A Comparison of Nutritional Indices in Total Joint Arthroplasty: Which is Better at Predicting Adverse Outcomes?

AUTHORS: Brian Hansen, B.S.[1,2], Devon Pekas, M.D., M.S.[1], John Sloboda, M.D.[1,2]

[1]Department of Orthopaedic Surgery, Institute for Orthopaedics & Neurosciences, Carilion Clinic, Roanoke, Virginia,
[2]Department of Orthopaedic Surgery, Virginia Tech Carilion School of Medicine, Roanoke, Virginia

DISCLOSURES: None

INTRODUCTION: Pre-operative malnutrition is a known risk factor for post-operative complications following Total Joint Arthroplasty (TJA), however there is scant literature comparing which nutritional index is best at predicting these outcomes. The purpose of this study is to investigate the utility of the Maastricht Index (MI), Onodera's Prognostic Index (OPNI), and the Geriatric Nutritional Risk Index (GNRI) in predicting Prosthetic Joint Infection (PJI), Wound Complications (WC), readmission, and re-operation rates in TJA.

METHODS: A single center, retrospective cohort study was performed utilizing patients that underwent primary TJA from Jan 2016-Dec 2021. Ninety-day preoperative albumin, prealbumin, and TLC were collected. Outcome measures were PJI, WC, readmission, and return to operating room. Patients with confounding disease processes were excluded. Youden's Index (YI) and Receiver Operator Characteristic (ROC) curves were used to determine optimal cut-off points. Multivariable logistic regression was used to adjust for potential confounders including BMI, Age, & Charlson Comorbidity Index (CCI).

RESULTS: Overall, 1,575 patients were included in the study. GNRI2 had the largest area under the ROC curve (AUC = 0.6333; Optimal cut-off point = 86.8) in predicting post-operative adverse outcomes. Complication rates were significantly higher in the low GNRI2 group (</= 86.8). When controlled for BMI, CCI, and age, the odds of PJI, WC, readmission, and re-operation in patients with low GNRI were 6.61 (p = 0.005), 3.04 (p = 0.004), 2.25 (p = 0.005), and 2.75 (p = 0.024), respectively.

CONCLUSION: GNRI2 is a novel, and easy-to-calculate nutritional index, and an excellent predictor of post-operative complications following TJA. GNRI2 outperforms GNRI, MI and OPNI in predicting post-operative complications. Our results suggest that patients who fall below the 86.8 threshold should be carefully considered for nutritional optimization prior to surgery.

CLINICAL RELEVANCE: GNRI2 provides surgeons an easy to obtain and interpret nutritional index which correlates with post-operative complications.

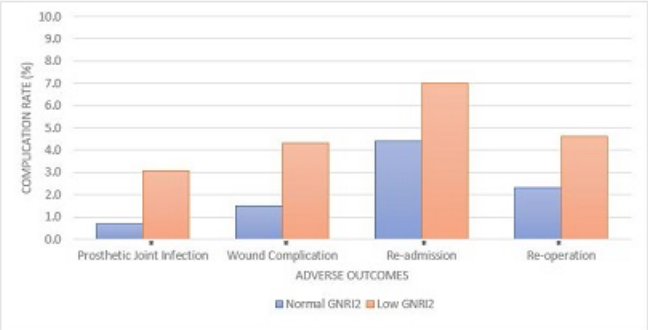

Figure 1. Incidence of each complication in patients with normal GNRI2 (n = 856) and low GNRI2 (n = 544). *Represents statistically significant differences.

Table 1. Area under the ROC curve for each biomarker and nutritional index in predicting adverse outcomes

	PJI	WC	Readmission	Return-OR	Any AE
Index	*AUC*	*AUC*	*AUC*	*AUC*	*AUC*
Albumin	0.5889	0.6392	0.6129	0.572	0.612
Prealbumin	0.5152	0.593	0.5374	0.4921	0.5733
TLC	0.6031	0.4947	0.5129	0.5102	0.5111
MI	0.5003	0.6176	0.5813	0.5376	0.6018
MMI	0.5008	0.618	0.5814	0.5377	0.6021
OPNI	0.5193	0.6127	0.5925	0.5485	0.6015
GNRI	0.5965	0.6344	**0.6123**	0.5673	0.6269
GNRI2	**0.6384**	**0.6514**	0.5652	**0.5795**	**0.6333**

AUC, area under the ROC curve; MI, Maastricht Index; MMI, Modified Maastricht Index; OPNI, Onodera's Prognostic Index; GNRI, Geriatric Nutritional Risk Index; PJI, Prosthetic Joint Infection; WC, Wound Complication
Bolded values indicate the largest AUCs for each outcome.

Table 2. Adjusted odds ratios for GNRI2, CCI, BMI and Age using multivariable logistic regression in predicting adverse outcomes

	PJI		WC		Re-admission		Re-operation	
	Adjusted OR [95% CI]	p-value	Adjusted OR [95% CI]	p-value	Adjusted OR [95% CI]	p-value	Adjusted OR [95% CI]	p-value
GNRI2	6.61 [1.80, 24.37]	0.005*	3.04 [1.19, 7.81]	0.021*	2.25 [1.14, 4.47]	0.020*	2.75 [1.15, 6.61]	0.024*
CCI	1.03 [0.79, 1.35]	0.821	1.28 [1.08, 1.52]	0.005*	1.19 [1.04, 1.37]	0.014*	1.19 [1.01, 1.43]	0.042*
BMI	0.96 [0.85, 1.07]	0.449	0.99 [0.91, 1.09]	0.969	0.96 [0.90, 1.03]	0.264	0.96 [0.89, 1.05]	0.364
Age	1.01 [0.98, 1.06]	0.367	1.01 [0.99, 1.05]	0.278	1.04 [1.02, 1.07]	0.001*	1.03 [0.99, 1.06]	0.052