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Comparative Evaluation of Malnutrition Screening in Oncology Patients in an Acute Care Hospital: A Pilot Study

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COMPARATIVE EVALUATION OF MALNUTRITION SCREENING IN ONCOLOGY PATIENTS IN AN ACUTE CARE HOSPITAL: A PILOT STUDY

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ABSTRACT

COMPARATIVE EVALUATION OF MALNUTRITION SCREENING IN ONCOLOGY PATIENTS IN AN ACUTE CARE HOSPITAL: A PILOT STUDY

by Chandni Sen Sinha

Malnutrition is associated with negative health consequences in the vulnerable cancer population, making it imperative for an efficient interdisciplinary approach to conduct nutritional screening using an appropriate scale. For the present study, a comparison between an existing malnutrition risk-screening questionnaire (EMR-SQ) and a comprehensive screening questionnaire (CMR-SQ) was performed on 37 cancer patients. The first stage of data collection required the nurses to electronically complete the EMR-SQ. In the second stage, the same patients' data were assessed using the CMR-SQ, developed by the authors based on the guidelines of the PG-SGA and A.S.P.E.N. The CMR-SQ identified 32.4% at low, 37.8% at moderate and 29.7% at high risk of developing malnutrition compared to 81.1% at low risk of developing malnutrition with less than 20% identified at a moderate or severe risk by the EMR-SQ. The CMR-SQ resulted in identifying a greater number of people at risk of developing malnutrition in comparison to the EMR-SQ currently being used at Good Samaritan Hospital's oncology unit ($p < 0.0001$). The combined distribution pattern of 70% for all patients at moderate and high risk of developing malnutrition identified by the CMR-SQ is consistent with what is reported in the literature, indicating the prevalence of malnutrition is between 40 and 80% of the cancer patients in hospitals. The CMR-SQ may assist in time sensitive referrals of patients with a moderate and high risk of developing malnutrition for nutritional interventions to the registered dietitian nutritionists (RDN).

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LIST OF ABBREVIATIONS

AND- Academy of Nutrition and Dietetics

A.S.P.E.N.- American Society for Parenteral and Enteral Nutrition

CMR-SQ- Comprehensive Malnutrition Risk Screening Questionnaire

EMR-SQ- Existing Malnutrition Risk Screening Questionnaire

ESPEN- European Society for Clinical Nutrition and Metabolism

ICD-International Classification of Diseases

MNA- Mini Nutritional Assessment

MST- Malnutrition Screening Tool

MUST- Malnutrition Universal Screening Tool

NRS- Numeric Rating Scale

NRS- Nutritional Risk Screening

RDN-Registered Dietitian Nutritionist

PG-SGA-Patient-Generated Subjective Global Assessment

SGA- Subjective Global Assessment

SNAQ- Short Nutritional Assessment Questionnaire

VAS- Visual Analog Scale

VDS- Verbal Descriptor Scale

WHO-World Health Organization

Introduction

Malnutrition is a common complication in the cancer population, and has a negative impact on the healthcare system. The nutrition screening process is an important first step in identifying cancer patients with nutrition-related problems, such as malnutrition or those with the potential risk of developing malnutrition and who may benefit from a thorough nutrition assessment by a registered dietitian nutritionist (RDN).

The Joint Commission (1995), an independent, non-profit accreditation organization that certifies healthcare institutions nationwide to meet certain quality standards, has mandated that nutrition screening be performed on all hospitalized patients within 24 hours of admission. The Joint Commission, however, does not endorse a universal nutrition screening instrument or method, nor does it specify guidelines for nutrition screening, including which staff member should be responsible for conducting the screening. These are currently decided by the individual healthcare facility. To adhere to the mandate that nutrition screening be completed within 24 hours of patient admission, hospitals use a variety of nutrition screening instruments, including a set of questions typically administered by the nursing staff. The lack of uniform or defined procedures and inconsistencies of the screening process, can lead to inefficient communication between the interdisciplinary healthcare team members, as well as to a higher incidence of morbidity and mortality in the inpatient setting. Compounding these problems, the lack of an efficient and effective screening method may result in failing to correctly identify patients with a risk of developing moderate and severe malnutrition.

One of the primary objectives of this study was to compare the ability of an existing screening questionnaire currently in use at an acute care facility with a more comprehensive malnutrition risk screening questionnaire, developed for purposes of this study, in identifying nutritionally at-risk cancer patients. The review of literature, as it relates to the subject of this study, covers a broad overview of cancer, malnutrition, the impact of malnutrition in the oncology population, nutrition screening for hospitalized patients, and the types of popularly employed malnutrition screening instruments used in an inpatient setting.

Chapter 1. Literature Review

Cancer and Malnutrition

Cancer may be defined as a group of diseases that cause the cells of the body to divide in an uncontrollable manner, producing cells that serve no purpose in the normal functioning of the body. Some of these extra or unwanted cells may invade the surrounding tissues and spread to other parts of the body. The National Cancer Institute projected that in the United States in 2016 there will be 1,685, 210 diagnosed new cases of cancer, representing the second leading cause of death, following cardiovascular disease (U.S. Department of Health & Human Services, National Institutes of Health, National Cancer Institute, 2016).

Cancer patients are potentially at risk of developing malnutrition, reflected by unintentional weight loss over a specific timeframe, loss of appetite, loss of subcutaneous fat, loss of muscle mass, presence of edema, and diminished hand-grip strength. The incidence of malnutrition among cancer patients has been estimated to range between 40% and 80% (Bauer, Capra, & Ferguson, 2002). Researchers have also found that malnutrition is being poorly diagnosed by nurses, who represent the first point of contact with patients in hospitals. In one study, for example, nurses identified only 15% of patients as malnourished, even though the nutrition instrument (Mini Nutritional Assessment or MNA) identified 56.7% as being malnourished (Suominen, Sandelin, Soini, & Pitkala, 2009). Malnutrition in acute care hospitals has been found to be unidentified in 70% of cases (Kelley et al., 2000).

Malnutrition is difficult to define, in part because it includes a wide range of characteristics, from undernutrition to overnutrition, as well as deficiency or excess of calorie or protein intake, or that of micronutrients such as vitamins and minerals. For many years, there was a lack of consensus among healthcare professionals regarding an appropriate definition of malnutrition. The American Society of Parenteral and Enteral Nutrition (A.S.P.E.N.) has defined the term malnutrition in association with the conditions of both undernutrition and overnutrition, with or without the presence of inflammation, possibly reflecting acute, sub-acute, or chronic conditions leading to adverse health effects and reduced functional capacity (White et al., 2012). For purposes of this study, malnutrition is discussed in the context of undernutrition.

