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Malnutrition and Adverse Outcomes After Surgery for Head and Neck Cancer

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Supplemental content

IMPORTANCE Patients with head and neck cancer (HNC) have an increased risk of malnutrition, partly due to disease location and treatment sequelae. Although malnutrition is associated with adverse outcomes, there is little data on the extent of outcomes and the sociodemographic factors associated with malnutrition in patients with HNC.

OBJECTIVES To investigate the association of race, ethnicity, and payer type with perioperative malnutrition in patients undergoing HNC surgery and how malnutrition affects clinical outcomes.

DESIGN, SETTING, AND PARTICIPANTS This retrospective cohort study used data from the Premier Healthcare Database to assess adult patients who had undergone HNC surgery from January 2008 to June 2020 at 482 hospitals across the US. Diagnosis and procedure codes were used to identify a subset of patients with perioperative malnutrition. Patient characteristics, payer types, and hospital outcomes were then compared to find associations among race, ethnicity, payer type, malnutrition, and clinical outcomes using multivariable logistic regression models. Analyses were performed from August 2022 to January 2023.

EXPOSURE(S) Race, ethnicity, and payer type for primary outcome, and perioperative malnutrition status, race, ethnicity, and payer type for secondary outcomes.

MAIN OUTCOME(S) AND MEASURE(S) Perioperative malnutrition status. Secondary outcomes were discharge to home after surgery, hospital length of stay (LOS), total cost, and postoperative pulmonary complications (PPCs).

RESULTS The study population comprised 13 895 adult patients who had undergone HNC surgery during the study period; they had a mean (SD) age of 63.4 (12.1) years; 9425 male (67.8%) patients; 968 Black (7.0%), 10 698 White (77.0%), and 2229 (16.0%) individuals of other races; and 887 Hispanic (6.4%) and 13 008 non-Hispanic (93.6%) individuals. Among the total sample, there were 3136 patients (22.6%) diagnosed with perioperative malnutrition. Compared with White patients and patients with private health insurance, the odds of malnutrition were higher for non-Hispanic Black patients (adjusted odds ratio [aOR], 1.31; 95% CI, 1.11-1.56), Medicaid-insured patients (aOR, 1.68; 95% CI, 1.46-1.95), and Medicare-insured patients (aOR, 1.24; 95% CI, 1.10-1.73). Black patients and patients insured by Medicaid had increased LOS, costs, and PPCs, and lower rates of discharge to home. Malnutrition was independently associated with increased LOS (β, 5.20 additional days; 95% CI, 4.83-5.64), higher costs (β, $15 722 more cost; 95% CI, $14 301-$17 143), increased odds of PPCs (aOR, 2.04; 95% CI, 1.83-2.23), and lower odds of discharge to home (aOR, 0.34; 95% CI, 0.31-0.38). No independent association between malnutrition and mortality was observed.

CONCLUSIONS AND RELEVANCE This retrospective cohort study found that 1 in 5 patients undergoing HNC surgery were malnourished. Malnourishment disproportionately affected Black patients and patients with Medicaid, and contributed to longer hospital stays, higher costs, and more postoperative complications.

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There are more than 500 000 survivors of head and neck cancer (HNC) and approximately 66 000 new cases yearly in the US.[1,2] These patients have an elevated risk of malnutrition because of a combination of lifestyle choices, social determinants, disease location, and treatment-associated toxic effects and sequalae.[3] Furthermore, 1 of 3 patients hospitalized with cancer is malnourished or at risk for malnutrition, with estimates as high as 1 of 2 patients with HNC given the unique challenges that the tumor location presents.[4,5]

Until recently, malnutrition had been poorly defined, with disagreement on factors contributing to diagnosis.[6,7] The Global Leadership Initiative on Malnutrition (GLIM) consensus states that a malnutrition diagnosis should include both a phenotypic (eg, weight loss, body mass index [BMI, weight in kilograms divided by height in meters squared]) and etiologic (eg, disease process, reduced food intake) factors.[8] In this study, we included these factors by using diagnosis and procedures codes from the *International Classification of Diseases, Ninth Revision (ICD-9)* for both malnutrition and its associated phenotypic responses (eg, cachexia, low BMI, weight loss) (eAppendices in Supplement 1).

