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# Can the laparoscopic approach for adhesive small bowel obstruction be used in octogenarians? An observational study using ACS NSQIP



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## ABSTRACT

**Background:** With the population of octogenarians projected to increase fourfold by 2050, we sought to compare outcomes of laparoscopic *versus* open approach in octogenarians requiring surgery for adhesive small bowel obstruction (SBO).

**Methods/Materials and methods:** Using 2006–2015 American College of Surgeons National Surgical Quality Improvement Project, we identified patients aged  $\geq 80$  y who underwent emergency surgery within 1 d of admission for SBO. Risk variables of interest included age, sex, race, body mass index, preoperative sepsis, and American Society of Anesthesiologists (ASA) classification. Outcomes included length of stay, mortality, and pneumonia. Univariable and multivariable analyses were performed.

**Results:** Eight hundred fifty-six patients were identified. Six hundred ninety-nine (81.7%) underwent laparotomy; 157 (18.3%) underwent laparoscopy. Twenty-four (15.3%) of laparoscopic cases were converted. There was no difference between the open and laparoscopic groups in age, and race, preoperative albumin, or preoperative sepsis. The open group had higher rates of totally dependent functional status, congestive heart failure, chronic obstructive pulmonary disease, and higher ASA class. There was no difference in operative time. Laparoscopy was associated with shorter length of stay. The open approach showed higher rates of postoperative pneumonia, myocardial infarct, and mortality. Multivariable analysis showed increased age, functional status, preoperative albumin, and ASA class associated with mortality. The operative approach was not associated with mortality. Postoperative pneumonia was associated with male sex and open approach.

**Conclusions:** Age, preoperative functional status, low preoperative albumin, and ASA classes IV and V were associated with mortality, while the open approach and male sex were

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associated with postoperative pneumonia. Octogenarians who present with SBO due to adhesive disease may benefit from an initial laparoscopic exploration. Further prospective studies are warranted.

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## Introduction

Octogenarians are the fastest growing age group in the United States, with their population expected to increase fourfold by the year 2050.<sup>1</sup> As a result, general surgeons are faced with an aging patient population, particularly those requiring urgent or emergent surgery for small bowel obstruction (SBO). In the United States, adhesions are the most common cause of SBO, responsible for 65%-75% cases.<sup>2</sup> The octogenarian population proposes a specific challenge in both operative intervention and perioperative management due to preexisting conditions, decreased oxygen reserve, and frailty.<sup>1</sup>

In previous studies reviewing the management of SBO in the elderly population (age >70 y), 51% of patients required operative intervention due to failure of conservative management.<sup>3</sup> Open operative intervention compared to conservative management was associated with increased complications at a rate of 67% compared to 20%, respectively.<sup>3</sup> There is some heterogeneity in practice now, with SBO managed operatively by an open or laparoscopic approach. In a large series, laparoscopy was successful in managing SBO due to adhesive disease in 73.4% with reduced postoperative mortality and reduced length of stay (LOS) as compared to laparotomy.<sup>2</sup> At this time, there is limited research available studying the implementation of laparoscopy for SBO in the octogenarian population.

The aim of our study was to compare the outcomes of laparoscopy in the octogenarian population with the traditional open approach in patients presenting with SBO from adhesive disease. Our hypothesis was that laparoscopy would be associated with a reduced mortality and a lower risk of pneumonia.

## Methods

### Patients and data

For this study, the American College of Surgeons National Surgical Quality Improvement Program participant user files from 2006 to 2015 were used. We identified patients aged  $\geq 80$  y with a postoperative diagnosis of intestinal/peritoneal adhesion with obstruction (ICD-9560.81) who underwent emergency laparoscopic or open procedure (see [Appendix](#) for CPT codes) within 1 d of admission to account for acuity of surgical necessity. Risk variables that were included in univariate analysis include age, sex, race, body mass index (BMI), diabetes, presence of dyspnea, functional status, history of congestive heart failure (CHF), history of chronic obstructive pulmonary disease (COPD), renal failure, dialysis dependence, presence of ascites, steroid use, presence of disseminated cancer, weight loss, preoperative transfusions of blood products, preoperative albumin levels, presence of preoperative sepsis, and American Society of Anesthesiologists (ASA)

classification. We also identified whether patients underwent an open versus laparoscopic procedure and whether a laparoscopic case was converted to open. We defined laparoscopic procedures on an intention-to-treat basis in that patients who started laparoscopically but were converted to open were considered to be laparoscopic cases.

Outcomes of interest included LOS, postoperative superficial/deep/organ space wound infection, wound dehiscence, pneumonia, failure to wean from ventilator, reintubation, pulmonary embolism, deep vein thrombosis, progressive renal insufficiency, acute renal failure, urinary tract infection, cerebrovascular accident, myocardial infarct, cardiac arrest, bleeding requiring transfusions, sepsis, septic shock, return to the operating room, and death.

### Statistical analysis

Before analysis, multivariate imputation by chained equation was used to impute missing data. Univariable analysis was performed using Student's t-test and Wilcoxon rank sum test for continuous variables and Fisher's exact test and  $\chi^2$  test for categorical variables. Multivariable analysis was performed using logistic regression for all outcome variables adjusting for age, sex, race, BMI, CHF, COPD, functional status, preoperative albumin levels, preoperative sepsis, open versus laparoscopic procedure, and conversion to open. Odds ratio (OR) for continuous variables was calculated by comparing the third to first interquartile ranges. The R statistical language, version 3.4.3, was used for all analysis.<sup>4</sup> American College of Surgeons National Surgical Quality Improvement Program data deidentified and publically available. For this reason, Institutional Review Board was not mandated for this study.

## Results

### Patient characteristic

A total of 856 patients met the inclusion criteria. Of these, 157 (18.3%) underwent a laparoscopic procedure, while 699 (81.7%) underwent an open procedure for SBO due to adhesive disease. Of the laparoscopic cases, 24 (15.3%) were converted to open. There were no significant differences in age (median 85.0 versus 85.0,  $P = 0.139$ ), sex (42.0% versus 36.2% male,  $P = 0.202$ ), race (87.9% versus 85.4% white,  $P = 0.177$ ), preoperative albumin levels (median 3.8 versus 3.8 g/dL,  $P = 0.349$ ), and preoperative sepsis (22.9% versus 28.5% systemic inflammatory response syndrome,  $P = 0.143$ ) between the laparoscopic and open groups. While there was a statistically significant difference in BMI (median 24.6 versus 23.6 kg/m<sup>2</sup>,  $P = 0.00961$ ), laparoscopic to open, respectively, both groups were in the normal weight categories as per the World Health Organization

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