KAPC Practice Guideline

Title: Anesthesia for Bariatric Surgery Practice Guideline

Date Approved: 4/9/2018 KAPC Board

Definitions:[1]

Total body weight (TBW)	The actual weight of the patient
Ideal body weight (IBW)	What the patient should weigh with a normal ratio of lean to fat mass. Varies with age, and is usually approximated to a function of height and gender: $$\text{IBW (kg)} = \text{height (cm)} - x \text{ (where } x = 105 \text{ in females and 100 in males)}$$
Lean body weight (LBW)	The patient's weight excluding fat. Many of the formulae for calculating lean body weight are complex but one of the most widely used is that of Janmahasatian et al. [34]: $$\text{LBW (kg)} = \frac{9270 \times \text{TBW (kg)}}{6680 + (216 \times \text{BMI (kg.m}^{-2}))} \text{(men)}$$ $$\text{LBW (kg)} = \frac{9270 \times \text{TBW (kg)}}{8780 + (244 \times \text{BMI (kg.m}^{-2}))} \text{(women)}$$ Regardless of total body weight, lean body weight rarely exceeds 100 kg in men and 70 kg in women (Fig. 2) [35]
Adjusted body weight (ABW)	Takes into account the fact that obese individuals have increased lean body mass and an increased volume of distribution for drugs. It is calculated by adding 40% of the excess weight to the IBW [36]: ABW (kg) = IBW (kg) + 0.4 (TBW (kg) – IBW (kg))

Policy Overview:

This policy is intended to address the issue of considerations in the anesthetic management of the bariatric surgical patient that are **different** from the routine anesthetic care of the non-bariatric surgical patient. This policy is not intended to address issues related to perioperative management of bariatric surgical patients' cardiac work-up, management of antiplatelet agents following coronary stent placement, management of pre-surgical testing, sleep apnea work-up and management, perioperative fasting, or the appropriate airway management pathway in the management of the difficult airway of the obese patient. These issues are addressed in separate KAPC policies, KAPC guidelines, or ASA guidelines and will be referred to when appropriate. These separate policies/guidelines include the KAPC Practice Guideline for Cardiac Evaluation Prior to Elective Surgery, the KAPC Practice Guideline on Non-emergent Surgery for Patients Taking Antiplatelet Agents Following Coronary Stent Placement, the KAPC Practice Guideline on Obstructive Sleep Apnea, the KAPC Practice Guideline on Perioperative Fasting, and the ASA Practice Guideline for Management of the Difficult Airway.

Many of the recommendations in this policy are derived from the 2015 guidelines of the Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anaesthesia.[2] This policy is not intended to replace those published guidelines, nor is it intended to create a strict inflexible clinical management protocol for the management of the bariatric surgery patient. Rather, the current policy is intended to present a reasonable approach to common perioperative clinical scenarios involving elective bariatric surgical patients. The goals of this guideline are to help facilitate appropriate, consistent perioperative management of these patients. Of course, the details of any particular clinical situation may require deviation from this policy by the responsible anesthesiologist and anesthesia care team.

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[1] Nightingale, C.E. et al. Perioperative Management of the Obese Surgical Patient 2015, Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anesthesia. Anaesthesia 2015, 70, p. 863.

[2] Nightingale, C.E. et al. Perioperative Management of the Obese Surgical Patient 2015, Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anesthesia. Anaesthesia 2015, 70, pp. 859-876.

Guideline Steps:

1) **<u>Perioperative Planning</u>**:

   a) **Perioperative diabetes control:**

Judicious treatment of hyperglycemia is recommended. Although obesity is strongly associated with increased insulin resistance, and poor glycemic control in the perioperative period is associated with increased morbidity, gastric bypass surgery causes a unique neuro-humeral response in the gastric bypass patient and can result in rapid reductions in insulin requirements and hypoglycemia starting immediately after surgery.[3]

   b) **Perioperative pain control:**

Perioperative pain management employing multimodal analgesia is recommended. Utilization of early recovery after surgery (ERAS) protocols help lower the risk of post-operative respiratory depression and sedation and improve early mobilization.[4]

