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Impact of malnutrition on gastrointestinal surgical patients



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ABSTRACT

Background: The accurate diagnosis of malnutrition is imperative if we are to impact outcomes in the malnourished. The American Society of Parenteral and Enteral Nutrition (ASPEN) and Academy of Nutrition and Dietetics (AND), in an attempt to address this issue, have provided evidence-based criteria to diagnose malnutrition. The purpose of this study was to validate the ASPEN/AND criteria in a cohort of patients from a single high-volume surgical oncology unit.

Methods: Patients undergoing major abdominal surgery from June 2013 to March 2015 were classified by their nutritional status using the ASPEN/AND criteria.

Results: A total of 490 patients were included. Median age was 64 y, a majority were female (50.6%), white (60.2%), underwent elective procedures (77.6%), had a Charlson comorbidity score (CCS) of 3-5 (40.0%), and a Clavien-Dindo complication (CDC) grade of 0-II (81.2%). A total of 93 (19.0%) patients were classified as moderately/severely malnourished. On univariate analysis, malnourished patients were more likely to be older, undergo emergent procedures, and have a CCS >5 ($P < 0.05$). Malnutrition was also associated with a longer postoperative length of stay (LOS), higher cost, higher in-hospital mortality, more severe complications, and higher readmission rates ($P < 0.05$). Multivariate analysis reaffirmed the association between malnutrition, LOS (odds ratio [OR] = 1.67), and cost (OR = 2.49), $P < 0.05$. Complications (OR = 1.35), mortality rates (OR = 3.05), and readmission rates (OR = 1.34) $P > 0.05$ failed to reach significance.

Conclusions: Malnutrition worsens LOS and cost. Utilization of standardized criteria consistently identifies patients at risk of negative outcomes who may benefit from perioperative nutritional support.

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Introduction

Malnutrition is an independent predictor of poor outcomes after surgery.¹ It is a prevalent, complex, multimodal pathology present in 30%-50% of surgical patients.^{2,3} The presence of malnutrition is associated with increased morbidity, mortality, length of stay (LOS), and hospital cost.⁴⁻⁶ Decades of surgical research support perioperative nutritional enhancement as a mechanism to improve the postsurgical outcomes in patients with moderate to severe malnutrition.⁷⁻¹³ Owing to the potential benefits of this treatment, nutritional assessment is considered to be of primordial importance in the perioperative evaluation of the surgical patients.

Historically, hepatic proteins (albumin, prealbumin, and transferrin) were used as the determinants of perioperative nutritional status.^{14,15} Similar to malnutrition, low albumin levels act as a predictor of poor postoperative outcome. However, serum albumin levels are influenced by a variety of factors and have a poor correlation with nutritional status.^{16,17} Commonly used as a single determinant of nutritional status, serum markers have lost their significance due to the lack of power to independently diagnose malnourishment.¹⁸ To overcome this gap, varieties of tools and guidelines have been introduced. The application of formulas coupled with subjective questionnaires, biochemical and immunologic serum markers, and anthropometric measurements has resulted in the development of numerous instruments to estimate nutritional status.¹⁹⁻²¹ Resultantly, the amount of data obtained is overwhelming with extensive literature studies attempting to validate these instruments. The American Society of Parenteral and Enteral Nutrition (ASPEN) and Academy of Nutrition and Dietetics (AND) have addressed the issues related to the lack of clear evidenced-based guidelines for malnutrition.²² Based on current literature and expert consensus, detailed nutritional screening criteria were jointly developed.²³ The primary aim of this study was to evaluate the value of the ASPEN/AND malnutrition criteria in a wide range of gastrointestinal surgical procedures performed on a single surgical oncology unit. We hypothesize that this structured evaluation will identify the malnourished patients at risk for increased postoperative complications, LOS, hospital cost, and mortality.

Materials and methods

A retrospective review was performed identifying all surgical oncology patients who underwent major abdominal surgery from June 2013 to March 2015 at Vidant Medical Center, East Carolina University, Greenville, North Carolina, USA. The Health Sciences Institutional Review Board of East Carolina University approved the study protocol and permitted waiver of consent. Patient demographics, nutritional status, operative factors, and financial data were obtained from the University Health Consortium and the electronic medical record. Patient demographics included age, gender, ethnicity, admitting diagnosis, comorbidities, and oncologic stage. An age-adjusted Charlson comorbidity index (CCI) was calculated for each patient.²⁴ Patients were categorized into three groups

depending on their CCI score [low (0-2), moderate (3-5), and high >5]. Nutritional status was obtained by reviewing the patient medical record. Based on the ASPEN/AND criteria (Table 1), which uses five factors including weight loss, caloric intake, body fat, muscle mass, and fluid accumulation in three different disease states or conditions (acute illness/injury, chronic illness, and social/environmental circumstances).²³ Patients were classified by registered dietitians as: well-nourished or moderately/severely malnourished. Various factors analyzed included the type of surgery (such as colectomy, intestinal resection, pancreatectomy, hepatic resection, gastrectomy, and other major abdominal interventions), LOS, in-hospital mortality, the rate of hospital readmission within 30 days of discharge, and postoperative complications. Complications were classified using the Clavien-Dindo grading system.²⁵ Adjusted financial data were obtained from the University Health Consortium database to calculate the hospital costs.

Statistical analysis

Patient demographics including nutritional status in addition to the operative and financial variables were represented as a mean and percentage as required. Student t test or chi-square test was used to perform univariate analysis. Variables with a P value < 0.2 in univariate analysis were included in a logistic regression model. Variables with a P value < 0.05 were defined as statistically significant. The analysis was conducted using JMP Pro version 10.0.0; 2012 (SAS Institute Inc, Cary, NC).

Results

Between the period from June 2013 and March 2015, 490 patients matched the inclusion criteria. Table 2 summarizes the population characteristics. Median age was 64 y (range, 20-99 y). Slight majorities of patients were ≥ 64 y and accounted for 52.2%. Almost equal gender representation was encountered. Most patients were white (60.2%) with a significant African American representation (36.3%). Other abdominal disease was the principal admitting diagnosis (38.2%) followed by colorectal cancer (26.5%), pancreatic cancer (14.5%), with less frequent presentation of primary and secondary liver malignancies (8%), gastric cancer (6.7%), and small bowel cancer (6.1%). A quarter of the population was diagnosed with a benign condition; the remainder had primary diagnosis of cancer. The most common cancer stage was stage II with 32% followed by stage IV 26.1%.

Almost half of the population (40%) had an intermediate (3-5) age-adjusted CCI score, with 37.3% presenting a low (1-2) CCI score and 22.7% presenting a high (>5) CCI score. The most commonly performed procedure was other abdominal (29%) followed by colectomy (18.6%), with the same percentage of intestinal resections and pancreatectomy (18% each) and finally followed by hepatic resection (10.6%) and gastrectomy (5.9%). A predominance of elective procedures was seen in 77.5% of the cases compared to emergent and/or urgent admissions accounting to 22.4% of the cases. Majority of the population was diagnosed as well-nourished (81%), whereas

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