Recent Modifications to the Definition of Malnutrition

An International Guideline Committee organized by A.S.P.E.N. and the European Society of Parenteral and Enteral Nutrition (ESPEN) developed an etiology-based approach for the diagnosis of malnutrition in the adult population. In 2012, A.S.P.E.N. and the Academy of Nutrition and Dietetics (AND) published a consensus statement that endorsed these criteria, for use in clinical practice (White et al., 2012). Six different criteria identified by the committee form the basis for a diagnosis of malnutrition (Table 1). The presence of two or more of these is required in order to arrive at a diagnosis of malnutrition. These six criteria are: insufficient energy intake, weight loss, loss of muscle mass, loss of subcutaneous fat, edema that may sometimes mask weight loss, and diminished muscle strength (measured by handgrip strength). Malnutrition, may be

identified as non-severe or severe, and may be diagnosed in the context of acute/chronic illnesses or social/environmental circumstances.

Table 1

Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition Clinical Characteristics for Diagnosing Malnutrition in the Adult Population

Type of Malnutrition	Acute Illness or Injury Related Malnutrition		Chronic Disease Related Malnutrition		Social or Environmental Related Malnutrition	
Insufficient Energy						
Moderate	<75% for >7 days		<75% for ≥1 month		<75% for ≥3 month	
Severe	≤50% or ≥5 days		≤75% for ≥1 month		≤50% for ≥1 month	
Body Fat Loss						
Moderate	Moderate		Moderate		Moderate	
Severe	Severe		Severe		Severe	
Muscle Mass Depletion						
Moderate	Moderate		Moderate		Moderate	
Severe	Severe		Severe		Severe	
Fluid Accumulation						
Moderate	Moderate		Moderate		Moderate	
Severe	Severe		Severe		Severe	
Hand Grip Strength						
Moderate	Not Applicable		Not Applicable		Not Applicable	
Severe	Not recommended in intensive care unit		Not recommended in intensive care unit		Not recommended in intensive care unit	
Weight Loss Characteristics						
Moderate	%	Time	%	Time	%	Time
	1-2	1 week	5	1 month	5	1 month
	5	1 month	7.5	3 months	7.5	3 months
	7.5	3 months	10	6 months	10	6 months
			20	1 year	20	1 year
Severe	%	Time	%	Time	%	Time
	>2	1 week	>5	1 month	>5	1 month
	>5	1 month	>7.5	3 months	>7.5	3 months
	>7.5	3 months	>10	6 months	>10	6 months
			>20	1 year	>20	1 year

Note. The data in Table 1 have been adapted from "Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)," by J. White et al., 2012, *Journal of the Academy of Nutrition and Dietetics*, *112,* pp. 730-738. Copyright 2012 by the American Society for Parenteral and Enteral Nutrition and the Academy of Nutrition and Dietetics. Used with permission.

Prevalence of Malnutrition in Hospitalized Patients

Malnutrition is a serious condition, affecting 30-50% of hospitalized patients (Jensen, Compher, Sullivan, & Mullin, 2013). Similarly, Gout, Barker, and Crowe (2009) found that 40% of the patients in hospitals in Western countries were malnourished. Studies have demonstrated that up to 69% of these patients may experience further nutritional decline during their hospital stay (Sauer, 2014).

Malnutrition is more prevalent among cancer patients than for the general population, with rates varying depending on the diagnosis. It has been reported that up to 85% of patients with certain cancer diagnoses may experience weight loss. A weight loss of even 5% has been associated with decreased response to treatment and a lower rate of survival. Hebuterne et al. (2013) reported a frequency of weight loss due to malnutrition, ranging from 31% to 87%, depending on tumor site and stage, with the highest occurrence found in patients with cancer of the aerodigestive tract (the organs and tissues of the respiratory tract and the upper part of the digestive tract, collectively).

Causes of Malnutrition among Oncology Patients

Malnutrition associated with cancer is believed to be primarily due to the presence of tumors, host responses to the tumor, and anticancer therapies, as well as the interplay of mechanisms between the host, tumor, and deranged metabolism. All of these factors may indirectly affect the carbohydrate, protein, fat, vitamin, and mineral metabolisms (Van Cutsem & Arends, 2005). These alterations in metabolism are also associated with decreased nutrient intake, loss of appetite, changes in taste, and food aversions (Van Cutsem & Arends, 2005). Psychological factors, such as fear, depression, and anxiety, may also be involved as causes of malnutrition. A combination of these factors,

psychological and other factors, may lead to an extreme form of malnutrition, known as cancer cachexia, potentially resulting in increased morbidity or mortality.

Impact of malnutrition in the oncology population. Capuano, Gentile, Bianciardi, Tosti, and Di Palma (2010) found the condition of malnutrition to be associated with mortality, morbidity, increased length of hospital stay, decreased response to cancer treatment, and increased health-care related costs. The authors conducted an observation-based study of 61 outpatients suffering from advanced head and neck cancer, reported that malnutrition can negatively impact the quality of life and performance status. Furthermore, the study findings indicated that an early diagnosis of malnutrition followed by adequate nutrition support, in which nutrients are delivered via a tube placed into the stomach or small intestine, or intravenously, could be beneficial regarding unintended weight loss and other markers of malnutrition, as well as general quality of life (QOL). Nutrition screening therefore plays an important role either in identifying patients who may be malnourished at the time of hospital admission, are prone to becoming malnourished during their hospital stay, or both.

Screening in Hospitalized Patients

Definition of screening instruments. Screening questionnaires are used in various healthcare settings for early detection of a possible underlying disease condition in individuals with or without the presence of signs or symptoms. Screening instruments can be used as a preventive measure for patients who may benefit from interventions, based on their current conditions. The screening instruments can guide healthcare providers

with initiating appropriate intervention and managing the condition in a time-sensitive manner.

Commonly used screening instruments in hospitals. Examples of screening instruments that are commonly used in hospital settings include the Braden Scale for predicting pressure sore risk, as well as a variety of screening instruments for assessing dementia and cognitive impairment, including the Numeric Rating Scale (NRS) and the Visual Analog Scale (VAS), or Verbal Descriptor Scale (VDS), for assessment of acute pain (Wewers & Lowe, 1990). The nutrition-related scales commonly used in hospitals for screening patients at risk of developing malnutrition include: The Malnutrition Universal Screening Tool (MUST), Nutritional Risk Screening (NRS 2002), Mini Nutritional Assessment (MNA), Short Nutritional Assessment Questionnaire (SNAQ), Malnutrition Screening Tool (MST), and Subjective Global Assessment (SGA) (Anthony, 2008).

Malnutrition Screening

Nutrition screening. According to the guidelines of The Joint Commission (1997), nutrition screening by a member of the interdisciplinary healthcare team, typically by a nursing professional, should be performed within 24 hours of admission at an acute-care hospital (Jensen et al., 2013). A study by Patel et al. (2014) concluded that nutrition screening in 86% of facilities in the U.S. are conducted by nurses. This screening represents the first step in identifying individuals who may be at risk of developing malnutrition and may require a thorough nutrition assessment by a Registered Dietitian Nutritionist (RDN). It is important to note that nutrition screening differs from nutrition assessment. A nutrition assessment, conducted by a RDN, is an involved process that

helps identify an existing or impending nutrition problem, and includes recommendations for possible nutrition intervention.

