
Nationwide Analysis of Outcomes of Bowel Preparation in Colon Surgery



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- BACKGROUND:** There are limited data comparing the outcomes of preoperative oral antibiotic bowel preparation (OBP) and mechanical bowel preparation (MBP) in colorectal surgery. We sought to identify the relationship between preoperative bowel preparations (BP) and postoperative complications in colon cancer surgery.
- STUDY DESIGN:** The NSQIP database was used to examine the clinical data of colon cancer patients undergoing scheduled colon resection during 2012 to 2013. Multivariate regression analysis was performed to identify correlations between BP and postoperative complications.
- RESULTS:** We evaluated a total of 5,021 patients who underwent elective colon resection. Of these, 44.8% had only MBP, 2.3% had only OBP, 27.6% had both MBP and OBP, and 25.3% of patients did not have any type of BP. In multivariate analysis of data, MBP and OBP were not associated with decreased risk of postoperative complications in right side (adjusted odds ratio [AOR] 0.80, 0.30, $p = 0.08, 0.10$, respectively) or left side colon resections (AOR 1.02, 0.68, $p = 0.81, 0.24$, respectively). However, the combination of MBP and OBP before left side colon resections resulted in a significantly decreased risk of overall morbidity (AOR 0.63, $p < 0.01$), superficial surgical site infection (AOR 0.31, $p < 0.01$), anastomosis leakage (AOR 0.44, $p < 0.01$), and intra-abdominal infections (AOR 0.44, $p < 0.01$).
- CONCLUSIONS:** Our analysis revealed that solitary mechanical bowel preparation and solitary oral bowel preparation had no significant effects on major postoperative complications after colon cancer resection. However, a combination of mechanical and oral antibiotic preparations showed a significant decrease in postoperative morbidity. (J Am Coll Surg 2015;220:912–920. © 2015 by the American College of Surgeons)
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Infectious complications after colorectal resections are some of the most severe postoperative complications, leading to an increase in mortality, morbidity, hospital cost, and length of hospitalization.^{1,2} Infectious complications, with a 40% incidence rate, were one of the main causes of mortality and morbidity in patients undergoing colorectal surgery in the first half of the 20th century.^{2–4} Improvements in perioperative care and surgical techniques during the last few decades have significantly decreased postoperative infectious complications.

However, infectious complications still remain a major cause of morbidity in colorectal patients.^{1,2} Given this ongoing problem, it is important to recognize risk factors and effective risk reduction strategies for infectious complications before surgery in an effort to reduce the morbidity and mortality of these patients.

Mechanical and oral antibiotic bowel preparations have been used by surgeons for decades in an attempt to decrease postoperative infectious complications.² However, during the last 2 decades, there has been growing controversy regarding the effects of mechanical bowel preparation (MBP) on postoperative infectious complications.^{2,5–9} Moreover, some recent studies reported that MBP is actually harmful to colorectal surgery patients.^{6,8,10,11} Although several studies have reported no benefits of MBP for elective colorectal surgery, its use remains widespread among surgeons.^{12,13} The strategies for limiting MBP in clinical practice across Europe and the United States have been met with resistance.¹⁴ In a survey of the members of the

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Abbreviations and Acronyms

AOR = adjusted odds ratio
 BP = bowel preparation
 MBP = mechanical bowel preparation
 OBP = oral antibiotic bowel preparation
 SSI = surgical site infection

American Society of Colon and Rectal Surgeons in the United States in 2003, 99% of respondent surgeons reported that they use MBP routinely.¹² In a multinational survey in Europe and the US, more than 85% of colorectal patients underwent preoperative MBP in 2006.¹⁴ Although that trend has changed in recent years, most of the change has been limited to right side resections, even though the data do not allow that distinction. It is unclear why surgeons have not changed their practice.¹⁵ The major hurdles may be a reluctance to change.¹⁵ Recent guidelines did not suggest discarding MBP entirely, but they did suggest that MBP should not be used routinely in colonic surgery.¹⁶⁻¹⁸ Deciding whether MBP is needed in elective colorectal surgery is difficult. Therefore, this study aimed to report the contemporary status of MBP and oral antibiotic bowel preparation (OBP) in the United States (US), and to investigate associations between these bowel preparations (BPs) with postoperative complications in right side and left side colon cancer resections.

METHODS

This study was performed using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database for 2012 and 2013. The

ACS NSQIP is a large, validated outcomes-based program that provides preoperative to 30-day postoperative surgical outcomes based on clinical data to improve the quality of surgical care in the United States.¹⁹ This study evaluated patients who had colon cancer and underwent elective colon resections using the appropriate procedure codes as specified by the Current Procedural Terminology (CPT) codes. Patients who had colon procedures were defined based on the following CPT codes: 44140–44147, 44204–44208, 44160, and 44213. Patients who underwent colon surgery without colon resection, patients with missing data regarding preoperative BP, and patients younger than 18 years were excluded from this study (Fig. 1). Patient diagnoses were defined based on the International Classification of Diseases, 9th Revision, clinical modifications (ICD–9–CM) codes of 153.0–153.9, 154.0, 154.1, 230.3, and 230.4. We categorized patients into 4 groups: patients who had MBP only, patients who had OBP only, patients who had a combination of mechanical and oral antibiotic BP, and patients who did not have any BP. Also, procedures were categorized into 2 groups: right side colon resections (cecum, ascending colon, hepatic flexure colon, and transverse colon) and left side colon resections (splenic flexure, descending colon, sigmoid, and rectosigmoid junction).

Preoperative factors analyzed in the study included patient characteristics (age, sex, and race) and comorbidity conditions, which included history of congestive heart failure within 30 days before surgery, renal failure with need for dialysis, history of dyspnea within the 30 days before surgery, bleeding disorder, steroid use within the 30 days before surgery, diabetes mellitus, preoperative sepsis

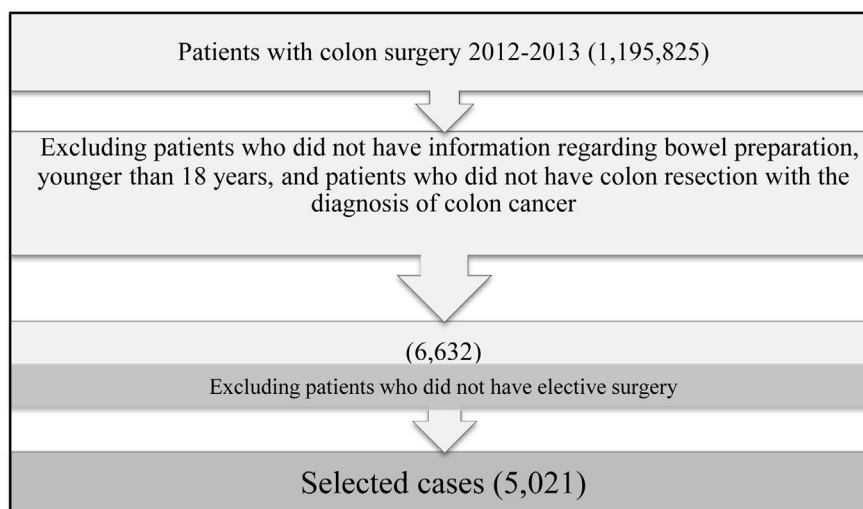


Figure 1. Inclusion and exclusion criteria in case selection for the study.

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