Unfortunately, malnutrition is an underdiagnosed and undertreated problem. As few as 20% of patients who are malnourished and are admitted to a hospital (for any reason) are diagnosed with malnutrition, and few receive enteral or parenteral nutrition during their stay.[9] However, malnutrition in the perioperative setting is a known modifiable risk factor associated with higher hospital costs, increased lengths of stay, and higher rates of postoperative complications.[10,11] Furthermore, evidence indicates that racial minority groups present with higher overall rates of malnourishment compared with non-Hispanic White patients.[9]

The preponderance of literature on surgery has focused on the general surgery population; however, among the population of patients with HNC, rates of malnutrition and its effects on outcomes are underdescribed.[5,9,12-18] The literature focused on patients with HNC demonstrates that in addition to the malnourishing effects of cancer, HNC tumor location produces dysphagia, placing the patients at higher risk of reduced oral and caloric intake.[19] This study aimed to investigate the associations of race, ethnicity, and payer type with perioperative malnutrition among patients undergoing surgery for HNC, and to identify possible associations of perioperative malnutrition with race, ethnicity, payer type, and clinical outcomes.

Key Points

Question Are race, ethnicity, and payer type associated with perioperative malnutrition status in patients with head and neck cancer, and is malnutrition associated with hospital and postoperative outcomes?

Findings This retrospective cohort study of 13 895 patients who underwent head and neck cancer surgery found that 23% were diagnosed with perioperative malnutrition, and that non-Hispanic Black patients and Medicaid beneficiaries were more likely to be malnourished. Malnutrition was associated with longer hospital stays, higher hospital costs, more postoperative pulmonary complications, and lower odds of discharge to home.

Meaning These findings indicate that malnourishment disproportionately affects Black and Medicaid-insured patients, and is associated with increased length of hospital stay, cost, and postoperative complications.

Methods

This retrospective cohort study was reviewed and approved by the institutional review board of Duke University. Informed consent was waived because only deidentified patient data were used. We followed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Data Source

We used data from the Premier Healthcare Database (PHD), a nationwide administrative claims database. The PHD includes patient demographic and hospital information, *ICD-9* and *-10* diagnosis and procedure codes, and billing information, which together allowed us to form a detailed date-specific billing record for each patient during the hospital stay. The PHD represents approximately 20% of all hospital discharges per year in the US.

Study Population

This study used deidentified hospital-based discharge data of inpatient and outpatient medical visits and *ICD-9* and *-10* diagnostic and procedure codes to identify participants. Adult patients (age, ≥18 years) who had both a diagnosis of HNC and had undergone 1 of the selected representative HNC surgical procedures during a hospitalization in 2008 to 2020 were included. Additional detailed information on patient selection and surgical procedures is available in the eAppendices in Supplement 1.

Exposure

Race (Black, White, or “other” race [due to small sample size, included Asian, other, or unknown race]), ethnicity (Hispanic or non-Hispanic), and payer type (Medicaid, Medicare, managed care, or other care) were used for the primary outcome. Note that race and ethnicity information is compiled by the PHD from multiple sources including electronic medical records and claims databases. The perioperative malnutrition status, race, ethnicity, and payer type were used for the secondary outcomes (eAppendices in Supplement 1).

Outcomes

The primary outcome measure was perioperative malnutrition status. The secondary outcome measures were discharge to home after surgery, hospital length of stay (LOS), total cost, and postoperative pulmonary complications (PPCs). The PPCs were defined as a composite of respiratory failure, pneumonia, reintubation, and pulmonary edema,[20] using *ICD* codes.

Other outcomes included in-hospital mortality, 30-day readmission, antibiotic usage (identified by hospital charge codes), noninvasive ventilation, and invasive mechanical ventilation.[21] Ventilation type was identified using codes from *ICD-9* and *-10* or hospital charge codes.

Covariates

Covariates included in the models were age; sex; marital status; van Walraven score (calculated using the 29 Elixhauser comorbidity index categories)[22]; radiation treatment (*ICD-10* code, Z92.3); hospital size (number of beds); teaching status (yes/no); location (rural/urban); and US geographic region.

Statistical Analysis

Data were presented as mean (SD) for continuous variables or frequency, and percentages were used for categorical variables, as appropriate. Either the χ^2 or Fisher exact test was used for nominal variables, and unpaired *t* tests were used to compare continuous variables between malnutrition groups. For the primary outcome, the multivariable logistic regression model was fit to evaluate the association of race, ethnicity, and payer type with malnutrition, adjusting for covariates. For the second outcomes, the multilevel multivariable logistic regression models were fit to evaluate the associations among malnutrition, race, ethnicity, and payer type with hospital outcomes including discharge to home and PPCs. The multilevel multivariable linear regression models were fit for length of stay and total cost. Hospital size was modeled as a random effect in the model. Model results were reported as an adjusted odds ratio (aOR) or an estimate coefficient (β) with 95% CIs. Statistical tests were 2-tailed, and a type I error rate of $P = .05$ was set as the threshold for statistical significance. Analyses were conducted using SAS, version 9.4 (SAS Institute). Data analyses were performed from August 2022 to January 2023).