Significance of malnutrition screening. Early detection of an increased risk of developing malnutrition through appropriate nutrition screening, followed by a comprehensive nutrition assessment and treatment, is imperative for proper care of cancer patients. A prospective three-year study conducted by Lim et al. (2012) on a group of newly admitted patients in a tertiary level acute-care hospital in Singapore evaluated the effect of malnutrition on the length of hospital stay, cost of hospitalization, readmission, and mortality. The SGA instrument was used for the nutrition assessment of this study sample of 818 patients. The highest prevalence of malnutrition was found in the patients of the oncology unit (71%), followed by endocrinology (48%), and respiratory medicine (47%). In comparison to the well-nourished patients (71%), the authors concluded that the 29% of patients with malnutrition experienced longer hospital stays (6.9±7.3 days versus 4.6±5.6 days) and were also at a higher risk of readmission within 15 days after discharge (adjusted relative risk=1.9, p=0.025). The study authors also found the mortality rate to be higher in the malnourished patients during the three-year period: 48.5% versus 9.9% in the well-nourished population group. The average cost of hospitalization for the malnourished population group was found to be three times higher than for adequately nourished patients. According to Lim et al. (2012), this implies greater use of hospital resources, higher re-admission rates, greater risks of infections, more pressure ulcers, and poorer wound healing.

Another study, utilizing cross-sectional design, conducted in Korea by Wie et al. (2010), analyzed the prevalence of malnutrition among 12,112 hospital cancer patients. The findings indicated that 61% were malnourished, with greatest prevalence among males. Prevalence of malnutrition was also found to be greater among patients with liver (86.6%) and lung (60.5%) cancers, as well as advanced cancer patients (stages III or IV) of all kinds (60.5%). The length of hospital stays of greater than 10 days ($p = 0.0017$) and readmission ($p < 0.0001$) were found to be associated with higher risk of malnutrition in cancer patients.

Malnutrition screening instruments for use with oncology patients. The use of an appropriately sensitive nutrition screening instrument is important for the accurate identification of malnutrition among oncology patients. The Patient Generated Subjective Global Assessment (PG-SGA), modeled on the SGA screening instrument, is a validated nutritional screening questionnaire used for the oncology population. The PG-SGA is also used for cross-validating other screening instruments. There are three main differences between the PG-SGA and the SGA, on which the former is modeled (Bauer et al., 2002). First, the SGA screening instrument is used more broadly, for a variety of medical conditions, including cancer, while the PG-SGA is used specifically for cancer patients. Second, the SGA is scored categorically, whereas the PG-SGA is scored on a continuous scale, that is, the higher the score, the greater the risk of developing malnutrition. Third, the SGA screening is conducted entirely by a healthcare staff member, in contrast with the PG-SGA, for which the first half of the form can be

completed by the patient using check boxes, with the second half to be completed by a healthcare professional.

The PG-SGA questionnaire consists of two sections: Part one is based on information obtained from the patient on weight history, nutrition history, symptoms affecting normal eating, and activities of daily living. Part two consists of worksheets that calculates weight loss, metabolic changes related to nutritional requirements, and physical examination based on assessment of body composition. The score obtained from the questionnaire is then used to determine whether the patient is at mild, moderate or severe risk of developing malnutrition (Shaw, Fleuret, Pickard, Mohammed, & Black, 2015).

Bauer, Capra, and Ferguson (2002) evaluated the PG-SGA as a nutrition screening instrument for 71 cancer patients between the ages of 18 and 92 in an Australian hospital. The PG-SGA demonstrated a sensitivity of 98% and a specificity of 82% for malnutrition screening. The study concluded that the PG-SGA was a simple and efficient instrument for screening malnutrition in cancer patients.

The lack of training or expertise in conducting nutrition screenings, however, along with the absence of a universally accepted screening method makes it challenging for nursing staff to conduct screening based on evidence-based guidelines. This is likely to lead to problems associated with failure to identify nutritionally at-risk patients, with the result that these patients would not receive appropriate care.

Efficiency of an Interdisciplinary Team Approach in Identifying Malnutrition

In accordance with the mandatory policies and procedures set forth by The Joint Commission in 1997, nutrition screening is conducted within 24 hours of admission in an acute-care facility (Jensen et al., 2013). A survey conducted by Patel et al. (2014) concluded that out of 1,777 respondents, nurses were the primary providers for conducting nutrition screening in 83% of the facilities in the U.S. The survey also concluded that an interdisciplinary team approach consisting of nursing staff, physicians, and other related healthcare providers in hospital settings is imperative for appropriate recognition and management of malnutrition.

Despite the prevalence and the negative outcomes associated with malnutrition, and the protocol specified by The Joint Commission implying the need for trained professionals in identifying malnutrition, the condition remains under recognized and even often unidentified in some healthcare care establishments (White et al., 2012). Furthermore, non-evidence-based approaches are not likely to identify malnutrition accurately. For instance, Gout et al. (2009) found that malnutrition was not appropriately diagnosed and documented in hospitalized patients. Gout et al. (2009) conducted the study in a teaching hospital in Melbourne, Australia. The researchers analyzed the identification of and referral rates for malnutrition among the hospitalized patients. The SGA was used for the nutritional assessment of 275 patients upon admission. The researchers found the rate of malnutrition to be 23%, with patients exhibiting longer

length of stays by 4.5 days, in comparison with non-malnourished individuals. It was found that only 15% of the malnourished population was identified accurately.

Bavelaar, Otter, van Bodegraven, Thijs, and van Bokhorst-de van der Schueren (2008) conducted a prospective study to investigate the general protocol for identifying and treating malnutrition by physicians, medical students, and nurses in the general medical unit at the Vrije Universiteit Medical Center in Amsterdam. The study was conducted in 395 patients between 19 and 96 years of age, at three stages of hospital stay: prior to admission, during hospitalization, and after discharge. The evaluation was based on several criteria that included body mass index (BMI), SNAQ (Short Nutritional Assessment Questionnaire) scores (≥2 points), medical doctor referrals, nutritional screening, and interventions at various stages, including before, during, and post-discharge. The researchers found that the medical doctors conducted only 15.3% of the nutritional assessments, nursing staff were responsible for 30%, and the medical students 53% of the assessments. Moreover, it was also found that no nutritional intervention was undertaken during patients' stays, and nutritional condition was not reported on the discharge summary. Neither screening nor intervention was found to be efficient in this hospital system.

