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Comparison of the prevalence of malnutrition diagnosis in head and neck, gastrointestinal and lung cancer patients by three classification methods

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Abstract

Background—Malnutrition is prevalent among patients within certain cancer types. There is lack of universal standard of care for nutrition screening, lack of agreement on an operational definition and on validity of malnutrition indicators.

Objective—In a secondary data analysis, we investigated prevalence of malnutrition diagnosis by three classification methods using data from medical records of a National Cancer Institute (NCI)-designated comprehensive cancer center.

Interventions/Methods—Records of 227 patients hospitalized during 1998 with head and neck, gastrointestinal or lung cancer were reviewed for malnutrition based on three methods: 1) physician diagnosed malnutrition related ICD-9 codes; 2) in-hospital nutritional assessment summary conducted by Registered Dietitians; and 3) body mass index (BMI). For patients with multiple admissions, only data from the first hospitalization was included.

Results—Prevalence of malnutrition diagnosis ranged from 8.8% based on BMI to approximately 26% of all cases based on dietitian assessment. Kappa coefficients between any methods indicated a weak (kappa=0.23, BMI and Dietitians and kappa=0.28, Dietitians and Physicians) to fair strength of agreement (kappa=0.38, BMI and Physicians).

Conclusions—Available methods to identify patients with malnutrition in an NCI designated comprehensive cancer center resulted in varied prevalence of malnutrition diagnosis. Universal standard of care for nutrition screening that utilizes validated tools is needed.

Implications for Practice—The Joint Commission on the Accreditation of Healthcare Organizations requires nutritional screening of patients within 24 hours of admission. For this purpose, implementation of a validated tool that can be used by various healthcare practitioners, including nurses, needs to be considered.

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INTRODUCTION

Malnutrition has been shown to be a common problem in hospitalized patients for more than 30 years [1–5] and is highly prevalent among head and neck, lung and gastrointestinal cancer patients[6–9]. There is no consistent standard of care for nutrition screening in inpatient or outpatient oncology settings to date. Compounding this issue is the lack of universal agreement on the operational definition of malnutrition and on the validity of the assessment indicators [10]. Approximately 20% to 80% of cancer patients become malnourished during their clinical course [6, 11–14]. Currently, most of the nutrition screening in oncology settings is completed by nursing professionals, but not all of the methods used for this purpose have been validated [15].

Examinations of malnutrition in patient populations have used weight loss as the primary indicator of malnutrition - specifically, involuntary weight loss of greater than 10% [16]. Other indicators used in the assessment of malnutrition include serum albumin and body mass index (BMI) [10, 17, 18]. Physicians utilize the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) which includes major diagnoses of malnutrition [19]. The malnutrition-related diagnoses, including cachexia, coded by the ICD-9-CM are displayed in Figure 1. As Swails et al. stated in 1996, these descriptions were based on primary malnutrition in the pediatric populations of less-developed countries, and therefore should not be used as a standard reference for hospitalized adults in industrialized populations [20]. A new coding system, the ICD-10 has been in place in countries other than the United States since 1994, but accurate, universally-accepted and clinically relevant classifications of malnutrition are still lacking [21].

To date the condition of malnutrition remains under diagnosed in hospitalized patients [5–9]. This is due to several factors including a lack of a universal standard of care for malnutrition screening, lack of agreement on the operational definition of malnutrition, and lack of the use of validated screening methods. Nursing professionals are usually responsible for nutrition screening in the oncology setting. They cannot work effectively with nutrition professionals to manage malnutrition if it is not identified. Additionally, due to the inconsistency of methods used for nutrition screening in oncology settings, the incidence of malnutrition cannot be determined accurately within cancer centers. The impact of this dilemma therefore remains understated and healthcare resources are not made available to manage this issue.

The primary framework guiding this research is consistent with the framework that guided the parent study and is the quality health outcomes model developed by the American Academy of Nursing Expert Panel on Quality of Health [22]. This model proposes that interventions affect and are affected by characteristics of the system and the client to produce outcomes. The components of the quality health outcomes model are reciprocal, that is there are feedback relationships between components. Specifically for this study, the outcome is the prevalence of malnutrition diagnosis in certain cancer populations. Using data from medical records of a National Cancer Institute (NCI)-designated comprehensive cancer center, the prevalence of malnutrition diagnosis was investigated using three available classification methods. Hospitalization records of 227 patients hospitalized during a one year period in 1998 with either head and neck, gastrointestinal or lung cancer were examined. The aims of this secondary data analysis were to (1) compare prevalence of malnutrition diagnosis as identified by three methods and (2) determine agreement of clinical judgment between physicians, dietitians and BMI criteria for the identification of malnutrition in these patients.

