

Influence of Preoperative Sarcopenia on Ninety-Day Readmission after Robotic Gastrointestinal Surgery

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Background: Sarcopenia, characterized by the progressive loss of skeletal muscle mass and function, has emerged as an important predictor of adverse surgical outcomes. Although robotic gastrointestinal surgery offers several perioperative advantages, the influence of preoperative sarcopenia on postoperative readmission remains incompletely understood.

Objective: To evaluate whether preoperative sarcopenia is associated with increased ninety-day hospital readmission following robotic gastrointestinal surgery.

Methods: A retrospective observational study was conducted involving 246 patients who underwent elective robotic gastrointestinal procedures between January 2022 and December 2024. Sarcopenia was assessed using preoperative computed tomography measurements at the third lumbar vertebral level. Demographic characteristics, perioperative variables, postoperative complications, and ninety-day readmission rates were analyzed. Multivariate logistic regression identified independent predictors of readmission.

Results: Preoperative sarcopenia was identified in 72 patients (29.3%). Ninety-day readmission occurred in 38 patients (15.4%), with significantly higher rates among sarcopenic individuals (27.8%) compared with non-sarcopenic patients (10.3%, $p < 0.001$). Infectious complications, delayed gastrointestinal recovery, and nutritional deficiencies represented the leading causes of readmission. After adjustment for age, body mass index, comorbidities, and operative duration, sarcopenia remained an independent predictor of readmission (adjusted OR 2.94; 95% CI 1.48–5.82; $p = 0.002$).

Conclusion: Preoperative sarcopenia significantly increases the likelihood of ninety-day readmission after robotic gastrointestinal surgery. Early nutritional optimization and prehabilitation may reduce postoperative morbidity and healthcare utilization.

Key Words: Sarcopenia; Robotic surgery; Gastrointestinal surgery; Readmission; Prehabilitation; Surgical outcomes (*Ann Surg* 2026;284:1–3)

Introduction

Robotic gastrointestinal surgery has transformed the management of both benign and malignant digestive diseases by providing improved dexterity, enhanced visualization, and greater surgical precision. Numerous studies have demonstrated reductions in blood loss, postoperative pain, and hospital stay compared with conventional open procedures.

Despite these advances, postoperative readmission continues to impose a substantial burden on patients and healthcare systems. Readmissions within ninety days often reflect unresolved complications, nutritional deterioration, infections, or impaired recovery.

Sarcopenia has recently gained recognition as an objective marker of physiological reserve. Reduced skeletal muscle mass is associated with impaired immune response, delayed wound healing, and decreased tolerance to surgical stress. As the prevalence of sarcopenia increases with aging and chronic disease, understanding its influence on postoperative outcomes has become increasingly important.

This study investigates whether preoperative sarcopenia independently predicts ninety-day hospital readmission after robotic gastrointestinal surgery.

Materials and Methods

Study Design

A retrospective cohort study was performed at a tertiary referral center after institutional approval. Consecutive adult patients undergoing elective robotic gastrointestinal surgery between January 2022 and December 2024 were included.

Inclusion Criteria

- Age ≥ 18 years
- Elective robotic gastrointestinal surgery
- Available preoperative abdominal CT scan within six weeks before surgery
- Minimum ninety-day follow-up

Exclusion Criteria

- Emergency procedures
- Conversion to open surgery
- Incomplete clinical records

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- Previous organ transplantation

Assessment of Sarcopenia

Cross-sectional skeletal muscle area was measured at the L3 vertebral level using standardized CT image analysis software. Skeletal muscle index (SMI) was calculated by normalizing muscle area to height squared. Patients below established sex-specific cutoff values were classified as sarcopenic.

Data Collection

Collected variables included:

- Age
- Sex
- Body mass index
- American Society of Anesthesiologists (ASA) classification
- Diabetes mellitus
- Smoking status
- Procedure type
- Operative duration
- Estimated blood loss
- Length of hospital stay
- Postoperative complications
- Ninety-day readmission

Statistical Analysis

Continuous variables were expressed as mean $\pm$ standard deviation and compared using Student's t-test. Categorical variables were analyzed with Chi-square testing. Multivariate logistic regression evaluated independent predictors of ninety-day readmission. Statistical significance was defined as $p < 0.05$.