2) **<u>Pre-operative Evaluation:</u>**

   a) **Airway evaluation:**

A routine pre-anesthetic airway examination is carried out and an airway management plan is formulated as for all surgical patients. Although airway findings in the bariatric surgical population carry different implications for planned intra-operative airway management, there is currently no evidence to favor the use of a particular anesthetic induction technique or intubation technique over another.

   i) Difficult mask ventilation (DMV) is more likely to occur in patients with a Mallampati score $\geq$ 3, in patients with limited mandible protrusion, in patients with neck circumference > 46 cm, and in male patients. Obstructive sleep apnea (OSA) and limited temporomandibular distance (TMD) were **NOT** predictors of DMV.[5]

   ii) Neither absolute obesity nor increasing BMI was associated with difficult intubation in morbidly obese patients. Difficult intubation was associated with increasing neck circumference and a Mallampati score of ≥3. A neck circumference of 40 cm increases the risk of difficult intubation to 5%. A neck circumference of 60 cm increases the risk of difficult intubation to 35%. A poor view during direct laryngoscopy is not a factor in successful intubation because in all but one patient in a study of obese patients, the trachea was intubated by direct laryngoscopy. Therefore, the degree of obesity or neck size that justifies interventions such as elective, awake/sedated fiberoptic bronchoscopy for intubation remains unknown.[6]

   b) **Obstructive sleep apnea (OSA) evaluation:**

A routine pre-anesthetic screening is performed for bariatric surgical patients as for all surgical patients according to the KAPC Practice Guideline on Obstructive Sleep Apnea. Severe OSA occurs in 10-20% of patients with BMI > 35 kg/m2. A diagnosis of OSA doubles the incidence of post-operative desaturation, respiratory failure, cardiac

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[3] Guidone C. Mechanisms of recovery from type 2 diabetes after malabsorptive bariatric surgery. Diabetes 2006; 55: 2025–2031.

[4] Awad S, et al. Enhanced recovery after bariatric surgery (ERABS): clinical outcomes from a tertiary referral bariatric centre. Obesity Surgery 2014; 24: 753–758.

[5] Leoni A, et al. Difficult mask ventilation in obese patients: analysis of predictive factors. Minerva Anestesiologica 2014 Feb; 80 (2):149-157.

[6] Brodsky JB, et al. Morbid obesity and tracheal intubation. Anesthesia and Analgesia 2002; 94: 732–736.

events, and ICU admission.[7] OSA identified preoperatively and treated appropriately decreases the risk of post-operative complications.[8]

c) Risk stratification:

A routine pre-anesthetic screening is performed for bariatric surgical patients for risk stratification for anesthesia consent. The Obesity Surgery Mortality Risk Stratification Score (OS-MRS) has been validated for patients undergoing bariatric surgery to identify risk factors associated with mortality[9]:

Risk factor	Score
(a)	
BMI > 50 kg.m^{-2}	1
Male	1
Age > 45 years	1
Hypertension	1
Risk factors for pulmonary embolism:	1
Previous venous thromboembolism	
Vena caval filter	
Hypoventilation (sleep-disordered breathing)	
Pulmonary hypertension	
	Risk of mortality
(b)	
Class A: 0-1 points	0.2–0.3%
Class B: 2–3 points	1.1–1.5%
Class C: 4–5 points	2.4–3.0%

3) <u>Intra-operative Management:</u>

a) Intra-operative medication management:

There is limited information available on the effect of obesity on the pharmacodynamics of commonly used anesthetic drugs. Given the fact that most anesthetic medication dosing is titrated to effect (e.g. loss of eyelash reflex, pain relief, or nerve stimulator response), dosing guidelines are not absolute, but rather for safe dosing ranges. Current recommendations base dosing most medications (including induction agents, non-depolarizing neuromuscular blockers, morphine, and local anesthetics) according to lean body weight. The exceptions are listed below[10]:

Propofol infusions: **Dose according to adjusted body weight (ABW).**
Note: Propofol induction doses based on LBW.

Neostigmine: **Dose according to adjusted body weight (ABW).**
Sugammadex: Dose according to adjusted body weight (ABW).
Succinylcholine: Dose according to total body weight (TBW).

b) Preoperative Oxygenation and positioning for induction:

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[7] Mutter TC, et al. A matched cohort study of post-operative outcomes in obstructive sleep apnea. Anesthesiology 2014; 121: 707–718.