METHODS

Study Design

Retrospective data were obtained from hospital medical records of an NCI-designated comprehensive cancer center by trained data extractors for this secondary analysis. In the parent study, three large data sets of cancer patients were analyzed for the impact of malnutrition on health care costs. All medical records of adult persons hospitalized during 1998 that had a diagnosis of lung, gastrointestinal or head and neck cancer were selected. Patient data including diagnosis and stage of cancer and treatment type were collected. The original population contained 393 patients. After the selection criteria were applied, 227 patients were eligible for this study. In the case that a patient had multiple hospitalizations (n=45), the first hospitalization meeting the inclusion criteria was used for analysis. The inclusion criteria for this study required that the medical record for each hospitalization contain, at a minimum, a completed nutrition assessment with documented height, weight before or at the day of the nutrition assessment and serum albumin values. The 166 patient records eliminated had one or more of these indicators missing. The most frequent missing indicator was serum albumin. Exclusion criteria included patients under the age of 18 and patients without a diagnosis of lung, gastrointestinal or head and neck cancer.

Measures of Malnutrition

Three available methods to identify malnutrition among patients in this comprehensive cancer center were selected for comparison: ICD-9 malnutrition codes determined by physicians, in-hospital nutritional assessment summaries by staff Registered Dietitians, and body mass index (BMI) of patients.

ICD-9 Codes—For each discharge, the responsible physician documented all of the primary and secondary discharge diagnoses in the medical record and these were assigned ICD-9 codes by staff coders. If ICD-9 codes ranging from 260.0 to 263.9 or code 799.4 were found, the case was designated as malnourished (see Figure 1). Coding for cachexia (799.4) was included in this study, as cachexia and malnutrition share clinical components such as abnormal BMI values.

For quite a long period of time there has been a lack of consensus regarding the exact meaning of malnutrition. In 2008, an operational definition was published stating that malnutrition is “a subacute or chronic state of nutrition in which a combination of varying degrees of over-or undernutrition and inflammatory activity has led to a change in body composition and diminished function” [23]. Prolonged malnutrition may result in cachexia [10]. Cachexia involves an increase in tissue catabolism, impaired anabolism along with the release of tumor derived catabolic factors, neuroendocrine dysfunction and the presence of inflammatory cytokines [24, 25]. Cachexia is not overturned by nutrition support alone and requires the use of anti-cachexia agents to affect the proteolysis, lipolysis, anorexia, inappropriate increased resting energy expenditure and the acute phase response [26]. Since some of the criteria used to determine malnutrition might also be used for cachexia, this endpoint was included in the investigation.

In-Hospital Nutritional Assessment Summaries—It was a policy of the NCI-designated comprehensive cancer care center that a nutrition assessment be completed by a Registered Dietitian and included in the medical record of every inpatient. Staff dietitians classified the nutritional status of patients as “adequate”, “at risk” or “compromised” based on institutional criteria. Criteria for establishing nutritional status of patients included the consideration of clinical ranges for indicators such as percentage of ideal body weight, body mass index (BMI), serum albumin values and clinical symptoms such as mucositis and

dysphagia. Dietitians used clinical judgment in reviewing these indicators and determined nutritional status. Cases identified as "compromised" were designated as malnourished for this investigation.

Body Mass Index—Weight and height for each patient was extracted from the medical record. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Values below 18.5 were interpreted as malnourished as described by Heymsfield et al. [16].

Procedures

Three nursing students and one clinical dietetic intern were trained to extract data from the medical records. After several practice sessions, interrater reliability was tested and 90% agreement was achieved. Interrater agreement was also tested midway through data collection with 90% agreement. The medical records staff of the comprehensive cancer center identified all adult patients with cancer diagnoses of head and neck, gastrointestinal and lung. Data were entered into the database and entries were verified by other trained staff. The study was approved by the University at Buffalo Health Science IRB after receiving administrative approval from the designated comprehensive center, an affiliate of the University at Buffalo

Statistical Analyses

The Statistical Package for Social Scientists (SPSS, version 11) was used for all statistical analyses. Descriptive analyses examining prevalence, means and standard deviations for the height, weight, BMI and serum albumin measurements of the population were used to summarize the data. The percent agreement for the prevalence of malnutrition using the different diagnostic methods was compared for all cases combined using the kappa statistic. The kappa statistic describes the amount of agreement that exceeds the agreement that would be expected by chance. The kappa statistic ranges from 0 (no additional agreement) to 1 (perfect agreement).