Results

Patient Characteristics

Among 246 eligible patients, the mean age was 61.8 ± 11.4 years, and 142 (57.7%) were male. Sarcopenia was diagnosed in 72 patients (29.3%).

Sarcopenic patients were significantly older and demonstrated lower body mass index compared with non-sarcopenic individuals.

Table 1. Baseline Characteristics

Variable	Sarcopenia	No Sarcopenia	p-value
Patients	72	174	—
Mean age (years)	68.2	58.9	<0.001
Male (%)	62.5	55.7	0.34
BMI (kg/m ²)	21.1	25.0	<0.001
Diabetes (%)	36.1	28.2	0.24

Surgical Outcomes

The mean operative time was comparable between groups. However, sarcopenic patients experienced significantly longer hospital stays and higher postoperative complication rates. Readmission within ninety days occurred in:

- Sarcopenia group: **20 patients (27.8%)**
- Non-sarcopenia group: **18 patients (10.3%)**

This difference was statistically significant ($p < 0.001$).

Common causes of readmission included:

- Surgical site infection
- Anastomotic-related complications
- Delayed bowel function
- Nutritional insufficiency
- Dehydration

Multivariate Analysis

Independent predictors of ninety-day readmission included:

Variable	Adjusted OR	95% CI	p-value
Sarcopenia	2.94	1.48–5.82	0.002
Diabetes	1.79	1.01–3.19	0.047
Major postoperative complication	3.65	1.92–6.94	<0.001
Hospital stay >7 days	2.11	1.12–3.96	0.021

Discussion

The present study demonstrates a strong association between preoperative sarcopenia and ninety-day hospital readmission following robotic gastrointestinal surgery. Patients with diminished skeletal muscle mass experienced nearly threefold higher odds of readmission after adjustment for major clinical variables.

Several mechanisms may explain these findings. Sarcopenic patients possess reduced physiological reserve, impaired immune competence, and diminished capacity for tissue repair. Consequently, they may be more susceptible to postoperative infections, delayed recovery, and nutritional complications.

These findings support growing evidence emphasizing body composition rather than body weight alone when evaluating surgical risk. Routine CT imaging already performed for operative planning provides an opportunity for objective assessment of skeletal muscle without additional investigations.

Implementation of structured prehabilitation programs incorporating nutritional supplementation, resistance exercise, and optimization of comorbid conditions may improve postoperative recovery in high-risk individuals.

Robotic surgery minimizes operative trauma; however, technological advantages cannot completely compensate for compromised patient physiology. Therefore, patient optimization remains essential for improving long-term outcomes.

Limitations

This study has several limitations. Its retrospective design introduces potential selection bias. The investigation was conducted at a single institution, limiting external validity. Functional muscle strength was not routinely assessed alongside radiologic measurements. Additionally, nutritional interventions before surgery were not standardized.

Future multicenter prospective studies should validate these findings and evaluate targeted interventions aimed at reducing readmission among sarcopenic patients.

Conclusion

Preoperative sarcopenia is an independent predictor of ninety-day hospital readmission following robotic gastrointestinal surgery. Incorporating routine assessment of skeletal muscle mass into preoperative evaluation may improve risk stratification and identify patients who could benefit from nutritional optimization and multidisciplinary prehabilitation before surgery.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability

The datasets generated for this demonstration article are fictional and are intended solely for educational and formatting purposes.

Author Contributions

Arindam Sen: Conceptualization, manuscript drafting, supervision. Priya Mukherjee: Data collection, statistical analysis. Jonathan R. Lewis: Methodology, critical manuscript revision. Haruto Nakamura: Imaging analysis, interpretation of results. Elena Petrova: Literature review, manuscript editing, final approval.

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