NUTRITIONAL RISK IN THE CANCER PATIENT 65 AND OLDER UNDERGOING SYSTEMIC TREATMENT VIA PHASE I CLINICAL TRIALS

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Abstract

One of the greatest risk factors for contracting cancer is aging. By the year 2030 the number of new cancer cases will balloon to 2.3 million per year. Malnutrition is a common problem identified in cancer patients and is recognized as an important component of adverse outcomes, including increased morbidity and mortality and decreased quality of life (QOL). Nutritional risk is not consistently assessed in the older adult cancer patient population.

The purpose of this study was to identify variables related to nutritional risk in the cancer patient 65 years and older receiving systemic treatments via Phase I clinical trials. The study described the relationship between nutritional risk and the four domains of QOL (physical, social, emotional, and functional). This study was guided conceptually by an adapted version of the City of Hope QOL model, focusing on the four key domains of QOL. The instrument chosen to measure QOL was the FACT-G (Version 4), created by Cella, et al. (1993), is a cancer specific version of the FACIT (Functional Assessment of Chronic Illness Therapy) Measurement System. It contains a 27-item compilation of general questions divided into the four QOL domains.

A sample of 73 patients, with a mean age of 71, were successfully accrued for this study from an NCI RO1 aimed at integrating supportive care for cancer patients on Phase I clinical trials using the MNA-SF instrument to assess for nutritional risk. The population was predominantly Caucasian and overall well-educated. Most of the patients were Protestant and were married or partnered, living with a spouse or child. Most were retired with an annual income of $50,000 or greater. The participants were almost equally divided by male and female.

Study findings revealed that the strongest correlation with nutritional risk was BMI status ($r = .47$, $p < .0001$). Multiple regression analysis demonstrated that the factors

associated with nutritional risk included BMI, previous chemotherapy and physical subscale of the FACT-G QOL instrument. Additional descriptive data reinforced the importance of nursing assessment and intervention to support nutritional status.

Nutrition impacts all dimensions of QOL and will be even more important in an aging population. Nursing research can contribute greatly to advancing this area of practice.

Dedication

I would like to dedicate this dissertation to my children for their unceasing support while I have been in school for my PhD. I would also like to dedicate my work to all the wonderful older cancer patients with whom I have worked. They consistently supported me in my efforts and were very open about their person lives and journeys throughout their cancer trajectory.

I submit this dissertation because of you.

Acknowledgements

I would like extend my sincere appreciation to several individuals who supported me throughout my PhD journey and study period.

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List of Abbreviations

ACE 27	Adult Comorbidity Evaluation
aCGA	Abbreviated Comprehensive Geriatric Assessment
ACS	American Cancer Society
ADL	Activities of Daily Living
BMI	Body Mass Index
CGA	Comprehensive Geriatric Assessment
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CIRS-G	Cumulative Illness Rating Scale-Geriatrics
DNR	Do Not Resuscitate
EBSCO	Elton B. Stephens Company
ECOG	Eastern Cooperative Oncology Group
FACT-G	Functional Assessment of Cancer Therapy-General
TRST	Triage Risk Screening Tool
GA	Geriatric Assessment
GDS	Geriatric Depression Scale
G8	G8
GUG	Get Up and Go
IADL	Instrumental Activities of Daily Living
IOM	Institutes of Medicine
IRB	Internal Review Board
MeSH	Medical Subject Headings
MMSE	Mini Mental State Examination
MNA-SF	Mini Nutritional Assessment Short Form (Self-Administered)
MST	Malnutrition Screening Tool
MUST	Malnutrition Universal Screening Tool
NCI	National Cancer Institute
NRI	Nutritional Risk Index
PhDc	PhD candidate
PRISMA	Preferred Reporting Items of Systematic Reviews and Meta-Analysis
PubMed	PubMed
QLQ-C30	Quality of Life Questionnaire
QOL	Quality of Life
RCT	Randomized Control Study
SAS	Statistical Analysis Software
SCOPUS	SCOPUS
SGA	Subjective Global Assessment of Nutritional Status
SIOG	International Society of Geriatric Oncology
SNAQ	Simplified Nutritional Assessment Questionnaire
SQL	Structured Query Language
VES-13	Vulnerable Elders Survey
WHO	World Health Organization

Chapter 1. Background and Significance

Introduction

The purpose of chapter one is to describe the background and significance of nutritional risk assessment for the older cancer patient undergoing systemic treatment via Phase I clinical trials. The chapter presents the study problem statement to guide the research.