Similar findings were reported in the study by Suominen et al. (2007), which found that nurses were not proficient at diagnosing and documenting malnutrition. The study examined the efficiency with which malnutrition in elderly patients living in long-term care hospitals in Helsinki, Finland was identified, with 1,043 residents and 53 nurses participating in the study. The residents were assessed using the MNA questionnaire, in

conjunction with a questionnaire. Although the MNA identified 56.7% as malnourished, the nurses recognized only 15.2% as malnourished.

In summary, a variety of nutrition-related scales are commonly used in hospitals today for screening patients at risk of developing malnutrition. Malnutrition is more prevalent among cancer patients than for the general population, with rates that vary, depending on the specific diagnosis. Patients with malnutrition experience longer hospital stays and are also at a higher risk of readmission. The mortality rate has been found to be higher among malnourished patients, which implies greater use of hospital resources, higher re-admission rates, greater risks of infections, more pressure ulcers, and poorer wound healing (Lim et al., 2012).

The story that the review of the literature tells, overall, is that of glaring failure, worldwide, to adequately identify malnourishment among hospital patients, and subsequently to appropriately address their nutritional needs, regardless of screening instruments used or requirements in place. The lack of a universally accepted screening method makes it difficult for nursing staff to conduct screening based on evidence-based guidelines. This is likely to lead to problems associated with failing to identify nutritionally at-risk patients, with the likely result that these patients will not receive appropriate care. At the same time, what the literature highlights is that an interdisciplinary team approach consisting of nursing staff, physicians, and other related healthcare providers in hospital settings is imperative for appropriate recognition and management of malnutrition (Patel et al., 2014).

The review of the literature exposed a set of problems resulting from acute care hospitals, requiring nursing staff to perform nutritional screening, which would best be delegated to RDNs, nutrition experts with the knowledge and skill set to effectively identify nutritionally at-risk patients. This study was designed to address both dimensions of this set of problems: the screening instrument, and its use by healthcare professionals.

One of the study objectives was to determine whether the existing nutritional screening process could be improved upon, by substituting a more comprehensive and sensitive screening instrument (CMR-SQ) for the instrument currently in use (the EMR-SQ) at Good Samaritan Hospital (GSH) oncology unit in San Jose, California. The rationale for exploring this potential improvement is evident from the review of literature. The nursing staff members at acute-care hospitals tend to lack the skills and knowledge necessary for identifying nutritionally at-risk patients. This is further demonstrated by the screening results utilizing the EMR-SQ instrument, which identified most of the patients (81%) being in the low-risk category. Moreover, because of issues with the reliability of the EMR-SQ as a screening instrument, the RDNs at the hospital devoted long hours to reading through complex medical histories, for the sake of ensuring that patients who were potentially at nutritional risk were being identified appropriately, in a time-sensitive manner, and were receiving proper nutritional intervention.

Chapter 2. Journal Article

COMPARATIVE EVALUATION OF MALNUTRITION SCREENING IN ONCOLOGY PATIENTS IN AN ACUTE CARE HOSPITAL: A PILOT STUDY

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Keywords: cancer, malnutrition, nutrition screening, screening instrument

Abstract

Background. Malnutrition is associated with negative health consequences in the cancer population, making it imperative for an efficient interdisciplinary approach to conduct nutritional screening using an appropriate instrument. The present study compared the qualitative evaluation of nutritionally at-risk cancer patients, using an existing malnutrition risk-screening questionnaire (EMR-SQ), with a new comprehensive questionnaire (CMR-SQ).

Materials and methods. The population studied consisted of 37 cancer patients. The first stage in data collection involved assessment by the nurses, utilizing the EMR-SQ. In the second stage, these same patients were evaluated using the CMR-SQ developed by the authors, containing components specific to identifying individuals at-risk for malnutrition, based on the PG-SGA and A.S.P.E.N. guidelines. The risk scores were subsequently used to classify low, moderate, and high risk of developing malnutrition.

Results. The EMR-SQ identified 81.1% at low risk of developing malnutrition, whereas the CMR-SQ determined 32.4% low, 37.8% moderate, and 29.7% at high risk. These differences between the screening instruments were statistically significant ($p < 0.0001$). Correlational analyses of factors affecting the risk of developing malnutrition using Spearman's rho indicated a positive relationship in presence of co-morbidities $r = 0.63$, $p < 0.010$ and an inverse relationship between handshake strength $r = -0.40$, $p < 0.05$.

Conclusion. The combined distribution pattern of 70% for moderate and high risk of developing malnutrition identified by the CMR-SQ is consistent with the estimates of prevalence of malnutrition in hospitalized cancer patients in the literature. The increased sensitivity of the CMR-SQ could be attributed to the addition of nutrition focused clinical characteristics.

Introduction

Malnutrition is the result of a serious decline in the nutritional status of individuals. It may be characterized by unintentional weight loss, loss of muscle mass, loss of subcutaneous fat, fluid accumulation, and reduced physical function. Malnutrition represents a major problem for the modern healthcare system and the community at large. Significantly, Gout, Barker, and Crowe (2009) found that 40% of hospitalized patients in Western countries were malnourished.[1]

Malnutrition, which is particularly challenging among cancer patients, may arise from interaction between a tumor, the host's response to the tumor's growth, and anticancer therapies.[2] An estimated 30-50% cancer patients die because of cachexia,[3] an extreme form of malnutrition characterized by severe muscle wasting. Malnutrition has been associated with a host of negative consequences in cancer patients, including increased length of hospital stay, impaired tolerance to cancer treatments, and increased health-care related costs.[4]

The Joint Commission (1997), an independent, non-profit accreditation organization that certifies healthcare institutions nationwide to meet certain quality standards, has mandated that nutrition screening be performed on all hospitalized patients within 24 hours of admission.[5] The Joint Commission does not endorse a universal nutrition screening instrument or method, however, nor does it specify particular guidelines for nutrition screening, including which staff member should be responsible for conducting the screening. These are currently decided by the individual healthcare facility. To adhere to the mandate that nutrition screening be done within 24 hours of patient admission,

hospitals use a variety of nutrition screening instrument, including a set of questions typically administered by a nursing staff member. The resulting variations and inconsistencies of the screening process can lead to inefficient communication between the interdisciplinary healthcare team members and to higher incidences of morbidity and mortality in the inpatient setting.[5]

The objectives of the present study were three-fold: First, to compare the malnutrition screening questionnaire currently used within the oncology unit (EMR-SQ) at Good Samaritan Hospital (GSH), a large metropolitan hospital in the San Francisco Bay Area, with a more comprehensive questionnaire (CMR-SQ), to determine their relative ability to detect patients at-risk for developing malnutrition. Second, to determine the distribution of patients identified under the categories of low risk, moderate risk, or high risk. Third, to determine the variables that may be more sensitive indicators of identifying patients at a potential risk of malnutrition particularly at moderate along with high risk.