RESULTS

Patient Characteristics and Description of Nutritional Status

Of the 227 patients that met the selection criteria, 56% were males and 44% were females. The primary cancer diagnoses were as follows: 46% gastrointestinal, 39% lung and 15% head and neck. Approximately 20% had *in situ* or local stage of disease, 36% had regional stage of disease (in or near primary organ site), 40% had metastatic disease and stage was unknown for 4%. A summary of indicators of nutritional status can be found in Table 1. The average BMI and albumin was 25.1 kg/m^2 (± 5.7) and 3.2 g/dl (± 0.6) respectively.

Comparison of Prevalence of Malnutrition Diagnosis by Classification Methods

Using the different classification methods, the prevalence of malnutrition diagnosis for all cases combined ranged from 9.3% for ICD-codes to approximately 26% based on dietitian assessments. Among patients identified with malnutrition by physicians using ICD-9 codes, 6 were coded with 263.9 (unspecified protein-calorie malnutrition), 2 each were coded with 261.0 (nutritional marasmus) and 263.1 (malnutrition of mild degree) and one each was coded with 262.0 (other severe protein-calorie malnutrition) and 263.0 (malnutrition of moderate degree). Another 11 patients were coded with 799.4 (cachexia). One of these 11 patients was additionally coded with 261.0 and another was additionally coded with 263.9. Among specific cancer types, the prevalence of malnutrition diagnosis also varied by

classification method. Dietitian assessments identified most of the malnutrition cases for each type of cancer (Table 2**).**

When comparing the different methods with each other for all cases, the agreement in malnourished diagnoses was calculated using a kappa statistic (Table 3). The kappa coefficients between any methods indicated a weak (kappa=0.23 for agreement between BMI and Dietitians and kappa=0.28 for agreement between Dietitians and Physicians) to fair strength of agreement (kappa=0.38 for agreement between BMI and Physicians) at best.

DISCUSSION

There is no universal or commonly shared method for identifying those who are malnourished among cancer patients, yet malnutrition is associated with decreased survival in these patients [8, 9, 27]. We investigated the differences in the prevalence of malnutrition diagnosis by available classification methods in a comprehensive cancer setting.

The differences between the identification of malnutrition by the three methods in this study are notable. There was a three -fold difference in prevalence of malnutrition diagnosis, depending on the particular measure used. BMI based identification of malnutrition resulted in the lowest prevalence, which is closely followed by physician based identification (ICD-9 codes) of malnutrition. The advantage of using BMI as a classification tool is that one only needs values for height and weight, which are routinely measured and examined in acute care settings [28, 29]. Unfortunately, BMI is not sensitive enough to detect differences in body composition, relevant biochemical markers, and changes in energy expenditure or functions of body systems and it has been recommended that more than two nutritional indicators be used to determine malnutrition in patients [16, 17, 30]. Additionally, the cut-off point of less than18.5 kg/m^2 for malnutrition may be too low to capture all of those who are truly malnourished and some researchers have recommended a malnutrition cut off point of less than 20.0 kg/m^2 [31]. Furthermore, given that the prevalence of abnormal BMI measures in the population is high due to overweight status and obesity, the use of BMI to truly detect malnutrition may be difficult especially with a one-time measure. The average BMI for this group of patients was 25.1. Involuntary weight loss of greater than 10% is a much more sensitive measure of malnutrition and the onetime measure of BMI is not sensitive to the history of unplanned weight loss [16]. Unfortunately, we only had information concerning weight loss for approximately 21% of the population.