Results

A total of 13 895 patients (mean [SD] age, 63.4 [12.1] years; 9425 male [67.8%] and 4470 female [32.2%] individuals) were identified with both the included diagnosis and an HCN surgical procedure between 2008 and 2020 across 482 hospitals (**Table 1**); 19 patients who were younger than 18 years old were excluded from the analysis. The study population was composed of 968 Black individuals (7.0%), 10 698 White individuals (77.0%), and 2229 individuals of other races (16.0%); 887 were Hispanic individuals (6.4%) and 13 008 were non-Hispanic individuals (93.6%). Due to small sample sizes, patients of Asian, other, or unknown race or ethnicity were classified by the authors as other. Additional patient characteristics considered were a history of prior radiation, marital status, and payer status. Of the total study population analyzed (n = 13 895), 3136 patients (22.6%) were malnourished.

For the primary study outcome, we found that the odds of malnutrition were higher among Black patients (aOR, 1.31; 95% CI, 1.11-1.56) compared with White patients (**Table 2**). Medicaid (aOR, 1.68; 95% CI, 1.46-1.95) and Medicare (aOR, 1.24; 95% CI, 1.09-1.42) insurance were associated with a higher malnutrition rate than those with managed care (Table 2).

For the second outcomes, malnutrition was associated with decreased odds of discharge to home (aOR, 0.34; 95% CI, 0.21-0.38), longer LOS (β, 5.23 additional days; 95% CI, 4.83-5.64), and higher cost (β, $15 722 additional cost; 95% CI, $14 301-$17 143) compared with those patients who did not have malnutrition. Black patients and those insured by Medicaid or Medicare were also associated with increased LOS, lower rates of discharge to home, and higher hospitalization costs (**Figure**). Additionally, malnutrition was associated with higher odds of a PPC (aOR, 2.04; 95% CI, 1.83-2.28).

Discussion

The purpose of this study was to assess how sociodemographic factors affect perioperative malnutrition status, and how malnutrition affects adverse hospital and postoperative outcomes. The study findings offer a novel contribution given that, to our knowledge, this is the first HNC study to use the PHD. We found disparate odds of being malnourished perioperatively among Black patients with HNC and those who were publicly insured. Additionally, our analyses showed that malnutrition and sociodemographic factors substantially affected several outcomes including LOS, discharge destination, hospital cost, and the odds of experiencing a PPC.

A pinnacle challenge in studying malnutrition lies in defining it. The GLIM compiled prior criteria to standardize the diagnosis of malnutrition and recommends that malnutrition assessment criteria be divided into phenotypic (eg, weight loss, BMI) and etiologic (eg, disease process, reduced food intake) criteria. A combination of phenotypic and etiologic factors must be present to accurately diagnose malnutrition.[8] Notably, GLIM states that BMI is not always accurate when diagnosing malnutrition. For example, a patient who is classified as overweight or normal on the BMI range may also be malnourished. Similarly, loss of muscle density and strength could be attributed to age-related sarcopenia vs malnutrition, lending credence to requirement of both phenotypic and etiologic factors for diagnosis.[8]

In our study, we had an etiologic factor for diagnosis of malnutrition (the HNC). Malnutrition has several *ICD-10* codes in addition to E40-46. To capture patients who may have been malnourished without a recorded diagnosis, we used *ICD-10* codes for phenotypic characteristics, including abnormal weight loss (R63.4), underweight (R63.6), cachexia (R64.0), and BMI less than 19.9 (Z68.1) (eAppendices in Supplement 1).

