

# The Geriatric Nutritional Risk Index and Early Prognosis Following Revision Total Hip Arthroplasty

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**INTRODUCTION:** The incidence of total hip arthroplasty (THA) and therefore revision THA (rTHA) is rapidly increasing due to the obesity epidemic and the aging population of the United States. Given the increasing demand for rTHA, understanding the role of patient demographics and conditions perioperatively is crucial. Malnutrition is a well-documented risk factor associated with an increased rate of postoperative complications. While serum albumin has classically been used as a proxy for nutrition status, it has received criticism for its inability to account for systemic processes related to malnutrition. The Geriatric Nutritional Risk Index (GNRI) is a simple validated risk index that assesses malnutrition in elderly patients by using patients' serum albumin, body weight, and ideal body weight. This study aims to investigate the association between GNRI and early postoperative complications following rTHA.

**METHODS:** The American College of Surgeons National Surgical Quality Improvement (NSQIP) database was queried for all patients age >65 who underwent rTHA for a non-infectious cause from 2015 to 2021. 30-day postoperative complications following rTHA as well as patient demographics and comorbidities were collected. GNRI was then calculated for each patient using body weight, ideal body weight determined by the Lorenz equation, and preoperative serum albumin levels. The study population was then indexed into 3 cohorts based on their preoperative GNRI: normal (GNRI > 98), moderate malnutrition (92 ≤ GNRI ≤ 98), and severe malnutrition (GNRI < 92). Bivariate logistic regression analysis was used to identify significant patient factors and postoperative complications associated with moderate and severe malnutrition. Subsequently, multivariate logistic regression analysis was used to identify postoperative complications independently associated with moderate and severe malnutrition.

**RESULTS:** A total of 7,119 patients were included in this study: 4,342 in the normal nutrition group, 1,367 in the moderate malnutrition group, and 1,410 in the severe malnutrition group. After controlling for associated patient demographics, moderate malnutrition was found to be independently significantly associated with a greater likelihood of experiencing any complications (odds ratio [OR] 2.08, 95% confidence interval [CI] 1.78-2.42; P<0.001), blood transfusions (OR 1.78, 95% CI 1.55-2.06; P<0.001), deep vein thrombosis (DVT) (OR 1.01, 95% CI 1.00-1.01; P=0.044), non-home discharge (OR 1.83, 95% CI 1.60-2.09; P<0.001), readmission (OR 1.27, 95% CI 1.02-1.57; P=0.035), length of stay (LOS) > 2 days (OR 1.98, 95% CI 1.72-2.28; P<0.001), and periprosthetic fracture (OR 1.54, 95% CI 1.07-2.23; P=0.020). Severe malnutrition was independently significantly associated with a greater likelihood of experiencing any complication (OR 8.79, 95% CI 6.74-11.46; P<0.001), sepsis (OR 3.67, 95% CI 2.01-6.70; P<0.001), septic shock (OR 3.75, 95% CI 1.62-8.69; P=0.002), pneumonia (OR 2.73, 95% CI 1.67-4.49; P<0.001), urinary tract infection (OR 2.04, 95% CI 1.31-3.19; P=0.002), blood transfusions (OR 2.78, 95% CI 2.41-3.20; P<0.001), DVT (OR 1.01, 95% CI 1.00-1.01; P=0.001), pulmonary embolism (OR 2.47, 95% CI 1.16-5.27; P=0.019), surgical site infection (OR 2.59, 95% CI 1.96-3.41; P<0.001), acute renal failure (OR 8.44, 95% CI 1.64-43.52; P=0.011), non-home discharge (OR 3.36, 95% CI 2.91-3.87; P<0.001), readmission (OR 1.69, 95% CI 1.37-2.09; P<0.001), unplanned reoperation (OR 1.97, 95% CI 1.54-2.52; P<0.001), LOS > 2 days (OR 5.41, 95% CI 4.48-6.54; P<0.001), periprosthetic fractures (OR 1.61, 95% CI 1.10-2.35; P=0.015), and mortality (OR 2.63, 95% CI 1.56-4.44; P<0.001).

**DISCUSSION:** In geriatric patients with GNRI indicative of malnutrition, the overall rate of complication following rTHA was found to increase with increasing severity of malnutrition. Our findings show that GNRI is a strong predictor of early postoperative complications following rTHA in geriatric patients. Given the increasing surgical volume of rTHA in elderly patients and the poor surgical outcomes associated with malnutrition, it is important to identify malnutrition in the preoperative selection of surgical candidates. This study used a large sample size and adjusted for patient demographics, comorbidities, and operative variables. This study was limited by the inherent limitations of the NSQIP database.

**SIGNIFICANCE/CLINICAL RELEVANCE:** Validating the GNRI's prognostic utility for geriatric rTHA patients supports its use as an adjunctive tool in preoperative risk stratification to help surgeons better select surgical candidates, address modifiable risk factors, and promote favorable patient outcomes.

## IMAGES AND TABLES:

**Table I.** Multivariate analysis of 30-day postoperative complications in patients with preoperative normal GNRI, moderate malnutrition, and severe malnutrition. Dashes represent associations not significant in bivariate analysis and were not included in multivariate analysis. Bold P values indicate statistical significance with P < 0.05.

Complication	Moderate malnutrition	Severe malnutrition
	OR, P value (95% CI)	OR, P value (95% CI)
Any complication	2.08, <0.001 (1.78-2.42)	8.79, <0.001 (6.74-11.46)
Sepsis	--	3.67, <0.001 (2.01-6.70)
Septic shock	--	3.75, 0.002 (1.62-8.69)
Pneumonia	--	2.73, <0.001 (1.67-4.49)
Urinary tract infection	1.59, 0.055 (0.99-2.54)	2.04, 0.002 (1.31-3.19)
Cardiac arrest or myocardial infarction	--	1.30, 0.388 (0.72-2.35)
Stroke	2.99, 0.055 (0.98-9.19)	--
Blood transfusions	1.78, <0.001 (1.55-2.06)	2.78, <0.001 (2.41-3.20)
Deep vein thrombosis	1.01, 0.044 (1.00-1.01)	1.01, 0.001 (1.00-1.01)
Pulmonary embolism	1.87, 0.108 (0.87-3.99)	2.47, 0.019 (1.16-5.27)
Surgical site infection	--	2.59, <0.001 (1.96-3.41)
Acute renal failure	--	8.44, 0.011 (1.64-43.52)
<i>Clostridioides difficile</i> infection	--	1.50, 0.387 (0.60-3.75)
Non-home discharge	1.83, <0.001 (1.60-2.09)	3.36, <0.001 (2.91-3.87)
Readmission	1.27, 0.035 (1.02-1.57)	1.69, <0.001 (1.37-2.09)
Unplanned reoperation	1.29, 0.056 (0.99-1.69)	1.97, <0.001 (1.54-2.52)
Length of stay > 2 days	1.98, <0.001 (1.72-2.28)	5.41, <0.001 (4.48-6.54)
Periprosthetic fracture	1.54, 0.020 (1.07-2.23)	1.61, 0.015 (1.10-2.35)
Mortality	1.24, 0.500 (0.66-2.32)	2.63, <0.001 (1.56-4.44)

GNRI, Geriatric Nutritional Risk Index; OR, odds ratio; CI, confidence interval.