



# Are morbidly obese patients suitable for ambulatory surgery?

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## Purpose of review

The incidence of morbid obesity continues to increase worldwide. Associated comorbidities, particularly obstructive sleep apnea, increase the perioperative morbidity for this group of patients. The purpose of this review is to discuss appropriate selection of morbidly obese patients for ambulatory surgery.

## Recent findings

Patients with BMI  $<40$  kg/m<sup>2</sup> can safely undergo ambulatory surgery, provided their comorbidities are optimized before surgery. However, patients who are super obese (BMI  $\geq 50$  kg/m<sup>2</sup>) have an increased risk of perioperative complications, suggesting that these patients should be selected with caution for ambulatory surgery. The outcomes data for patients with BMI between 40–50 kg/m<sup>2</sup> are limited, and therefore, it is suggested that other factors such as obstructive sleep apnea are taken into consideration.

## Summary

Recent evidence suggests that carefully selected morbidly obese patients can safely undergo surgery on an ambulatory basis. Individualized evaluations taking into account patient-related factors, surgery-related factors, and anesthesia-related factors should dictate which patients are appropriate for ambulatory surgery.

## Keywords

ambulatory surgery, morbid obesity, obstructive sleep apnea, patient selection

## INTRODUCTION

The number of surgical procedures being performed on an ambulatory basis has increased over the years, as it is associated with decreased cost and superior patient satisfaction [1<sup>•</sup>]. Advances in surgical techniques and anesthetic management have allowed many operations that used to necessitate an overnight stay to be performed on an ambulatory basis [1<sup>•</sup>,2,3<sup>•</sup>]. Selection of patients for ambulatory surgery is critical to ensuring that resources are used efficiently and patients are kept safe.

The prevalence of obesity, BMI  $\geq 30$  kg/m<sup>2</sup>, continues to increase worldwide. The largest rate of increase has been in the morbidly obese (BMI  $\geq 40$  kg/m<sup>2</sup>) and super obese (BMI  $\geq 50$  kg/m<sup>2</sup>) categories [4]. Obesity is associated with many comorbid conditions, including metabolic syndrome, hypertension, cardiomyopathy, pulmonary hypertension, hypoventilation syndrome, and obstructive sleep apnea (OSA). These comorbidities can increase perioperative complications. Therefore, appropriate selection of morbidly obese patients for ambulatory surgery remains a controversial topic.

## OUTCOMES AFTER AMBULATORY SURGERY IN THE OBESE

The most frequent outcome measures examined when determining appropriate patient selection for ambulatory surgery are perioperative morbidity, unplanned admission, and readmission rates. Obesity has been cited as a risk factor for increased perioperative complications and unanticipated admission after ambulatory surgery [5–7]. However, analysis of a large ambulatory database (i.e., National Survey of Ambulatory Surgery) found that morbidly obese patients had a similar incidence of adverse postoperative outcomes, delayed discharge, and unplanned hospital admission, when compared with nonobese patients [8<sup>••</sup>]. A systematic review of published studies also showed that BMI alone did

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## KEY POINTS

- BMI should not be the sole factor in determining if a patient is appropriate for ambulatory surgery.
- OSA has a high prevalence in the morbidly obese population.
- Screening tools such as the STOP-Bang questionnaire can be used to detect the presence of OSA.
- Appropriately selected morbidly obese patients can safely undergo ambulatory surgery.

not increase perioperative complications or unplanned admissions after ambulatory surgery [9]. However, further analyses showed that the average BMI of patients undergoing nonbariatric surgery was only 30 kg/m<sup>2</sup> and for those undergoing bariatric surgery was 40 kg/m<sup>2</sup>. In addition, patients undergoing bariatric surgery had rigorous preoperative assessment and optimization, particularly for OSA.

## PREOPERATIVE CONSIDERATIONS

Because morbid obesity is associated with several comorbid conditions, and these patients may be scheduled for complex surgical procedures requiring general anesthesia, preoperative evaluation, assessment, and identification of any comorbid conditions [e.g., difficult airway, cardiovascular disease, respiratory (particularly OSA), and endocrine dysfunction (particularly diabetes mellitus)] should preferably be performed prior to the day of surgery.

### Obesity and cardiac comorbidity

Typically, ambulatory surgery carries a low risk of perioperative cardiac complications (defined by a cardiac risk of <1%). However, severe obesity (i.e., weight  $\geq 135$  kg or BMI  $\geq 40$  kg/m<sup>2</sup>) alone can lead to cardiomyopathy even in the absence of intrinsic cardiac disease [10]. The increased mortality seen with obesity is largely because of cardiovascular disease including hypertension, atherosclerosis, heart failure, arrhythmias, and pulmonary hypertension [11]. Therefore, preoperative cardiac assessment is critical in this patient population.

The American College of Cardiology and American Heart Association developed a guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery, including those with morbid obesity [12\*]. These guidelines state that the assessment of functional

capacity should be the first step in evaluating patients undergoing elective noncardiac surgery. Preoperative cardiopulmonary exercise testing can also be helpful for predicting which patients are at increased risk for morbidity and mortality prior to gastric bypass surgery [13]. However, in the obese, the assessment of functional capacity may be difficult. In addition, in this population, functional capacity may be limited for reasons other than cardiac compromise.