The statistical analysis demonstrated that the prevalence of malnutrition among the study population was 22.6%. A recent study by Williams et al,[23] which also used data from the PHD, found that the prevalence of malnutrition within a population of nearly 3 million surgical encounters was approximately 4.3%. There are likely 2 major reasons for the large disparity between our study cohort and the surgical population that Williams et al[23] evaluated. First, their study was not specific to patients undergoing oncologic surgery. Second, pa-

Table 1. Patient Characteristics Stratified by Nutritional Status

Characteristic	Patient No. (%)		
		Malnutrition	
	Total (N = 13 895)	Yes (n = 3136)	No (n = 10 759)
Patient characteristics			
Age, mean (SD), y	63.4 (12.1)	63.6 (11.2)	63.4 (12.3)
Sex			
Female	4470 (32.2)	975 (31.1)	3495 (32.5)
Male	9425 (67.8)	2161 (68.9)	7264 (67.5)
Race			
Black	968 (7.0)	326 (10.4)	642 (6)
White	10 698 (77.0)	2350 (74.9)	8348 (77.6)
Other[a]	2229 (16.0)	460 (14.7)	1769 (16.4)
Ethnicity			
Hispanic	887 (6.38)	194 (6.2)	693 (6.4)
Non-Hispanic/unknown	13 008 (93.6)	2942 (93.8)	10 066 (93.6)
Payer category			
Managed care	4693 (33.8)	804 (25.6)	3889 (36.2)
Medicaid	1876 (13.5)	615 (19.6)	1261 (11.7)
Medicare	6829 (49.2)	1599 (51.0)	5230 (48.6)
Other[a]	497 (3.6)	118 (3.8)	379 (3.5)
Van Walraven score, mean (SD)	8.0 (7.2)	13.3 (7.7)	6.5 (6.3)
Previous RT	1957 (14.1)	626 (20.0)	1331 (12.4)
Marital status	6351 (45.7)	1247 (39.8)	5104 (47.4)
Hospital characteristic			
Teaching status			
No	2707 (19.5)	478 (15.2)	2229 (20.7)
Yes	11 188 (80.5)	2658 (84.8)	8530 (79.3)
Geographic setting			
Rural	892 (6.4)	187 (6.0)	705 (6.6)
Urban	13 003 (93.6)	2949 (94.0)	10 054 (93.4)
Hospital size, beds			
<300	1465 (10.5)	250 (8.0)	1215 (11.3)
300-399	1305 (9.4)	227 (7.2)	1078 (10)
400-499	1324 (9.5)	309 (9.9)	1015 (9.4)
≥500	9801 (70.5)	2350 (74.9)	7451 (69.2)
US region			
Midwest	2793 (20.1)	782 (24.9)	2011 (18.7)
Northeast	3334 (24.0)	769 (24.5)	2565 (23.8)
South	5914 (42.6)	1193 (38.0)	4721 (43.9)
West	1854 (13.3)	392 (12.5)	1462 (13.6)
Outcomes and relevant factors			
Length of stay, mean (SD), d	8.3 (10.3)	14.2 (13.4)	6.6 (8.4)
Total cost, mean (SD) $	34 002.3 (36 500.2)	52 504.7 (46 117.3)	28 609.3 (31 176.4)
Death	124 (0.9)	53 (1.7)	71 (0.7)
Readmission <30 d	6232 (44.9)	1415 (45.1)	4817 (44.8
PPC	2946 (21.2)	1165 (37.2)	1781 (16.6)
IMV	2959 (21.3)	1061 (33.8)	1898 (17.6)
NIV	402 (2.9)	166 (5.3)	236 (2.2)
Antibiotics total	8042 (57.9)	2272 (72.5)	5770 (53.6)

Abbreviations: IMV, invasive mechanical ventilation, NIV, noninvasive ventilation; PPC, postoperative pulmonary complications; RT, radiation therapy.

[a] Due to small sample sizes, Asian, other, and unknown race or ethnicity were classified by the authors as other.

tients with HNC face challenges due to tumor location and treatment sequelae. Dysphagia is a common adverse effect that may reduce oral and caloric intake.[19]

When assessing the role of sociodemographic variables, Black patients and patients with Medicaid and Medicare insurance were significantly more likely to be malnourished than

Table 2. Adjusted Odds Ratio (aOR) Estimates for Malnutrition, by Race, Payer, and Ethnicity

Variable	Malnutrition	aOR (95% CI)[a]
Race	Black compared with White	1.31 (1.11-1.56)
	Other[b] compared with White	0.94 (0.80-1.09)
Payer	Medicaid compared with private	1.68 (1.46-1.95)
	Medicare compared with private	1.24 (1.09-1.42)
	Other[b] compared with private	1.35 (1.05-1.74)
Hispanic	Hispanic compared with non-Hispanic	0.95 (0.75-1.20)

[a] Adjusted for age, sex, marital status, van Walraven score, radiation treatment, hospital size (number of beds), teaching status, location, and geographic regions.

