

Clinical Science

Even modest hypoalbuminemia affects outcomes of colorectal surgery patients



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Abstract

BACKGROUND: A small decrease in the serum albumin from the normal level is a common condition in preoperative laboratory tests of colorectal surgery patients; however, there is limited data examining these patients. We sought to identify outcomes of such patients.

METHODS: The National Surgical Quality Improvement Program database was used to evaluate all patients who had modest levels of hypoalbuminemia ($3 \leq$ serum albumin < 3.5 g/dL) before colorectal resection from 2005 to 2012. Multivariate analysis using logistic regression was performed to quantify complications associated with modest hypoalbuminemia.

RESULTS: A total of 108,898 patients undergoing colorectal resection were identified, of which 16,962 (15.6%) had modest levels of preoperative hypoalbuminemia. Postsurgical complications significantly associated ($P < .05$) with modest hypoalbuminemia were as follows: hospitalization more than 30 days (adjusted odds ratio [AOR], 1.77), deep vein thrombosis (AOR, 1.64), unplanned intubation (AOR, 1.42), ventilator dependency for more than 48 hours (AOR, 1.30), and wound disruption (AOR, 1.22).

CONCLUSIONS: Modest hypoalbuminemia is a common preoperative condition in patients undergoing colorectal resection. Our analysis demonstrates that modest hypoalbuminemia has associations with increased postoperative complications, especially pulmonary complications.

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Malnutrition has a prevalence of 30% to 50% in hospitalized patients and is one of the most important conditions known to increase morbidity, mortality, length of hospitalization, and cost for patients.¹ Furthermore, malnutrition causes a significant increase in postoperative complications by impairing host immune function, causing muscle dysfunction, decreasing collagen synthesis, and delaying tissue healing.^{1,2} It is important to recognize malnourished patients before surgical intervention to minimize the morbidity and mortality of these patients.

There are a number of tools available that allow assessment of the preoperative nutritional status of patients and help to identify malnourished patients.^{3–5} Preoperative serum albumin level has been identified as a reliable measure of a patient's perioperative nutritional status. Low albumin levels have been proved to be strongly associated with delayed recovery of bowel function and postoperative complications. Furthermore, low levels of albumin have been shown to be a strong predictor of mortality and morbidity of major general surgery procedures.^{6–8}

Numerous studies have identified complications as a consequence of hypoalbuminemia in hospitalized patients with the goal of controlling morbidity and mortality.⁹ Some of these complications include prolonged ventilator support, pneumonia, poor tissue healing, and delayed recovery of postoperative bowel function.^{4,9} However, there is limited data examining associations between modest decreases in serum albumin levels frequently seen in patients undergoing colorectal procedures and postoperative complications. Therefore, a large nationwide study analyzing the contemporary rate and the impact of modest decrease in the serum albumin level is needed.

There is a broad difference in postoperative complications attributable to hypoalbuminemia according to the types of surgical procedures. Therefore, it would be helpful to study complications as a consequence of hypoalbuminemia as adjusted by groups of procedures.⁶ The primary objective of our study was to investigate outcomes of postoperative complications in patients undergoing colorectal surgery with moderate hypoalbuminemia. Using a large national database to analyze 13 postoperative complications, we aim to report on the incidence, risk factors, complications, and outcomes associated with the modest levels of hypoalbuminemia in patients undergoing colorectal procedures.

Methods

This study was performed using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database from January 1, 2005, to December 31, 2012. ACS NSQIP is a nationally validated, risk-adjusted, outcomes-based program to measure and improve the quality of surgical care in the United States.¹⁰ ACS NSQIP provides preoperative to 30-day postoperative surgical outcomes based on clinical data. We considered patients who had undergone colorectal resections for the diagnoses of benign or malignant colorectal tumors, diverticular diseases, and ulcerative colitis using the appropriate procedural and diagnosis codes as specified by the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*. Patients undergoing colorectal procedures were defined based on the following Current Procedural Terminology codes: 44,140 to 44,160; 44,204 to 44,212; 45,110; 45,126; and 45,395. Patients who did not undergo colon or rectal resection were excluded from this study. Patients' diagnoses were defined based on the following *ICD-9*

codes: malignant neoplasm of colon and rectum (153.0 to 153.9, 154.0, 154.1, 230.3, and 230.4), benign neoplasm of colon and rectum (211.3 and 211.4), diverticulosis or diverticulitis (562.10 to 562.13), Crohn disease (555.1 and 555.2), and ulcerative colitis (556.0 to 556.9). Preoperative modest hypoalbuminemia was defined as the presence of serum albumin level between 3 and 3.4 g/dL based on preoperative laboratory results. The serum albumin level was based on preoperative laboratory results within 14 days of operation (the mean time was 5 days).

Preoperative factors that were analyzed include patient characteristics (age, gender, and race) and 16 comorbidity conditions as conveyed in [Table 1](#), including congestive heart failure (CHF) 30 days before surgery, currently on dialysis (preoperatively), diabetes mellitus with oral agents or insulin, weight loss more than 10% in last 6 months, steroid use for chronic condition, history of severe chronic obstructive pulmonary disease (COPD), current smoker within 1 year, moderate or severe dyspnea, the presence of ascites on physical examination or imaging within 30 days before operation, partial or total dependency in activities performed in the course of a normal day in a person's life (bathing, feeding, dressing, toileting, and mobility) before surgery as a measure of functional health status, disseminated (stage 4) cancer, American Society of Anesthesiologists (ASA) score more than 2, chemotherapy for malignancy in the last 30 days before operation, radiotherapy for malignancy 90 days before operation, alcohol abuse as defined by more than 2 drinks/d 2 weeks before admission, and hypertension requiring medication. Other factors analyzed include postsurgical complications (superficial surgical site infection [SSI], deep incisional SSI, organ space SSI, wound disruption, pneumonia, unplanned intubation, ventilator dependency for >48 hours, urinary tract infection, cardiac arrest requiring cardiopulmonary resuscitation, myocardial infarction, deep vein thrombosis [DVT], acute renal failure, and hospitalization for >30 days from admission date), pathologic conditions (colorectal cancer, diverticulosis or diverticulitis, Crohn disease, ulcerative colitis, and benign colorectal tumor), procedure type (total colectomy, partial colectomy, abdominoperineal resection, and pelvic exenteration), surgical techniques (laparoscopic vs open), and wound classification (clean, clean/contaminated, contaminated, and dirty). The overall rate of preoperative modest hypoalbuminemia and the rate of postoperative complications by procedure type and serum albumin level were examined. Risk-adjusted analysis was performed to identify independent predictors of postoperative complications after colorectal surgery. Male gender, Caucasian race, and benign colorectal tumor were used as reference data points for comparison in line with the literature.^{8,11}

Statistical analysis

Statistical analysis was performed with SPSS software, version 22 (SPSS Inc., Chicago, IL). Logistic

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