Therefore, for morbidly obese patients with limited functional capacity, an ECG should be obtained if there is at least one risk factor for heart disease [14]. Presence of ECG signs of right ventricular hypertrophy (i.e., right axis deviation and right bundle branch block) suggests pulmonary hypertension, whereas a left bundle branch block may suggest occult heart disease. In addition, cardiac chamber enlargement or abnormal pulmonary vascularity on a chest radiograph may suggest undiagnosed heart failure or pulmonary hypertension, respectively. Further cardiovascular investigation such as exercise and/or pharmacological stress echocardiography may be performed in the presence of  $\geq 3$  risk factors for coronary artery disease (e.g., history of heart disease, history of congestive heart failure, history of cerebrovascular disease, preoperative treatment with insulin, and preoperative serum creatinine  $>2$  mg/dl).

### Obesity and obstructive sleep apnea

One of the major comorbidities associated with obesity is OSA. The incidence of OSA in the bariatric surgical population may be as high as 80% and increases as BMI increases [15,16]. OSA is an independent risk factor for perioperative complications and can increase the odds ratio of postoperative intubation and ventilation two to five-fold [17]. Concerns regarding the safety of outpatient surgery for morbidly obese patients with OSA have been raised, especially in light of perioperative complications including anoxic brain injury and death [18\*,19].

Most patients with OSA are undiagnosed; therefore, all surgical patients should be assessed for the presence of OSA. The STOP-Bang questionnaire can be used to screen patients for OSA and has been validated in the obese population [20]. It is easy to administer and has a high sensitivity. Because of its low specificity, it is recommended that a STOP-Bang score of  $\geq 5$  should be used to determine a presumptive diagnosis of OSA in the perioperative period [21]. Its low specificity is improved when the STOP score  $\geq 2$  and BMI  $> 35$  kg/m<sup>2</sup> and male gender are also present [22]. There is also a correlation between a higher STOP-Bang score and the severity of OSA [23\*].

The recent update of the American Society of Anesthesiologists practice guideline for the perioperative management of patients with OSA includes selection for ambulatory surgery [24<sup>■</sup>]. These updated guidelines have eliminated the previous recommendation that patients undergoing upper abdominal or airway surgery should not have ambulatory surgery [24<sup>■</sup>]. In these guidelines, a scoring system is proposed to assess whether a patient is at increased perioperative risk of complications because of OSA. The scoring system is based on the severity of OSA, the invasiveness of surgery and anesthesia, and need for postoperative opioids. Use of positive airway pressure (PAP) devices and a resting  $\text{PaCO}_2 > 50$  mmHg can decrease or increase the score, respectively. However, this scoring system has not been validated and thus, it has no clinical utility.

The consensus statement from the Society for Ambulatory Surgery (SAMBA) offers recommendations for selection of OSA patients scheduled for ambulatory surgery. Patients with OSA (either known or presumed) and unstable or inadequately treated comorbidities may not be suitable for ambulatory surgery, if a general anesthetic is necessary [21]. Patients with a presumed diagnosis of OSA (based on screening tools such as the STOP-Bang questionnaire) may be appropriate for ambulatory surgery if their comorbid diseases are optimized and there will be minimal need for opioids postoperatively. Patients with known OSA (i.e., those with a diagnosis based on a sleep study) can safely undergo ambulatory surgery if their disease is optimized and PAP devices are used postoperatively. Patients with known OSA who are unwilling or unable to use a PAP device may not be suitable for ambulatory surgery. Use of PAP devices postoperatively significantly decreases the apnea-hypopnea index [25<sup>■</sup>]. Also, a retrospective study in the bariatric surgical population found that known OSA patients who used continuous positive airway pressure (CPAP) pre and postoperatively had a shorter hospital stay than patients who had a presumed diagnosis of OSA (based on STOP-Bang criteria of  $\geq 3$ ) who did not use CPAP [26<sup>■</sup>].

Of note, the SAMBA recommendations do not apply to patients undergoing airway surgery because of insufficient evidence. However, several studies have been published subsequently. The rate of respiratory complications following surgery for OSA is 1–4%, with most events occurring within 4 h of surgery [27]. A systematic review of over 2000 patients undergoing ambulatory OSA surgery found a 0.4% readmission rate and 5.3% total adverse event rate, which were because of surgical complications and not specifically related to the OSA. There were no major catastrophic events or deaths [28]. Thus, the author concluded that

routine overnight observation of all patients undergoing OSA surgery is unnecessary, but certain patients should be considered for admission, particularly those undergoing tongue base surgery, with a higher apnea-hypopnea index, or high Opioid requirements. A retrospective study of over 400 patients demonstrated that appropriately selected patients with OSA who underwent nasal and/or pharyngeal surgery on an outpatient basis did not have a higher incidence of adverse events, when compared with inpatients [29]. Another study of 189 000 patients undergoing ambulatory laryngopharyngeal surgeries found a low admission rate of 3.3% and an incidence of complications similar to inpatients, demonstrating the safety of such surgeries in an outpatient setting [30].