[b] Due to small sample sizes, Asian, other, and unknown race or ethnicity were classified by the authors as other.

their White and privately insured counterparts. These findings provide further insights that are consistent with the robust body of evidence reporting on differential health outcomes stemming from sociodemographic factors,[24-29] specifically in patients with HNC.[30,31]

When we assessed how malnutrition status affected overall patient outcomes, we observed that although age and van Walraven score[22] were statistically significantly associated with risk of in-hospital mortality, there were no difference associated with malnourishment. This was partly due to the low rate of in-hospital mortality in this study population (124 deaths [0.89%] among 13 895 patients). Therefore, a substantially larger sample size would be required to detect differences between groups.

When considering the results of the multivariable regression models, there were pronounced differences in cost, LOS, and discharge destinations. Malnourished patients, Black patients, and publicly insured patients (those with Medicare or Medicaid) had longer LOS than their counterparts (Figure). The most significant difference was seen in the patients with malnutrition, whose hospital stays were an average of 5 days longer. This is consistent with the findings of several other studies that have found similar effects of malnutrition on LOS in the general adult patient[11,32,33] and postsurgical cancer populations,[34] including in those with HNC.[35,36] Although underlying medical conditions tend to have a large effect on LOS, malnutrition has been shown to retain its effect on LOS and other hospitalization outcomes, even after matching for diagnosis-related groups.[32]

Our study analysis also indicated that malnourished patients, Black patients, and publicly insured patients were more likely to have higher total hospitalization costs (Figure). Being malnourished increased hospitalization costs by more than $15 700. Hospitalizations for Medicaid-insured patients cost $6500 more than for privately insured patients. Moreover, the study findings showed that hospitalization costs for Black patients were $3373 more than for White patients. These cost disparities are substantial, especially when considering they were present even after adjusting for potential confounders (eg, LOS).

Lastly, we assessed the discharge destination of patients after HCN surgery. We found that Black, malnourished, and publicly insured patients were much less likely to be discharged home vs a nursing facility. Postacute care has become increasingly common during the past several decades, with Medicare spending more than $60 billion on postacute care in 2015, and costs continuing to increase rapidly.[37,38] We found that the study patients who were malnourished were nearly 70% less likely to be discharged to home. Black patients were nearly 40% less likely than White patients to be discharged to home. Medicare- and Medicaid-insured patients were approximately 30% less likely to be discharged to home. Put another way, these patient groups were more likely to be discharged to a skilled nursing facility (SNF) or long-term acute care facilities. The choice of discharge destination after hospitalization is complex; a multitude of factors, such as patient preferences, costs, and outcomes must be considered. A recent study[38] of patients who were hospitalized (not necessarily for surgery) and Medicare insured found that those discharged to SNF had lower rates of re-admission within 30 days but no significant differences in 30-day mortality or functional outcomes. These authors also found that Medicare spending was significantly lower among patients discharged to home.

Although there is less literature in the field of oncologic surgery, the questions we sought to answer have been investigated in the fields of vascular, neuro, general, and orthopedic surgery.[39] Prior studies have shown that advanced age, frailty, and underlying comorbidities are associated with discharge destination.[39-42] These authors note similar disparities in the rates of discharge to home vs SNF among patients and postulate a number of potential contributing factors that include clinicians' desire to protect—by promoting institutional postacute care—the patients they perceive to be most vulnerable to adverse discharge outcomes.[43] Within the head and neck surgery literature, Sweeny et al[44] recently reported that older age, undergoing longer surgical procedures (>10 hours), and having postoperative complications were all associated with discharge to SNF as opposed to discharge to home. They found no correlation with anatomic site, free-flap donor selection, or free-flap survival. These findings are consistent with those of our study (although we did not assess surgery length); however, the variable of nutritional status was not available in their analysis.

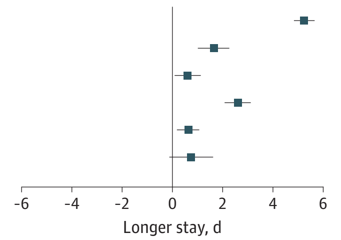
Limitations

A limitation of this study was that we assessed only a single, index surgical encounter per patient. Given that the journey to the operating room usually occurs for weeks and months, it is possible that there may have been diagnoses of malnutrition that this study did not capture, thus underestimating the prevalence of malnutrition. Second, although the PHD provided a robust inpatient sample representing a large surgical population, the study's generalizability may be limited. Furthermore, the PHD architecture is limited because it is populated by charge capture information, and thus our inquiries were limited to what could be captured by *ICD* codes. The *ICD* codes for unspecified malnutrition, E43 or E46, require that observed weight be 3 or more SDs below the mean for that population. The GLIM criteria are more precise, considering