Dietitians identified more than three times as many cases of malnutrition as physicians based on institutional criteria and subjective judgment, neither of which is a validated method. In the nutrition assessment process, dietitians used serum albumin as one of the criteria for determining nutritional status, however serum albumin is sensitive to dilution effects and can be affected by the primary disease, by the treatment and by related conditions rather than by malnutrition [16]. Additionally, one of the criteria for dietitians to consider in assessing nutritional status is BMI and this may have confounded results; however we are not sure to what extent BMI was considered as a factor in assessing nutritional status by the dietitian as each determination was based on subjective clinical judgment. In institutional settings, RDs typically assess nutritional status using several indicators including serum albumin and BMI [29, 32, 33]

Dietitians indicated that approximately 26% of the patients in our study were malnourished, but higher numbers might have been expected since the cancer types chosen have a high prevalence of malnutrition. Ranges of 20% to 80% of cancer patients who develop malnutrition during their clinical course have been reported in the literature [6, 11–14, 34]. Methods used in these studies to determine prevalence of malnutrition include the subjective

global assessment (SGA), the patient generated subjective global assessment (PG-SGA), the mini nutrition assessment (MNA) and percentage of weight loss or history of weight loss. It is possible that physicians code patients as having cachexia and not malnutrition and therefore we included this ICD-9 code. Additionally, it must be noted that 56% of our population had in situ or regional stage disease which may have accounted for the lower percentage of identified malnutrition. Estimated prevalence rates for cancer associated malnutrition vary with tumor site and stage of disease and there is evidence that tumor stage is associated with inadequate nutritional status [35, 36].

Based on this study's results, the frequency of agreement in malnutrition identification was poor between physicians and dietitians and BMI and dietitians and at best fair between physicians and BMI. The purpose of the study was to compare the prevalence of malnutrition diagnosis as identified by three classification methods and to determine the agreement of the clinical judgment of physicians and dietitians on the identification of malnutrition for these patients.

Applications and Limitations

Applications—There are several implications of these findings for research, clinical practice and administration. In research, the lack of agreement in defining and assessing malnutrition hinders comparison of incidence and treatment outcomes across studies.

In relation to clinical practice, comprehensive nutrition screening and assessment tools have been developed and evaluated in cancer populations. Tools such as the Short Nutritional Assessment Questionnaire, the Malnutrition Screening Tool, the Malnutrition Universal Screening Tool and the Nutritional Risk Screening provide comprehensive measures of nutritional status [10, 18, 37, 38]. Dietitians who are responsible for the nutrition assessment of patients, are usually understaffed in cancer centers [39] and may simply not be available to screen for malnutrition. Nurses are ideally suited to routinely screen for malnutrition and should consider using them. The Joint Commission on the Accreditation of Healthcare Organizations required nutrition screening within a 24 hour time frame of admission to an acute care facility in the mid-1990s which was then expanded to outpatient centers [29, 40]. This requirement may have increased the reliance on nursing staff to perform nutrition screens [41]. In 2007, Kubrak and Jensen critically evaluated screening tools for nursing professionals to use in the oncology setting and strongly encouraged the use of the PG-SGA. [15]. Ultimately, these patients need to be routinely screened with validated tools and preferably tools that can be used by various types of healthcare practitioners such as the PG-SGA. As a result, dietitians can effectively use their time to comprehensively assess those identified by screen and provide the necessary medical nutrition therapy.

In 2009, Soeters and Schols published a theoretical approach to grading the degree of malnutrition in initial patient assessments and suggested that the lack of agreement on the pathophysiology of malnutrition is most likely the basis for the lack of agreement concerning the measurement of malnutrition [10]. In this study, ICD-9 codes were a very conservative measure of malnutrition or cachexia and had poor agreement with other measures. Recently, Fox et al, estimated cachexia among cancer patients based on four definitions and showed, as this study did with malnutrition, that the proportion of cachexia among patients varied based on the definition used [42]. These authors proposed the development of a standard operational definition for cachexia in clinical practice [42]. An operational definition is also needed for malnutrition.

From a health care system perspective, it is difficult for administrators to appropriately charge for and allocate resources to address the problem if the prevalence of malnutrition diagnoses has such marked variance based on the method used to identify it. Although this

study could not determine which of the diagnostic methods examined was the most accurate, we suggest that the use of ICD-codes may underestimate the true prevalence of malnutrition and that a onetime measure of BMI may also underestimate the true prevalence. Weight loss is a strong and independent predictor of malnutrition and mortality in cancer patients [43, 44] and approximately 45% of patients suffer a weight loss of 10% or greater prior to diagnosis [3, 45–47]. Unintentional weight loss prior to diagnosis is one of several factors that needs to be included in malnutrition screening and is a component of several of the available tools noted previously.

