a multidisciplinary team caring for the pediatric patient with severe obesity. Because the POCG was primarily created for safety purposes, most of the POCG focus on the pediatric patient with severe obesity that is greater than 260 lb, a more generous cutoff than the adult recommendations (300 lb) from the VA *Safe Bariatric Patient Handling Toolkit* (Affairs, 2007). The POCG was not designed to be an obesity treatment plan or prevention program for this patient population, as this is available through the American Academy of Pediatrics in the 2007 Expert Committee Recommendations and through other internal policies and procedures (Barlow & Expert, 2007).

Key Elements of the POCG

The POCG was created using three main sources for driving content (Gallagher, 2005; Gallagher et al., 2004; Hurst et al., 2004) and used an institutional format for a CCG. This guideline focused on clinical management, severity classification (Barlow & Expert, 2007; Freedman et al., 2007), a treatment algorithm (Figure 1), a formula for calculation of ideal body weight, equipment, and parent education materials. Clinical management was divided into 10 categories, including specific examples of physical assessments, recommended diagnostic tests, broad understanding of how obesity affects medications/-dosing, and general areas where resuscitation and airway may be compromised and also included equipment that is not readily available in a FCH (Table 2). This FCH also invested resources in specialized equipment, identification of max limits on many commonly used items, and

creation of a bariatric supply cart for this population (Table 3). These management decision tools were based on the best currently available evidence from the literature, best practice from pediatric subspecialists, other treatment algorithms at this institution, and recently through the discovery process in the Failure Modes Effects Analysis (FMEA) process. For those unfamiliar with an FMEA, it is an in-depth process that looks at a particular system, in this case a severely obese patient in an FCH, and categorizes failures surrounding that system by severity and likelihood of those failures occurring. Ideally, this process will allow our institution to capture those failures that are most likely to happen and prepare for them prior to an event occurring.

Implementation of the POCG

The POCG was posted on the hospital intranet and available for use in May 2008. The POCG was presented by the nursing leaders of the POCG task force at multiple inhouse lectures, through unit-based education, and at a national conference to aide in dissemination of the information. Staff training included accessing the guidelines, ordering the bariatric cart and equipment, and assisting with assessment of the medical needs for the pediatric patient with severe obesity. An identified challenge of implementation of the POCG was the wide range of clinical units within the organization, all having their own unique equipment, assessment, and safety challenges to care for this population.

The literature supports the value of clinical guidelines for evidence-based practice, but yet, they have not been well studied in nursing and allied health fields (Davies, Edwards, Ploeg, & Virani, 2008; Wallin et al., 2005). Davies et al. found that when using a multifaceted approach to implement nursing guidelines, there was a statistically significant improvement in indicators for asthma, diabetic foot care, and venous leg ulcers but not for promotion of breast-feeding and smoking cessation. This report suggests that certain conditions are more suited to guideline implementation and those that are implemented using a multidiscipline method. With time, updates, and future outcomes research, we will be able to determine the effectiveness of the POCG in the improvement of care of this patient population in our institution.

Discussion

Clinical Implication

The pediatric patient with severe obesity enters a children's hospital system through a number of avenues, such as the emergency room, surgery, dental procedures, ambulatory clinics, and so forth. Each of these areas must be able to properly assess and meet the needs of these patients. The results from our survey indicated that those FCHs with bariatric surgery programs were more prepared for the severely obese patient than those without surgical programs. This is likely because such an institution is more aware of the needs of these patients and thus is more prepared. It became clear to this FCH that the known evidence and best practice from the literature needed to be formatted into a guideline for easy reference.

Current state, Barriers, and Future Considerations

The POCG served as a tool to help educate the multidisciplinary teams caring for these patients and aided in implementing many changes, including identification of the severely obese patient; creation of an equipment list; communication for admission of these patients; initiation of the workup for obesity-related comorbidities; creation of a bariatric cart, which provides additional sizes of various resuscitation/equipment items to the bedside of the patient; and discussion with patients of referral options to a weight management program.