Figure. Estimated Effects of Malnutrition on Length of Stay, Total Hospitalization Cost, and Discharge to Home

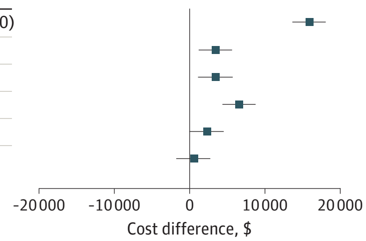
A Length of stay

Effect	Estimate (β) (95% CI)
Malnutrition yes compared with no	5.23 (4.83 to 5.64)
Black compared with White race	1.63 (0.99 to 2.26)
Other compared with White race	0.59 (0.075 to 1.11)
Medicaid compared with managed care	2.61 (2.09 to 3.13)
Medicare compared with managed care	0.62 (0.18 to 1.05)
Other compared with managed care	0.73 (−0.14 to 1.61)



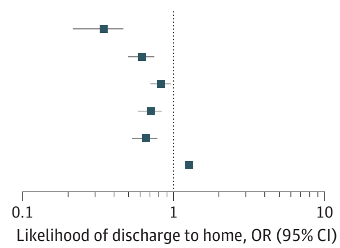
B Total hospitalization cost

Effect	Estimate (β) (95% CI)
Malnutrition yes compared with no	15 722.00 (14 301.00 to 17 143.00)
Black compared with White race	3372.63 (1178.69 to 5566.58)
Other compared with White race	3355.63 (1534.33 to 5176.94)
Medicaid compared with managed care	6499.00 (4695.56 to 8302.44)
Medicare compared with managed care	2268.37 (751.55 to 3785.19)
Other compared with managed care	477.70 (−2566.42 to 3521.82)



C Discharge to home

Effect	aOR[a] (95% CI)
Malnutrition yes compared with no	0.34 (0.31-0.38)
Black compared with White race	0.62 (0.53-0.73)
Other compared with White race	0.83 (0.73-0.95)
Medicaid compared with managed care	0.71 (0.62-0.81)
Medicare compared with managed care	0.66 (0.59-0.74)
Other compared with managed care	1.27 (1.01-1.60)



[a] Adjusted for age, sex, marital status, van Walraven score, radiation treatment, hospital size (number of beds), teaching status, location, and US geographic region. Only Black patients and White patients were compared because sample sizes were too small for additional comparisons. Other included Asian, other race or ethnicity, and unknown. aOR, adjusted odds ratio; OR, odds ratio.

the percentage of weight loss over time and the presence of chronic disease or reduced food intake, among other factors.[8] However, *ICD* codes cannot capture a patient's degree of malnutrition, nor are the codes always used accurately by clinicians.[9]

Another limitation regarding the use of *ICD* codes within the PHD was that the temporal relationship between the diagnosis of malnutrition and the date of surgery could not be established. Perioperative weight loss is common after major surgery, and diagnoses placed at the end of an inpatient stay may be secondary to the surgery rather than the cancer. The more clinically relevant diagnosis should come before surgery, but it was not possible to distinguish the time frame with this study design. The *ICD* code limitations have likely led to an underestimation of the true prevalence of malnutrition in the study population. A prospective, longitudinal study is needed to accurately capture malnutrition within preoperative patients with HNC and to stratify severity of malnutrition. Our study design could not assess whether degrees of malnutrition affected patient outcomes. Lastly, this study was retrospective, and thus has inherent limitations related to its design.

Conclusions

The findings of this retrospective cohort study indicate that malnutrition is unequally distributed among patients, by race and payer status. Furthermore, as opposed to malnutrition secondary to other causes or in the general surgical population, patients with HNC face a unique combination of challenges—ie, dysphagia, odynophagia, and treatment-related toxic effects associated with chemotherapy, radiation therapy, and surgery. These study findings show significant disparities in hospitalization costs, LOS, and discharge destination for patients who are malnourished and are undergoing HNC surgery. These findings also highlight major clinical and nonclinical differences that exist within index surgical hospitalization.

Most importantly, early identification and treatment of malnutrition are vital for all patients, especially those undergoing HNC surgery. We invite further investigation so that clinicians caring for patients with HNC can continue to improve their outcomes.

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