### Obesity and difficult airway

One factor commonly used to determine the suitability for ambulatory surgery is the potential for difficult airway. Conflicting evidence exists on whether obesity itself is a risk factor for difficult intubation. A large observational study of over 170 000 patients found that a  $\text{BMI} \geq 30 \text{ kg/m}^2$  was an independent risk factor for both difficult mask ventilation and difficult intubation [31]. Patients with known OSA as well as patients with a STOP-Bang score  $\geq 3$  have also been reported as having an increased risk for having a difficult airway [32<sup>■</sup>, 33<sup>■</sup>]. However, other authors have found that a higher BMI is not associated with a more difficult intubation [34]. Furthermore, prediction of difficult mask ventilation and difficult ventilation is challenging since no single predictor is reliable [35]. Nevertheless, with the availability of videolaryngoscopes and other adjunct airway equipment, it is increasingly being accepted that difficult airway alone should not be used to determine suitability for ambulatory surgery. Ambulatory surgical centers that care for morbidly obese patients should have specialized airway equipment available along with anesthesiologists who have experience with difficult airways.

### SURGICAL CONSIDERATIONS

Surgical factors commonly used to determine suitability for ambulatory surgery include invasiveness and degree of postoperative pain (i.e., pain should be managed with oral analgesics), minimal blood loss not requiring blood transfusion, and no specialized postoperative care required. Bariatric surgery continues to be a popular approach for morbidly obese patients to lose weight. Recently, the safety of outpatient bariatric surgery has been discussed. With appropriate patient selection and pathways

that include close follow-up, fast-track bariatric procedures can have a safety profile similar to conventional management [36]. A prospective study of 100 morbidly obese patients found that appropriately selected patients could undergo day surgery laparoscopic sleeve gastrectomy with acceptable readmission rates and a similar rate of complications compared with patients who had an overnight stay [1<sup>¶</sup>]. In contrast, in a large prospective study of patients undergoing laparoscopic Roux-en-Y gastric bypass, ambulatory patients had a 13-fold increased risk of mortality compared with the reference length of stay of 2 days, indicating that patients should not have laparoscopic Roux-en-Y gastric bypass on an ambulatory basis [7]. This iterates that surgical factors (i.e., the type of surgery) play an important role when determining which patients are appropriate to have ambulatory surgery.

## ANESTHETIC CONSIDERATIONS

In addition to the surgical procedure, another factor that is an important determinant in deciding if a patient can undergo ambulatory surgery is the type of anesthesia. Obese patients with or without OSA scheduled for procedures under local or regional anesthesia with minimal sedation are excellent candidates for ambulatory surgery. Not only will they be spared airway manipulation and exposure to muscle relaxants, hypnotics, and opioids, but local or regional anesthesia can provide prolonged analgesia and decrease the need for postoperative opioids. For patients having procedures not amenable to local or regional anesthesia and requiring a general anesthetic, a fast track anesthetic technique with short-acting anesthetics and minimal use of muscle relaxants as well as limited use of opioids should be beneficial. Of note, opioids are the most common cause of postoperative airway obstruction and respiratory depression in this patient population [21].

## SOCIETY FOR AMBULATORY SURGERY CONSENSUS RECOMMENDATIONS FOR PATIENT SELECTION

One of the questions posed by practitioners of ambulatory surgery and anesthesia is: Is there a weight limit above which ambulatory surgery is not safe? Based on recent evidence, it is accepted that BMI should not be the sole factor for determining if a patient can undergo ambulatory surgery. It is recommended that if a general anesthetic is required, patients with BMI <40 kg/m<sup>2</sup> can safely undergo ambulatory surgery, provided their comorbidities are optimized before surgery [9]. However, patients who are super obese (BMI ≥ 50 kg/m<sup>2</sup>) have an

increased risk of perioperative complications, suggesting that these patients should be selected with caution for ambulatory surgery. The outcomes data for patients with BMI between 40–50 kg/m<sup>2</sup> are limited, and therefore, it is suggested that other factors such as OSA are taken into consideration [21].

## CONCLUSION

Morbidly obese patients, especially those with OSA, have a high risk of perioperative complications and can be a challenging group of patients to care for. Given the increasing prevalence of obesity, especially morbid obesity and super obesity, anesthesiologists must be able to determine which patients are suitable for ambulatory surgery, and which are not. Knowledge of the anesthetic implications of morbid obesity and OSA is critical in ensuring that these patients have a well tolerated perioperative course. As undiagnosed OSA is common in the surgical population and failure to recognize OSA can lead to major perioperative complications, a focused history and physical are recommended to identify patients with OSA. Screening tools such as the STOP-Bang questionnaire are easy to administer and can provide an indication of the severity of OSA. Surgical facilities caring for this patient population should have appropriate personnel and equipment necessary for monitoring and treatment of potential complications. Finally, education of the patient and their family with regards to potential concerns, and approaches to prevention, is critical in improving postoperative safety.

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