Through continued work by the Obesity Task Force, educational offerings, involvement in a national obesity focus group, and increased hospital planning, both institutional and national awareness surrounding this patient population and their needs have increased. The greatest short-term achievement was the increased internal communication about the admission and discharge of these patients, the creation of the bariatric supply cart, and infrastructure planning. Anecdotally, we see that the POCG and related education have increased awareness related to these patients. For instance, when there is a planned admission, there is currently e-mail or electronic health record (EHR) communication related to this patient, necessary setup, ordering of equipment, and general understanding of potential complications as understood from the literature review and contents of the POCG. It has also become regular practice for many nurses who are familiar with the POCG to order the bariatric supply cart immediately upon admission of a patient who meets criteria. These anecdotal stories are not yet standard practice, and yet through the process of updating the POCG and utilization of decision support for our EHR, our FCH will be able to make these processes standardized.

Outcomes research is needed on the care and safety of the pediatric patient with severe obesity in a FCH and on the efficacy of the use of a POCG for this population. In this institution, the process of looking at outcomes was begun by tracking the number of patients with severe obesity in each department and the number of these patients in the institution at any given time. Outcomes specific to the POCG are being evaluated, including staff ordering the bariatric supply cart, staff education, and compliance with POCG elements. This institution has also initiated an FMEA process to capture potential areas of failure and implement provider education, including potential EHR alerts. Using the information from the current FMEA, the POCG will be updated with best practice, best evidence, and equipment that is needed and readily accessible. Other institutions may benefit from the process that our FCH has completed through the development of the POCG, and sharing this information could improve the care of the severely obese pediatric patient nationwide.

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Figure 1.
POCG obesity care algorithm

Table 1

Survey Results Comparing FCHs With and Without Bariatric Surgery

	FCH With Bariatric Surgery (n = 7)	FCH Without Bariatric Surgery (n = 21)
Equipment accommodations [*]		
All	5	3
No	0	9
Some	1	8
Unknown	1	1
Emergency crash cart	5	0
No	1	13
Unknown	1	8
Trained staff	7	2
No		13
Unknown		3
Somewhat [†]		2
Clinical protocol	4	2
No		14
Unknown	2	5
System for resuscitation of obese patients	3	2
No	3	13
Unknown	1	6

^{*} All of or at least one (some) of the following: lifts, scales, blood pressure cuffs, or ability to order adult equipment.

[†] Trained in lifting and transferring obese patients.

Table 2**POCG: Clinical Management Outline**

Key Clinical Management Areas	Obesity Related Components
Clinical assessment	Body systems and tips for improved assessment
Monitoring	Obesity Care Algorithm based on review of systems (Figure 1)
Diagnostic tests/studies	Recommended tests; problematic studies with large body habitus
Skin assessment	Skin breakdown, skin assessment, skin care
Thrombosis considerations	Risk factors; link to Venous Thrombosis Embolism Prevention Guidelines
Medication issues	Issues related to metabolism and pharmacokinetics
Airway management	Resuscitation, intubation, OSA
Patient placement	Size and width considerations, ADA rooms
Specialized equipment	Weight and circumference limitations; equipment/scale locations (Table 2)
Staff training	No lifting, stigma/bia

Table 3**POCG Equipment List**

Common Hospital Equipment	Bariatric Rental Company	Bariatric Cart
Assess max size limits (width and weight)	• How to order	• Special order from central supply
Assess location in FCH	• Trained staff	• Large diapers
• Wheelchairs	• Types of equipment available	• Extra large TED hose
• MRI/CT		• SCDs
• Commodes (wall mounted)		• BP Cuff (adult, large adult, extra large adult, thigh)
• Example: 500# for 10 minutes		• Gown (3× IV and 10×)
• Shower benches (wall mounted)		• Booties
• Room size (door width, bathroom size)—use ADA rooms		• Adult diapers
• Beds (width, weight max, and type)		• Large/simple/nonrebreather masks
		• LMA sizes 4 and 5
		• Longer IV catheter

Note: SCDs = sequential compression devices.