Pre-operative nutritional risk screening identifies patients at increased risk of adverse events after surgery

Valerie Luks, MD, MHS; Yue Ren, MS; James Rowe, RN; Rachel Kelz, MD, MBA; Walter Witschey, PhD; James Lewis, MD, MSCE; Gary Wu, MD; Victoria M Gershuni, MD, MS, MTR

Penn Medicine
Department of Surgery

RATIONALE

Surgical intervention, while beneficial and often lifesaving, comes with inherent risks that include infection, impaired wound healing, prolonged hospitalization, and death. As surgeons it is therefore imperative that we identify modifiable risk factors and, when possible, intervene prior to operating.

Clinical malnutrition is recognized as a major cause of perioperative morbidity; it is estimated that between 24-65% of surgical patients admitted to the hospital are at nutritional risk. Additionally, it has been shown that the benefits of nutritional support can be realized in as little as 5-7 days of pre-operative treatment. And yet, **only 20% of hospitals in the United States have a formalized nutrition assessment to screen patients for malnutrition.**

Preoperative nutritional screening, therefore, has the potential to identify patients that would benefit most from low-cost but high impact interventions.

METHODS

Single-institution data from a tertiary academic center collected between 2018-2021 was extracted from the American College of Surgery National Surgical Quality and Improvement Program (ACS-NSQIP) database. Emergent cases were excluded.

Surgical Procedures Included:

- Colectomy
- Proctectomy
- Pancreatectomy
- Hepatectomy
- Ventral hernia repair

In addition to standard demographic, comorbidity, and outcomes data, the electronic medical records were additionally reviewed to identify available pre-operative markers of nutritional risk, results of the in-hospital malnutrition screening tool (MST) and clinical malnutrition evaluations performed by hospital dietitians.

RESULTS

Malnutrition Screening Tool (MST) - a brief screening tool that stratifies patients into low (MST=0), moderate (MST=1), or high (MST=2) risk of malnutrition based on recent unintended weight loss and decreased intake. A score >0 triggers a formal clinical malnutrition assessment.

Table 1. DEMOGRAPHICS

	All Patients
	n = 2692
Demographic Data	
Age (mean (SD))	58.6 (15.3)
Sex (% male)	49%
BMI (mean (SD))	28.8 (6.9)
Comorbid Conditions	
Diabetes (%)	16.9%
Active Smoker (%)	10.1%
COPD (%)	2.4%
Hypertension (%)	43.4%
Disseminated Cancer (%)	11.6%
Immunosuppressed	10.9%
Preoperative Lab Values	
Albumin (median [IQR])	4.1 [3.8, 4.3]
Hematocrit (median [IQR])	39 [35, 42]
WBC (median [IQR])	6.7 [5.3, 8.4]

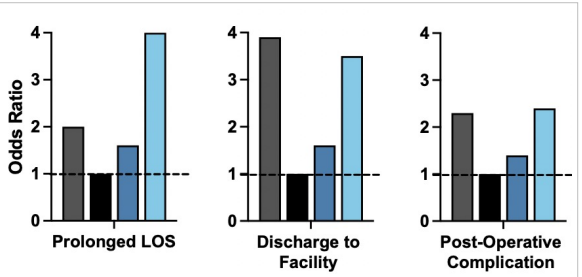


Figure 1. OUTCOMES

Compared to traditional markers of malnutrition (low albumin and low BMI), a positive nutrition screen was more predictive than BMI for adverse outcomes and a clinical malnutrition diagnosis was as predictive or more so than a low albumin for the same adverse outcomes.

Table 2. IN-HOSPITAL NUTRITION ASSESSMENT (Adjusted)

Total patients and divided by procedure type. 29.1% of patients had a positive nutrition screen, of which 60% went on to receive a diagnosis of malnutrition after clinical malnutrition assessment. 17% of the total cohort was diagnosed with malnutrition, but rates varied significantly by procedure.

	All Patients	Pancreatectomy	Hepatectomy	VHR	Colectomy	Proctectomy
	n = 2692	n = 435	n = 364	n = 781	n = 907	n = 205
MST Score > 0 (% Total Cohort)						
	29.1%	44.8%	21.9%	16.9%	34.4%	27.3%
Clinical Malnutrition (% Positive MST (>0))						
	59.5%	73.3%	43.8%	28.0%	61.2%	67.8%
Clinical Malnutrition (% Total Cohort)						
	17.3%	32.9%	9.5%	4.7%	21.1%	18.5%

RESULTS

Our patient cohort has a mean BMI of 28.8 (Table 1). Notably, the most common screening tools used clinically (MUST, NRS 2002, MNA-SF) would only flag BMI < 23 as abnormal, missing many patients and highlighting the need for alternative markers.

Similarly, the median albumin in the patient cohort is 4.1 and only 42% of patients had a preoperative albumin < 3.8. These patients would not be identified as malnourished when assessing traditional "nutrition" markers.

Almost one third of all patients had a positive MST screen (Figure 2) and two thirds of those patients were diagnosed with clinical malnutrition. Patients undergoing pancreatectomy or colorectal resections had the highest incidence of malnutrition.

Compared to traditional markers of malnutrition, MST > 0 was more predictive than BMI for prolonged LOS, post-operative complications, and need for post-operative rehabilitation (Figure 1). Further, a clinical malnutrition diagnosis increased the risk of adverse outcomes as much as, or more so than, low albumin.

CONCLUSIONS

Malnutrition is under recognized in the surgical population. Traditional markers of malnutrition, including BMI and low albumin, are not adequate for screening patients pre-operatively.

Clinical malnutrition is associated with 3-4x increased risk of adverse outcomes, highlighting the importance of preoperative screening and need for a more sensitive biomarker.

Different surgical procedures place higher stress on the patient and require more nutritional reserve to aid in recovery. Likewise, baseline nutritional risk varies between patient populations. Next steps will include examining the differences in these patient cohorts to identify those at greatest risk.

Questions or Comments: Victoria.Gershuni@pennmedicine.upenn.edu