Materials and Methods

Study design and patient population. The study was approved by the Institutional Review Board (IRB) of both GSH and San Jose State University (SJSU), both in San Jose, California. Written informed consent was obtained prior to initiation of the study.

The study was conducted in the oncology unit at GSH. The patients recruited for the study were newly admitted to the unit and data were collected within 24 hours of admission. Inclusion criteria for the study called for newly admitted cancer patients 18 years and older, the ability to understand English and follow oral instructions, and

voluntary participation in the study. Signs of impaired cognition, as well as the failure to meet the inclusion criteria, constituted the exclusion criteria.

Screening questionnaires. Two separate screening questionnaires were involved in this study. The first was the existing malnutrition screening questionnaire, which for purposes of this study is referred to as the EMR-SQ. The second screening questionnaire was a more comprehensive malnutrition risk screening questionnaire, developed to identify the nutritionally at-risk cancer patients, referred as the CMR-SQ.

The CMR-SQ was developed by the investigators based on The Patient Generated Subjective Global Assessment (PG-SGA). The PG-SGA is a validated nutritional screening questionnaire used for the oncology population. The PG-SGA consists of two sections[6]: Part one is based on information obtained from the patient on weight history, nutrition history, symptoms affecting normal eating and activities of daily living. Part two consists of worksheets that calculate weight loss, metabolic changes related to nutritional requirements, and physical examination based on assessment of body composition. The CMR-SQ also incorporated certain nutrition focused clinical characteristics, such as, the presence of co-morbidities, handgrip strength measurement, physical assessment, medications, lab values, more in-depth assessment of weight changes, along with the duration, and factors affecting loss of appetite. Furthermore, the CMR-SQ grouped different cancers based on an associated nutrition risk score. For example, cancer involving the reproductive system was assigned a score of one because of the relatively lower impact this cancer has regarding the nutritional status. Conversely, cancers of the lung, stomach, and colorectum were assigned a score of three, as these cancers are known

to have a significant impact on patients' nutritional status.[7] Cancers of the pancreas, head and neck, mouth, pharynx, esophagus, and liver were assigned the highest score (six), indicating the greatest level of nutritional risk.[7] Finally, early stage cancers were assigned lower nutritional impact scores than cancers in later stages (two, three, and four).[7]The score obtained from the questionnaire is then used to determine whether the patient is at low, moderate, or high risk of developing malnutrition.[6]

Data collection. Data were collected from 37 participants during a three-month period, from mid-March to mid-June 2015. The data collection process included two stages. The first stage involved an electronically completed EMR-SQ that included the patients' nutritional status, followed by assignment of a nutrition risk score of either level 1 (high risk), level 2 (moderate risk), or level 3 (low risk), based on the malnutrition diagnosis grid developed and used within the hospital. The assessment included: the patient's name, date of birth, age, sex, reason for the visit, primary diagnosis, chief complaint, allergies (if any), any swallowing difficulty affecting food intake, tube feeding or total parenteral nutrition (TPN), dietary restrictions, unintentional weight loss of ten pounds or more, very poor appetite for more than five days, recent onset of diabetes (less than 3 months), anthropometrics, abdomen appearance, gastrointestinal comment, pressure ulcer, Braden skin score, and any previous surgeries.

The second stage of the patients' nutritional status was assessed using the CMR-SQ. Specifics related to weight history, food intake, and appetite were gathered by interviewing the patient. A nutrition-focused physical exam and handshake for assessing the handgrip strength were also conducted on the patients. Data on existing treatment

including general chemistry/lab values, current diagnosis, comorbidities, and medications were obtained from the patient's admission history, physician assessments, and hospital progress notes. After assigning a score to each item in the questionnaire, the scores were totaled, with each patient assigned a nutrition risk level, 1 (low risk), 2 (moderate risk), or 3 (high risk), based on the total score. These nutrition risk level scores were assigned in accordance to the PG-SGA screening questionnaire.

Data analysis. Data were analyzed using SPSS version 22.0 (SPSS, Chicago, IL, USA). Comparison of assigned risk levels between the two questionnaires was assessed utilizing the Wilcoxon Signed-Rank Test. Correlational analyses using Spearman's rho and Kendall's tau β were used to examine the relationships between study variables, such as weight change, factors affecting appetite loss, presence of co-morbidities, and handshake strength, and their placement into one of the three at-risk levels. The level of statistical significance was specified at $p \leq 0.05$ level. A level of clinical significance regarding the distribution of nutritionally at-risk individuals was defined as a level of distribution more consistent with the published literature, which estimates the prevalence of moderate to severe malnutrition between 40% and 80% among cancer patients.[8]

Results

Clinical and demographic characteristics. The clinical and demographic characteristics of the 37 patients are provided in Table 1. Their ages varied between 23 and 95 years, with a mean ± SD of 67 ± 15 years. The mean ± SD body mass index (BMI) was 25.8 ± 5.24. The study group included three outliers, two with BMIs of 37.3 and 42.4 kg/m^2, as well as one outlier on the other end of the spectrum, with a BMI of 18.0 kg/m^2. Gender distribution was essentially equal.

Weight history. Subjects ranged in weight from 45 kg to 105 kg, with a mean ± SD weight of 73.4 ± 16.74 kg (Table 1). Fourteen of the 37 individuals (37.8%) reported weight loss during the 30 days prior to admission; of these, 11 (78.6%) reported a loss of 10-20 pounds (4.5 to 9 kg); three of the 14 (21.4%) reported a loss between 21 and 30 pounds (9.5 to 13.6 kg). On the other hand, only three of the 37 subjects (8.1%) reported a weight gain, ranging from 10 to 20 pounds (4.5 to 9 kg) during the 30 days prior to hospitalization.

Cancers. The most frequently reported cancers, accounting for 22 of the 37 patients (59%) diagnosed with cancer, involved either the reproductive system (affecting one or both breasts, the prostate, the endometrium, or the cervix) or one or both kidneys (Table 1). The next most commonly reported cancers, accounting for 13 of the 37 patients (35%) diagnosed with cancer, related to the lungs, stomach, and colon. The least commonly reported cancers, accounting only two of the 37 patients (5%) diagnosed with cancer, involved the pancreas, head and neck, pharynx, esophagus, and liver.

