Does the Geriatric Nutritional Risk Index Predict Complication Rates and Implant Survivorship in Revision Total Joint Arthroplasty?

Christian Thomas Oakley, Jerry Arraut, Jaclyn Aleksandra Konopka, Caleigh Ann Pope, Simon Lalehzarian, Omid S Barzideh, Morteza Meftah[1], Ran Schwarzkopf[2]
[1]NYU Langone Orthopedic Hospital, [2]NYU Langone Orthopedic Hospital, Hospital For Joi

INTRODUCTION:
Malnutrition is associated with poorer outcomes after revision total joint arthroplasty (rTJA), though no universal metric for assessing malnutrition in rTJA patients has been reported. This study sought to determine if malnutrition as defined by the Geriatric Nutritional Risk Index (GNRI) can independently predict short-term complication rates and re-revision risk in patients undergoing rTJA.
METHODS:
All patients ≥65 years old undergoing rTJA from 2011 to 2021 at a single high-volume orthopedic specialty hospital were identified. Preoperative albumin, height, and weight were used to calculate GNRI. Based on the calculated GNRI value, patients were stratified into three groups: normal nutrition (GNRI>98), moderate malnutrition (GNRI= 92-98), and severe malnutrition (GNRI<92). Chi-squared and independent samples t-tests were used to compare groups.
RESULTS:
A total of 531 rTJA patients were included in the analysis. Patients with normal nutrition were younger (p<0.001), had higher BMI (p<0.001), and were less likely to have preoperative albumin <3.5 g/dL (p<0.001). Patients with severe and moderate malnutrition had longer LOS (p<0.001), were less likely to be discharged home (p=0.0497), and had higher 90-day major complications (p=0.023) and readmission (p=0.005) rates as compared to those with normal nutrition. 90-day revision rates were similar (p=0.153). In Kaplan-Meier analysis, patients with severe and moderate malnutrition had worse freedom from all-cause re-revision at 1-year (p=0.001) and 2-year (p=0.002) follow-up as compared to those with normal nutrition.
DISCUSSION AND CONCLUSION: Moderate and severe malnutrition, as defined by GNRI, independently predicted higher complication and revision rates in rTJA patients. This suggests that the GNRI may serve as an effective screening tool for nutrition in patients undergoing rTJA.

Figure 1. Freedom from all-cause revision stratified by GNRI classification

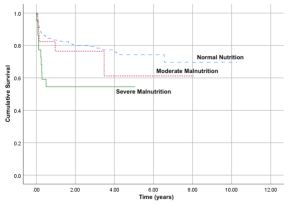

Table 1. Demographic characteristics of included patients.

	Normal Nutrition (n=464)	Moderate Malnutrition (n=27)	Severe Nutrition (n=40)	P-value
Male- no. (%)	200 (43.1)	10 (37.0)	12 (30.0)	0.239
Age (years)	72.6±6.0	75.9±8.1	76.2±8.5	**<0.001***
BMI (kg/m²)	31.2±6.7	23.8±4.3	22.1±3.1	**<0.001***
Race- no. (%)				0.558
White	334 (72.0)	20 (74.1)	34 (85.0)	
African American	74 (15.9)	3 (11.1)	3 (7.5)	
Asian	8 (1.7)	0 (0.0)	0 (0.0)	
Other	48 (10.3)	4 (14.8)	3 (7.5)	
ASA Classification- no. (%)				0.126
1	2 (0.6)	1 (4.5)	0 (0.0)	
2	136 (39.1)	6 (27.3)	8 (26.7)	
3	192 (55.2)	13 (59.1)	18 (60.0)	
4	18 (5.2)	2 (9.1)	4 (13.3)	
Smoking Status- no. (%)				0.347
Current	25 (5.4)	2 (7.4)	3 (7.5)	
Former	228 (49.1)	12 (44.4)	18 (45.0)	
Never	211 (45.5)	13 (48.1)	20 (52.5)	
BMI <18.5- no. (%)	1 (0.2)	2 (7.4)	3 (7.5)	**<0.001***
Albumin <3.5 g/dL- no. (%)	30 (6.5)	14 (51.9)	33 (82.5)	**<0.001***
Reason for Revision- no. (%)				**0.001***
Aseptic Loosening	131 (28.2)	1 (3.7)	8 (20.0)	
PJI	124 (26.7)	9 (33.3)	14 (35.0)	
Instability[2]	41 (8.8)	0 (0.0)	0 (0.0)	
Dislocation[2]	57 (12.3)	5 (18.5)	8 (20.0)	
Fracture[2]	41 (8.8)	9 (33.3)	10 (25.0)	
Arthrofibrosis[2]	13 (2.8)	1 (3.7)	1 (3.7)	
Liner wear	31 (6.7)	0 (0.0)	0 (0.0)	
Metallosis[3]	14 (3.0)	1 (3.7)	0 (0.0)	
Extensor mechanism issues	3 (0.6)	0 (0.0)	0 (0.0)	
Pain	9 (1.6)	0 (0.0)	0 (0.0)	
Type of Revision- no. (%)				0.457
Full Revision	245 (52.8)	9 (34.6)	21 (55.3)	
Partial Revision	90 (19.4)	7 (26.9)	6 (15.8)	
Liner Only	129 (27.8)	10 (38.5)	11 (28.9)	