Limitations—Limitations of this study relate to the retrospective data sampling from hospital records. Moreover, there was limited control over the quality and the amount of the data available for the study because of the intrinsic variability of hospital chart data and record keeping. A prospective review of patients as they are hospitalized would yield higher quality data to provide further insight.

In conclusion, this study compared the prevalence of malnutrition diagnosis by three available classification methods in a cancer patient population with the likelihood of a high prevalence of malnutrition and was able to show that these approaches varied widely in the detection of malnutrition. At the root of this concern are several factors. Primarily, there is no universal standard for the screening of malnutrition in this setting and therefore the problem may be underestimated. Additionally, there is the lack of an operational definition of malnutrition and a lack of agreement of nutritional indicators that accurately identify malnutrition in cancer patients. Nurses as front line clinicians could effectively interact with nutrition professionals and begin to use validated tools to identify these patients. As a result, this multidisciplinary clinician approach might provide better intervention with appropriate nutrition support to improve nutritional outcomes, quality of life and response to treatment. In the process, the need for resources to provide nutritional support will be demonstrated thereby improving nutritional support overall.

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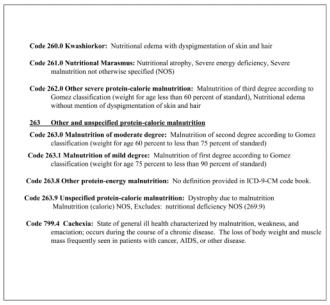

Code 260.0 Kwashiorkor: Nutritional edema with dyspigmentation of skin and hair

Code 261.0 Nutritional Marasmus: Nutritional atrophy, Severe energy deficiency, Severe malnutrition not otherwise specified (NOS)

Code 262.0 Other severe protein-caloric malnutrition: Malnutrition of third degree according to Gomez classification (weight for age less than 60 percent of standard), Nutritional edema without mention of dyspigmentation of skin and hair

263 Other and unspecified protein-caloric malnutrition

Code 263.0 Malnutrition of moderate degree: Malnutrition of second degree according to Gomez classification (weight for age 60 percent to less than 75 percent of standard)

Code 263.1 Malnutrition of mild degree: Malnutrition of first degree according to Gomez classification (weight for age 75 percent to less than 90 percent of standard)

Code 263.8 Other protein-energy malnutrition: No definition provided in ICD-9-CM code book.

Code 263.9 Unspecified protein-caloric malnutrition: Dystrophy due to malnutrition Malnutrition (calorie) NOS, Excludes: nutritional deficiency NOS (269.9)

Code 799.4 Cachexia: State of general ill health characterized by malnutrition, weakness, and emaciation; occurs during the course of a chronic disease. The loss of body weight and muscle mass frequently seen in patients with cancer, AIDS, or other disease.

FIGURE 1.
Malnutrition Related ICD-9-CM Codes[21]

Table 1

Descriptive Statistics of Nutritional Status Indicators

Indicator	N	Mean	Standard Deviation	Minimum	Maximum
Height (cm)	227	168.2	10.3	140.0	188.0
Weight (kg)	227	71.1	17.5	37.0	132.6
Body Mass Index (kg/m$^{2)}$	227	25.1	5.7	13.8	54.6
Albumin (g/dl)	227	3.2	0.6	1.5	4.8

Table 2

Prevalence of Malnutrition Diagnosis based on Three Classification Methods by Cancer Diagnosis

	Cancer Type			
Diagnosis Method	**Any n=227 n (%)**	**Gastrointestinal n=104 n (%)**	**Lung n=89 n (%)**	**Head and Neck n=34 n (%)**
ICD-code	21 (9.3)	7 (6.7)	11 (12.4)	3 (8.8)
Dietitian	59 (26.0)	27 (26.0)	22 (24.7)	10 (29.4)
BMI	20 (8.8)	8 (7.7)	11 (12.4)	1 (2.9)

Table 3

Frequency of Agreement in Identification of Malnutrition (Kappa Statistic)

	Physician	Dietitian	BMI
Physician	21 (1.00)		
Dietitian	15 (0.28)	59 (1.00)	
BMI	9 (0.38)	13 (0.23)	20 (1.00)