



Original Contribution

# Nationwide use and outcomes of ambulatory surgery in morbidly obese patients in the United States<sup>☆,☆☆</sup>



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## Abstract

**Study Objective:** To compare the overall characteristics and perioperative outcomes in morbidly obese and nonobese patients undergoing ambulatory surgery in the United States.

**Design:** Retrospective, propensity-matched cohort study.

**Setting:** Academic medical center.

**Measurements:** The association between duration of surgical procedures, postoperative complications, and unplanned hospital admission was assessed in a propensity-matched cohort of morbidly obese and nonobese patients derived from the 2006 National Survey of Ambulatory Surgery.

**Main Results:** Only 0.32% of the ambulatory procedures were performed on morbidly obese patients. The morbidly obese were significantly younger but had a higher burden of comorbidities, were more likely to undergo the procedure in hospital-based outpatient departments (HOPD; 80.1% vs 56.5%;  $P = 0.004$ ), and had significantly shorter procedures than the nonobese (median [interquartile range], 28 [21–38] vs 42 [22–65] min;  $P < 0.0001$ ). The incidences of postoperative hypertension, hypotension, hypoxia, cancellation of surgery, and unplanned hospital admissions did not differ significantly between groups. Similarly, adjusted rates of delayed discharge were similar in morbidly obese and nonobese patients (odds ratio [OR], 0.46; 95% confidence interval [CI], 0.18 - 1.15;  $P = 0.09$ ). In contrast, morbid obesity was associated with decreased odds of postoperative nausea and vomiting (OR, 0.27; CI, 0.09 - 0.84;  $P = 0.01$ ).

**Conclusions:** In 2006 in the U.S., the prevalence of ambulatory surgery in the morbidly obese was low, with most of the procedures being performed in the HOPD facilities, suggesting a conservative patient selection. The incidence of adverse postoperative outcomes and delayed discharge, as well as unplanned hospital admission after ambulatory surgery in the morbidly obese, was similar to that reported in the nonobese.

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## 1. Introduction

In the United States, obesity has increased steadily over the past two decades and is now recognized as a public health problem [1,2]. Morbid obesity (body mass index [BMI]  $\geq 40$  kg/m<sup>2</sup>) is associated with increased risk of comorbidities [3] that may influence perioperative morbidity and mortality. Therefore, ambulatory surgery in morbidly obese patients remains controversial [4,5]. Although several studies have assessed the effects of obesity on perioperative outcome after noncardiac surgery performed on an “inpatient” basis [6,7], the literature regarding the safety of ambulatory surgery in morbidly obese patients is sparse.

A study of morbidly obese patients (n=235) undergoing ambulatory surgery at a tertiary-care medical center found that the frequency of unplanned hospital admission in the morbidly obese population was similar to that in a matched nonobese cohort [8]. However, the unplanned hospital admission rate of 25% noted in this study was significantly higher than the national benchmark of 5% [9]. Other, more recent studies evaluating perioperative outcomes in obese patients undergoing ambulatory surgery are also limited; they are less rigorous single-center case series and may not be representative of practice across the U.S. [10–12]. Assessment of the national patterns of ambulatory surgery should provide us with the trends in clinical practice and their influence on perioperative outcome, as well as allow us to generate hypothesis and areas of future research.

The National Survey of Ambulatory Surgery (NSAS) is conducted periodically by the National Center for Health Statistics to obtain information representative of ambulatory surgery procedures performed in hospitals (ie, hospital-based outpatient departments [HOPD]) and freestanding ambulatory surgery centers (ASC) in the U.S. It may be used to assess the national status of ambulatory surgery in the morbidly obese and compare it with the nonobese ambulatory surgical population [13].

The aim of this study was to compare the overall characteristics and perioperative outcome in morbidly obese and nonobese patients undergoing ambulatory surgery. We hypothesized that morbidly obese patients were at greater risk of increased complications after ambulatory surgery.

## 2. Materials and methods

### 2.1. Data Source

Data from the 2006 NSAS database were used to determine the national use of ambulatory surgery among morbidly obese patients in the U.S. Because the NSAS data are publicly available and contain no personal identifying information, this study was exempt from institutional review board approval. The HOPD for the survey included short-stay hospitals exclusive of federal, military, and Department

of Veteran’s Affairs hospitals, located in the 50 states and the District of Columbia. The ASC included those facilities that are regulated by the states or certified by the Centers for Medicare and Medicaid Services, for Medicare participation.

The sampling methodology of the NSAS consisted of a stratified, multi-stage probability design, in which facilities were selected using a systematic random sampling procedure with probabilities proportional to the annual number of ambulatory surgeries performed in each facility. From each facility selected for the survey, a random sample of ambulatory surgery visits was further collected and data were extracted directly from the medical records. The information extracted for the survey consisted of demographic characteristics of patients; administrative information including type of facility (HOPD vs ASC), date of the surgery and disposition of the patient, and medical information, including up to 7 diagnoses and up to 6 surgical and nonsurgical procedures performed per visit.

In 2006, the NSAS collected additional information related to type of anesthesia, health care personnel who provided the anesthesia, duration of the surgical procedures, total time in the operating room, time in the Postanesthesia Care Unit (PACU), and occurrence of postoperative complications. Contract staff from the National Center for Health Statistics collected all the information for the survey by direct inspection of the medical records. All diagnoses and procedures were coded using the International Classification of Diseases, 9<sup>th</sup> Revision, Clinical Modification (ICD-9-CM system). Weights and stratification variables are provided with the dataset to allow for nationally representative estimates. The analysis was limited to the year 2006 because data on type of anesthetic and procedural times are available only in the 2006 NSAS.

### 2.2. Patient selection and independent variables

Adult patients (age > 18 yrs) with a diagnosis of morbid obesity, undergoing ambulatory surgery procedures during 2006, were identified from the dataset using the ICD-9-CM codes 278.01 (morbid obesity) and V85.4 (body mass index 40 kg/m<sup>2</sup> and over, adult). Agency for Health Care Research and Quality (AHRQ) Comorbidity Software, a family of databases and software tools developed as part of the Healthcare Cost and Utilization Project, was used to create comorbidity variables from the ICD-9-CM diagnosis codes present in each ambulatory surgical visit, excluding conditions that may be complications or that may be related to the principal diagnosis. In addition, the modified Charlson Comorbidity Index (CCI) was calculated for each patient based on the AHRQ comorbidity variables and ICD-9 diagnosis codes present in the databases and used in the analyses as a measure of comorbidity burden [14,15]. The CCI is a validated measure used with administrative data and correlates with morbidity and mortality after surgical procedures. It should be noted that obesity is not included as a parameter in the calculation of CCI. Type of surgical

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