Table 1

Clinical and Demographical Characteristics of Study Participants for Malnutrition Screening in the Oncology Unit at Good Samaritan Hospital

Clinical characteristics	Mean ± SD (%)	n (%)
Age (yr)	67.0 ± 15.2	
Height (cm)	168.1 ± 11.1	
Weight (kg)	73.4 ± 16.8	
Body Mass Index (kg/m^2)	25.81 ± 5.2	
Gender (M/F)		18M/19F (49/51)
Weight history		
No change in weight		20 (54)
Decreased weight		14 (38)
10-20 lb		11 (30)
21-30 lb		3 (8)
Increased weight		
10-20 lb		3 (8)
21-30 lb		0 (0)
>30 lb		0 (0)
Type of cancer		
Breast/Prostate/Endometrium/Cervix/Kidney		22 (60)
Lung/Stomach/Colon		13 (35)
Pancreas/Head/Neck/Pharynx/Esophagus/Liver		2 (5)

Note. Yr = years; kg = kilogram; kg/m^2 = kilogram per meter squared; F = female; M = male; lb = pound

Appetite. Duration and factors affecting appetite loss are presented in Table 2. Patients experiencing very poor appetite on CMR-SQ were equally distributed, with 19 (51.4%) presenting with very poor appetite and 18 out of 37 patients (48.6%) not reporting poor appetite during the 30 days prior to hospital admission. Of the majority of patients presenting with loss of appetite, 8 of 19 (42%), reported less than a week of this condition. Among the factors that may have contributed to loss of appetite, 14 of 19 patients (73.7 %) did not identify any of the factors listed on the questionnaire as possible

choices (including "other") associated with their loss of appetite loss, while 8 of 19 (42%) identified nausea, vomiting, and diarrhea as being associated with their loss of appetite. Overall, nausea (74%), vomiting (68%), and diarrhea (63%) were the most common factors associated with loss of appetite.

Table 2

Duration and Factors Affecting Appetite Loss in Study Participants for Malnutrition Screening in the Oncology Unit at Good Samaritan Hospital

Appetite	Frequency (%)
Loss of Appetite	
No	18 (48)
Yes	19 (51)
Duration of appetite loss	
<1 week	8 (42)
1-2 week	6 (13)
>2 weeks	5 (26)
Factors Affecting Appetite Loss	
Nausea	14 (74)
Vomiting	13 (68)
Diarrhea	12 (63)
Mouth Sores	2 (10)
Constipation	4 (21)
Dry mouth	5 (26)
Loose dentures	0 (0)
Taste Changes	9 (47)

Additional diagnoses/co-morbidities. Co-morbidities commonly observed in the oncology unit were listed under this category. For example, three patients (8.9%) presented with renal disease or hepatitis. This was followed by diabetes, present in the medical records of five patients (14%). Only two patients (5%) presented in the category of failure to thrive/malnutrition/cachexia.

Table 3

Associations between weight change, appetite loss, co-morbidities and handshake strength and level of risk of malnutrition

Variables	Kendall's tau-β			Spearman's rho		
	r	r^2	p value	r	r^2	p value
Weight change	0.370	0.137	0.016	0.400	0.160	0.014
Factors affecting appetite loss	0.360	0.130	0.02	0.420	0.176	0.01
Co-morbidities	0.560	0.314	0.0001	0.630	0.397	.0001
Handshake strength	– 0.370	0.137	0.015	– 0.400	0.160	0.014

Note. r = Correlation coefficient; r^2 = Coefficient of determination; Statistical significance = $P < 0.0001$

Statistically significant results on correlations and null hypothesis. Presented in Table 3 are the correlations between weight change, appetite loss, comorbidities, and handshake, the dependent variables on the questionnaires, and the levels of risk of malnutrition. Results from Spearman's rho indicated statistically significant positive relationships between three particular variables, weight change ($r = 0.40$, $p < 0.05$), factors affecting appetite loss ($r = 0.42$; $p < 0.05$), and presence of co-morbidities ($r = 0.63$; $p < 0.01$), and an inverse relationship between handshake strength ($r = – 0.40$; $p < 0.05$) and the level of risk with regard to developing malnutrition.

Results of the Wilcoxon-Signed Rank Test of the null hypothesis, that there is no difference between the two screening instruments, indicated that the difference between the two screening instruments was below the critical level. This leads to rejection of the

null hypothesis and conversely, support for the alternate hypothesis, that there is a significant difference between the two screening instruments (p = 0.0001).

Clinical laboratory analysis. The total WBC counts of less than 4,500 and greater than 11,000 per microliter (mcL) were reported as the most common laboratory abnormality, among 10 of the 37 (27%) hospitalized patients. This was followed by blood urea nitrogen (BUN) levels greater than 50 mg per deciliter (dl), in three (8%) of the patients.

Handshake. The handgrip strength of 19 out of 37 patients (51%) was assessed as normal, while the handgrip strength of 15 (41%) was assessed as strong. It should be noted that the CMR-SQ incorporated both handshake and handgrip strength measurements. For the actual study, only the handshake measurements were included in data analysis.

Physical assessment. The CMR-SQ also involved a section on physical assessment, covering five physical attributes, protruding clavicle, depression of temporal area, sunken orbital sockets, dark circle around eyes and shoulder squaring, potentially relating to nutritional condition, which are relatively easy to observe. None of the study participants exhibited any abnormal findings in this regard.

Differences between the two questionnaires, EMR-SQ and CMR-SQ. As presented in Table 4, the EMR-SQ identified 30 of the 37 patients (81%) as being at low risk for malnutrition, while five of the 37 (14%) were identified as being at moderate risk, and only two (5%) at high risk. The CMR-SQ, in contrast, identified 12 of the 37 patients (32%) as being at low risk, 14 (38%) at moderate, and 11 (30%) at high risk for developing malnutrition.

Table 4

Comparison of Nutrition Risk Scores in the Questionnaires EMR-SQ and CMR-SQ for Malnutrition Screening in the Oncology Unit at Good Samaritan Hospital

EMR-SQ	Frequency (%)
Low	30 (81)
Moderate	5 (14)
High	2 (5)
CMR-SQ	
Low	12 (32)
Moderate	14 (38)
High	11 (30)

Note. EMR-SQ = Existing Malnutrition Risk Screening Questionnaire; CMR-SQ = Comprehensive Malnutrition Risk Screening Questionnaire

Discussion

The purpose of the present study was three-fold. The first purpose was to determine the distribution of patients identified under the categories of: low, moderate, or high risk of developing malnutrition, between two screening questionnaires (EMR-SQ and CMR-SQ). The second purpose was to compare the EMR-SQ that is currently being used with a more comprehensive nutritional screening questionnaire (CMR-SQ) and to examine

whether the CMR-SQ is better able to detect nutritionally at-risk patients than the EMR-SQ. The third purpose of the study was to identify potential variables included in the CMR-SQ that may have contributed to increasing the ability in identifying patients who are potentially at increased nutritional risk for developing malnutrition.