[8] Weingarten T, Flores A. Obstructive sleep apnoea and perioperative complications in bariatric patients. British Journal of Anaesthesia 2010; 106: 273–273.

[9] Demaria EJ, et al. Validation of the Obesity Surgery Mortality Risk score in a multicenter study proves it stratifies mortality risk in patients undergoing gastric bypass for morbid obesity. Annals of Surgery 2007; 246: 578–584.

[10] Nightingale, C.E. et al. Perioperative Management of the Obese Surgical Patient 2015, Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anesthesia. Anaesthesia 2015, 70, p. 863.

If clinically feasible, patients should be positioned in a ramped-up position with the tragus of the ear level with the sternum, and the arms away from the chest.[11] The addition of CPAP or PEEP has been shown to further facilitate pre-oxygenation and maximize the safe apnea time prior to desaturation.[12]

c) Intraoperative induction of anesthesia and airway management:

- **i) There is currently no "ideal" or "recommended" management technique for induction of anesthesia and airway management in the bariatric surgical patient.**
- **ii) The degree of obesity or neck size that justifies interventions such as elective, awake/sedated fiberoptic intubation remains unknown.**
- **iii) The experience and ability of the anesthesia team are probably the most important determinants for induction and establishment of an adequate airway in the bariatric surgical patient regarding the use of conventional intubation, video-laryngoscope intubation, awake/sedated fiberoptic intubation, and the use of supra-glottic airways,[13] and whether or not to employ rapid sequence induction with cricoid pressure.**
- **iv) Difficult airway management should be guided by clinical judgement and the ASA difficult airway guidelines.[14]**

d) Intraoperative ventilatory management strategies:

- **i) Maintain tidal volume of 6-8 mL/kg (IBW) with respiratory rate that maintains normocapnia.**
- **ii) Apply PEEP up to 10 cm H2O as tolerated hemodynamically.**
- **iii) Use recruitment maneuvers as needed and as tolerated hemodynamically to maintain oxygenation.**
- **iv) Use reverse trendelenburg position when possible as tolerated hemodynamically.**

e) Intra-operative maintenance of anesthesia:

There is no evidence supporting total intravenous anesthetic (TIVA) over volatile agents for anesthetic maintenance in bariatric surgical patients. Fat-insoluble agents including desflurane and sevoflurane do have faster onset and offset times than isoflurane. Studies comparing emergence time between sevoflurane and desflurane have yielded conflicting results. Emergence times in cases lasting 2-4 hours between desflurane, sevoflurane, and isoflurane are minimal. Overall, the choice of inhaled anesthetic is thought to be of limited relevance.[15,16]

4) <u>Post-operative Management:</u>

a) Positioning:

- **i) Patient should be positioned/managed as much as possible in 45º head up tilt or sitting position if tolerated to maximize ventilation/perfusion matching and oxygenation.**
- **ii) Patient should receive CPAP/BiPAP therapy as per clinical judgement and KAPC OSA guidelines.**

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[11] Dixon BJ, et al. Preoxygenation is more effective in the 25 degrees head-up position than in the supine position in severely obese patients: a randomized controlled study. Anesthesiology, 2005;102:1110-1115.

[12] Gander S, Frascarolo P, et al. Positive end-expiratory pressure during induction of general anesthesia increases duration of nonhypoxic apnea in morbidly obese patients. Anesthesia and Analgesia 2005; 100: 580–584.

[13] Brodsky JB, et al. Morbid obesity and tracheal intubation. Anesthesia and Analgesia 2002; 94: 732–736.

[14] Difficult airway: Committee on Standards and Practice Parameters; Jeffrey L. Apfelbaum, et al. Practice Guidelines for Management of the Difficult Airway: An Updated Report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway 2013. Anesthesiology 02 2013, Vol.118, 251-270.

[15] Nightingale, C.E. et al. Perioperative Management of the Obese Surgical Patient 2015, Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anesthesia. Anaesthesia 2015, 70, pp. 859-876.

[16] Ingrande, J. et al. Dose Adjustments of Anesthetics in the Morbidly Obese. British Journal of Anaesthesia. 2010; 105Supplement 1:i16-i23.