ASA, American Society of Anesthesiologists; BMI, body mass index; dL, deciliter; g, gram; no., number
[1]All patients with this indication underwent revision total hip arthroplasty
[2]All patients with this indication underwent revision total knee arthroplasty
*p<0.05

Table 2. Short-Term outcomes stratified by nutritional status

	Normal Nutrition (n=464)	Moderate Malnutrition (n=27)	Severe Nutrition (n=40)	P-value
Operative Time (minutes)	138.2±76.9	134.5±60.8	152.2±69.7	0.506
LOS (days)	4.67±3.88	5.56±3.75	8.38±6.66	**<0.001***
Discharge Disposition- no. (%)				**0.001***
Home	304 (65.5)	14 (51.9)	14 (35.0)	**0.0497***
Skilled Nursing Facility	129 (27.8)	9 (33.3)	19 (47.5)	0.083
Acute Rehab Center	31 (6.7)	4 (14.8)	7 (17.5)	**0.028***
90-day Major Complications- no. (%)	89 (19.2)	6 (22.2)	15 (37.5)	**0.023***
PJI	32 (6.9)	2 (7.4)	4 (10.0)	0.765
Stroke	3 (0.6)	0 (0.0)	0 (0.0)	0.804
TIA	5 (1.1)	0 (0.0)	1 (2.5)	0.609
VTE	22 (4.7)	1 (3.7)	3 (7.5)	0.709
Acute Renal Failure	18 (3.9)	1 (3.7)	2 (5.0)	0.939
90-day Minor Complications- no. (%)	69 (14.9)	5 (18.5)	7 (17.5)	0.806
Anemia	39 (8.4)	3 (11.1)	3 (10.0)	0.846
Superficial Infection/Wound Dehiscence	12 (2.6)	0 (0.0)	0 (0.0)	0.412
UTI	10 (2.2)	2 (7.4)	2 (5.0)	0.159
Pneumonia	7 (1.5)	0 (0.0)	0 (0.0)	0.599
Hematoma	5 (1.1)	0 (0.0)	2 (5.0)	0.094
90-day Readmission- no. (%)	70 (15.1)	5 (18.5)	14 (35.0)	**0.005***
90-day Revision- no. (%)	40 (8.6)	3 (11.1)	7 (17.5)	0.153
90-day Revision Reason-no. (%)				0.961
Aseptic Loosening	3 (0.6)	0 (0.0)	1 (2.5)	
PJI	24 (5.2)	2 (7.4)	3 (7.5)	
Dislocation	8 (1.7)	1 (3.7)	2 (5.0)	
Fracture	2 (0.4)	0 (0.0)	1 (2.5)	
Other	1 (0.2)	0 (0.0)	0 (0.0)	

ED, Emergency Department; LOS, Length of stay; No., number; PJI, Periprosthetic joint infection; SSI, Surgical site infection; TIA, Transient ischemic attack; UTI, Urinary tract infection; VTE, Venous thromboembolism
*p<0.05

Table 3. Long-term outcomes for patients with at least 1-year follow-up stratified by nutritional status

	Normal Nutrition (n=302)	Moderate Malnutrition (n=17)	Severe Malnutrition (n=22)	P-value
1-year Revision- no. (%)	50 (16.6)	4 (23.5)	10 (45.5)	**0.003***
1-year Revision/Reoperation- no. (%)	66 (21.9)	5 (29.4)	11 (50.0)	0.156
Revision- no. (%)	64 (21.2)	5 (29.4)	10 (45.5)	**0.028***
Reasons for Revision- no. (%)				0.946
Aseptic Loosening	11 (4.0)	1 (5.9)	2 (9.1)	
PJI	31 (10.2)	3 (17.6)	4 (18.2)	
Instability	2 (0.6)	0 (0.0)	0 (0.0)	
Dislocation	12 (3.9)	1 (5.9)	3 (13.6)	
Fracture	2 (0.6)	0 (0.0)	1 (4.5)	
Other	6 (2.0)	0 (0.0)	0 (0.0)	

no., number; PJI, Periprosthetic joint infection
*p<0.05