A comparison between the two screening questionnaires clearly indicates that there were major differences in their ability to identify individuals with moderate and high risk of malnutrition. The CMR-SQ identified 32.4% at low, 37.8% at moderate and 29.7% at high risk of developing malnutrition, while the EMR-SQ identified less than 20% at a moderate or high risk, with the vast majority of patients (81.1%) being classified at low risk of developing malnutrition. Thus, the CMR-SQ was capable of identifying a greater number of patients who were potentially at an increased risk of developing malnutrition ($p < 0.001$). Moreover, the distribution pattern identified by the CMR-SQ is consistent with recent evidence in the literature that reported the prevalence of malnutrition between 40% and 80% among the hospitalized cancer patients in typical western hospitals. [1,5,8-11]

There were certain aspects of the CMR-SQ identified in the present study that potentially increased the precision and sensitivity of the CMR-SQ, contributing to the greater number of patients identified at moderate and high risk of potentially developing malnutrition. As weight loss is a strong indicator of prognosis in the cancer patients, weight history recorded by the CMR-SQ allowed for a much more in-depth analysis. There were three main variables, current body weight, usual body weight (UBW), history and degrees of weight changes specifically with regard to the previous 30 days. The addition of weight changes to the CMR-SQ is consistent with similar screening

instruments designed for the adult hospitalized patients including patients with cancer.[12-13] In contrast, the EMR-SQ assessed patients based only on current body weight and unintentional weight loss of more than ten pounds.

Anorexia, a severe form of loss of appetite, is common among cancer patients and may potentially lead to malnutrition. In the CMR-SQ, poor appetite, for less than one week, one to two weeks, or more than two weeks was further associated with eight factors that could have possibly affected appetite loss in the cancer patients. These factors that were associated with decreased food intake prior to admission to the hospital included, nausea, vomiting, diarrhea, mouth sores, constipation, dry mouth, loose dentures, and change in taste. The addition of these questions to CMR-SQ was consistent with other studies in this area involving screening cancer patients.[13] The EMR-SQ, on the other hand, only identified patients with poor appetite for more than five days, as well as with difficulty swallowing, which may have affected food intake.

A measure evaluating handgrip strength of patients that was not in the current practice was introduced in the CMR-SQ. The strength of the coefficient of determination suggest that approximately 14% (r^2=0.137) of the variation in degree of risk was related to handshake strength. This finding is consistent with the evidence in the literature indicating that patients demonstrating a higher handgrip strength had a decreased risk of being nutritionally at-risk.[14]

The CMR-SQ, unlike the EMR-SQ, included a wide range of co-morbidities that are commonly observed in the oncology unit at Good Samaritan Hospital. The strength of the coefficient of determination suggest that approximately 40% (r^2=0.396) of the variation

in placement in the three categories was related to co-morbidities. This is considered clinically significant in assessing the risk of malnutrition. However, research is limited in the area exploring the association of comorbidities and malnutrition within the cancer population.

Nutritional status was also assessed using five physical attributes, potentially relating to nutritional condition, which were relatively easy to observe. The addition of these physical attributes were consistent with the A.S.P.E.N. guidelines for detecting malnutrition among hospitalized patients and other nutrition screening questionnaires in this area involving screening of cancer patients.[15] These identifiers, however, were not present in the EMR-SQ.

Corticosteroids are commonly used in cancer patients to help prevent side effects such as nausea, vomiting to anticancer treatment, as appetite stimulants, and also in pain management. [16] The addition of these medications to the CMR-SQ was unique, especially for malnutrition screening among the cancer patients, and may have enhanced the ability to identify the nutritionally at-risk patients. However, none of the other popularly used malnutrition screening questionnaires, such as the PG-SGA, SGA, MNA, NRS-2002 have incorporated the use of medications.[17] The EMR-SQ, on the other hand, did not assess patients based on current medications.

Finally, lab values with potential relevance to nutrition status were also identified using the CMR-SQ, in contrast with the existing practice, which did not take this information into consideration. The inclusion of lab values in CMR-SQ was also another unique addition that was not found in any of the other screening questionnaires.

Study limitations. The present study had several limitations. First, information obtained on weight history and loss of appetite in the assessment of malnutrition on the CMR-SQ was self-reported by the patients, with no independent verification regarding the accuracy of these data. Self-reporting, a common technique of assessing patient's weight changes and food intake, has been adopted by several nutrition screening questionnaires, including the PG-SGA.[12] Second, information concerning edema, which could have affected a person's nutritional status and constituted one of the criteria for malnutrition assessment under the A.S.P.E.N. guidelines[5], was not included in the CMR-SQ. In the present study, there were two participants with edema who may have been at a higher risk of malnutrition. Other conditions (e.g., dyspnea, pleural effusion, and severe abdominal pain) that may have affected appetite and thereby affected risk of malnutrition were identified in nine patients. However, these problems were not assessed on the CMR-SQ under comorbidities, which could have potentially impacted the nutritional status of the patients. Third, information on dietary intake and nutritional supplements with possible effect on nutritional status was not collected by the CMR-SQ. These limitations are the same for both questionnaires and therefore in the nature of the data collected.

Study strengths. A strength of the present study was that the CMR-SQ was specifically designed for malnutrition screening of the oncology population. This contrasted with the EMR-SQ, which was designed for general medical and physical assessment, and was also not specifically designed to assess the nutritional status. Moreover, even though the CMR-SQ did not include all variables that might have helped

to accurately assess a patient's risk for malnutrition, it did include substantially more than the EMR-SQ in standard use, as explained above.

Conclusion

Evidence from the results of the present study clearly indicated that the EMR-SQ as an initial nutrition screening instrument was not highly effective, in the sense that it skewed the majority of nutritionally at-risk patients into the low risk level for developing malnutrition. In the inpatient setting, the typical timeframe for being assessed by a RDN for mildly at-risk individuals is 72 hours. For moderately at-risk patients, the timeframe is 24 to 48 hours, while for severely at-risk patients, it is 24 hours. However, as the EMR-SQ had a tendency to place most patients into the lower risk level of developing malnutrition, patients who were actually at a higher risk may have been overlooked and therefore not assessed by a dietitian in an appropriately time-sensitive manner. The CMR-SQ, in contrast, was more comprehensive and specific to nutrition assessment, thus was capable of better identifying individuals at a moderate or higher risk of developing malnutrition, with roughly equal distribution at the low, moderate, and high levels. The distribution pattern of percentages at the three levels of risk obtained using the CMR-SQ is consistent with the documentation in the literature in this area suggesting that malnutrition is prevalent in 30-85% of hospitalized cancer patients.[8-11] Hence, the CMR-SQ appears to be more sensitive and precise than the percentages obtained with the EMR-SQ.

The present study highlighted the importance of an instrument that is specifically designed to assess the risk of malnutrition by incorporating the nutritionally relevant

information. This will provide a more sensitive indication of an individual's actual risk for developing malnutrition. In this regard, the study highlights the importance of the RDN as an integral member of the interdisciplinary healthcare team. The use of an appropriately developed instrument based on important nutritional markers of nutritional status conducted by formally trained healthcare professionals would assure more time-sensitive referrals for nutrition related interventions, that can help reduce morbidity and mortality, especially with regard to moderate and high risk individuals.

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Chapter 3. Summary and References

Summary

Malnutrition in the cancer population is associated with deleterious health consequences. This includes cancer cachexia, a complex form of malnutrition leading to loss of lean body mass, wasting of muscles, and diminished mental and physical capacity. Together, these conditions can cause diminished response to cancer treatment and decreased quality of life, as well as increased morbidity and mortality, among malnourished cancer patients.

The Joint Commission has mandated that nutrition screening be performed for hospitalized patients within 24 hours of admission. Nurses are typically the first point of contact with the patients and at many hospitals are also responsible for conducting the nutrition screening. However, the lack of an effective and widely accepted screening method approved by The Joint Commission, as well as the lack of guidelines for nutrition screening, makes the task difficult. The screening instrument currently in use tend to create problems with regard to effective identification of nutritionally at-risk patients, especially those at a moderate and high level of risk for malnutrition. The likely result of this failure is that those patients most in need of timely nutrition intervention may not receive it.

This study on 37 cancer patients compared an existing malnutrition risk-screening questionnaire (EMR-SQ), in use at an acute care hospital, with a new questionnaire (CMR-SQ), developed by the authors. The study sought to compare the qualitative evaluation of nutritionally at-risk cancer patients based on the existing malnutrition risk-

screening questionnaire (EMR-SQ) with a new comprehensive questionnaire (CMR-SQ), determining the distribution of patients identified as being at low, moderate, or high levels of risk for developing malnutrition. The EMR-SQ skewed 81.1% at the low level of nutritional risk, whereas the CMR-SQ resulted in a more equal distribution at the three levels of low, moderate, and high: 32.4%, 37.8%, and 29.7%, respectively. Statistical analysis suggested that the CMR-SQ was more sensitive and precise at identifying individuals at the three risk levels of developing malnutrition, probably because of the addition of clinical characteristics, which is crucial for ensuring appropriate time-sensitive nutrition interventions.

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Appendix A: EMR-SQ

GOOD SAMARITAN ADMISSIONS
ADULT NUTRITION RISK ASSESSMENT DATA REPORT

RUN DATE:
RUN TIME:
RUN USER:
From Admit Date: To Admit Date:

Isolation: Code Status:
Visit Reason: Att. MD:
Primary Diagnosis:
Chief Complaint:

Allergies:
ADRS:

Swallowing difficulty affecting food intake: Dietary Restriction: Y/N
Tube Feeding or TPN: Y/N

Diet Restriction:

Unintentional weight loss>= 10#: Y/N Specify_____
Very poor appetite for greater than 5 days: Y/N
Diabetes -New onset (less than 3 months): Y/N
Diet: Service Date:
Ordering MD: Entered by:
TPN/TF:_____
Weight kg: Height: BMI:
Abdomen appearance:
GI Comment:
Pressure Ulcer >=
Braden Skin Score: Braden Skin Risk:

Medical History

Recreational drugs: Y/N Cardiovascular: Y/N Gastrointestinal: Y/N
Cancer: Y/N Alcohol: Y/N Respiratory: Endocrine/Immune: Y/N
Previous surgeries:
Level of risk of nutrition compromise: _____

Appendix B: CMR-SQ

Oncology Screening Tool *(updated 12/06/14)*

1. Weight history

Current weight _____ lbs Height _____ feet _____ inches BMI _____ kg/m^2

Usual body weight (UBW) _____lbs When did you last weigh UBW?_____

Did you lose weight unintentionally in the past 30 days? ☐ No change (0) ☐ decreased ☐ increased

If decreased:	10-20lbs (2)	21-30lbs (4)	>30lbs (6)
If increased:	10-20lbs (1)	21-30lbs (2)	>30lbs (3)

How long ago was patient's usual weight known?

2. Food intake

Have you experienced very poor appetite? ☐ No (0) ☐ Yes

If yes: ☐ Less than 1 week (1) ☐ 1-2 weeks(2) ☐ >2 weeks (3)

Have the following problems kept you from eating prior to admission (check all that apply):

☐ Nausea greater than 24 hours(1) ☐ Vomiting greater than 24 hours (1) ☐ Diarrhea/ loose bowels greater than 24 hours (1)

☐ Mouth sores (1) ☐ Constipation (1) ☐ Dry mouth (1)

☐ Loose Dentures/missing teeth (1) ☐ Change in taste (2) ☐ Other (1) specify: _____

3. Existing treatment:

Appetite stimulants(1 point) ☐Megestrolacetate ☐ Dronabinol ☐ Medroxyprogesterone ☐Cyproheptadine

Corticosteroids(1 point) ☐ Dexamethasone ☐ Methylprednisolone ☐ Prednisolone

Antidepressant(1 point) ☐ Mirtazapine ☐ Olanzapine

Other(1 point): ☐Thalidomide ☐Pentoxifylline

4: Current diagnosis

Cancer ☐ Breast/Prostate/Endometrium/Cervix/Kidney(1) ☐ Lung /Stomach/Colorectal(2) ☐ Pancreas/Head & neck/Oral/Pharynx/Esophagus/Liver(2)☐Newly diagnosed/Stage 1 (1)☐Newly diagnosed stage 2, 3, 4(2)

Additional diagnosis:

☐ AIDS(1) ☐ Crohn's, diverticulitis, ulcerative colitis(3) ☐ Bowel obstruction(1) ☐ Pancreatitis/Cirrhosis(1)

☐ Diabetes mellitus/GDM(1)☐Pulmonary disease(1)☐COPD/Congestive Heart Failure (CHF)(1)☐ Renal/Hepatic Disease(1)

☐ DKA(6)☐ Sepsis(1)☐ Pressure ulcer stage 1(1)☐ Pressure ulcer stages2,3,4(6) ☐ Failure to thrive/malnutrition/cachexia(6)

☐ Fistulas(2)

4.General chemistry/lab values

☐GFR 15-60(1) ☐GFR <15(2) ☐HgBA1c >7% (2) ☐SGOT & SGPT> 100 U/L(1)

☐ Lipase/Amylase>400U/L(1) ☐ BUN>50 mg/dl or <6 mg/dl(1) ☐ Creatinine<0.5 mg/dl(1)

☐ Total WBC count<4.5 or >11(1)

5. Handshake

☐ Weak (2) ☐Normal (0) ☐Strong (0)

6. Hand-grip strength measurement

☐Weak (3) ☐Normal (0) ☐Strong (0)

7. Physical assessment

☐Present ☐ Not present (0)

If present: ☐Protruding clavicle ☐Depression of temporal area ☐Sunken orbital sockets ☐Dark circle around eyes

☐ Shoulder squaring

Score based on symptoms present: 0-1(0) 2-3(3) +3(6)