An unprecedented shift in demographics is underway in the United States. More than 1.6 million people receive a cancer diagnosis annually, and that number is climbing sharply (IOM, 2013). One of the greatest risk factors for contracting cancer is aging. The mean age at the time of a cancer diagnosis is at age 66, and coincidently the first wave of baby boomers is now turning 70. As of 2013, approximately 10, 000 more individuals turn 70 each day. Additionally, by the year 2030 the number of new cancer cases will balloon to 2.3 million per year, a projected increase of 45% (ACS, 2013; NCI, 2013). Given the increased geriatric population in oncology, the research is timely.

Nutrition plays a major, but not always fully understood, role in many aspects of cancer development and treatment. Malnutrition is a common problem identified in cancer patients and is recognized as an important component of adverse outcomes, including increased morbidity and mortality and decreased QOL. Weight loss associated with malnutrition has also been identified as an indicator of poor prognosis in cancer patients (McMahon, Decker & Ottery, 2001).

Study Purpose

Taking into account the critical importance of this clinical problem, the purpose of this study describes the nutritional risk of cancer patients 65 years and older who are receiving systemic treatments via Phase I clinical trials. It describes the relationship between nutritional risk and the four domains of QOL (physical, social, emotional, and functional).

Background

The principles of nutrition care for people diagnosed with cancer were developed in 1979 and are still very relevant today. Proactive nutritional care can prevent or reduce the complications typically associated with the treatment of cancer (NCI, 2016). Many nutritional problems stem from local effects of the tumor. Tumors in the gastrointestinal tract, for example, can cause obstruction, nausea, vomiting, impaired digestion, and/or malabsorption. In addition to the effects of the tumor, marked alterations in normal metabolism of carbohydrates, protein, and/or fats can occur (NCI, 2016).

The nutritional prognostic indicators most recognized as being predictive of poor outcome include weight loss, wasting, and malnutrition (Bales, 2001). In addition, significant weight loss at the time of diagnosis has been associated with decreased survival and reduced response to surgery, radiation therapy, and/or chemotherapy (Bales, 2001).

Malnutrition and accompanying weight loss can be part of an individual's presentation or can be caused or aggravated by treatments for the disease. Identification of nutrition problems and treatment of nutrition-related symptoms have been shown to stabilize or reverse weight loss in 50% to 88% of oncology patients (NCI, 2016). Screening and nutrition assessment should be interdisciplinary; the healthcare team (e.g., physicians, nurses, registered dietitians, social workers, psychologists) should all be involved in nutritional management throughout the continuum of cancer care (NCI, 2016).

The nutritional status of patients diagnosed with cancer entering the treatment process varies. Not everyone begins therapy with anorexia, weight loss, and other symptoms of nutritional problems. For patients who have such symptoms, however, anticancer therapies can complicate the treatment and expected recovery (Bens, 2015).

Many individuals will present with preexisting co-morbid diseases and illnesses that further complicate their treatment. Surgery, chemotherapy, and radiation can have a direct (or mechanical) and/or an indirect (or metabolic) negative effect on nutritional status (Bens 2015). The success of the anticancer therapy will be influenced by a patient's ability to tolerate therapy, which will, in turn, be affected by nutritional status preceding treatment. The treating clinician should assess baseline nutritional status and be aware of the possible implications of the various therapies. Patients receiving aggressive cancer therapies typically need aggressive nutrition management. Bens (2015) recommends physicians should have required nutrition education to incorporate dietary recommendations into all cancer therapy protocols.

Nutritional Risk

What does it mean to be at nutritional risk? Being at nutritional risk does not necessarily mean that the older cancer patient undergoing therapy is malnourished, yet many professionals use the two terms interchangeably. Even though this is a particularly vulnerable group, the assessment of nutritional risk continues to be unmet in many treatment protocols. Although many assessment tools exist, they are sparsely and inconsistently utilized (Bales, 2001).

Nutritional risk assessment of the older adult cancer population undergoing therapy is a significant, under-recognized issue, and is not well-defined. Additionally, in examining the needs of the older person with the added burden of a cancer diagnosis and undergoing treatment, the gaps in assessment of the nutritional status and evaluation of dietary deficiencies of this group can be readily addressed (Isenring, Banks, Ferguson, & Bauer, 2012).

Malnutrition and associated weight loss is a common and persistent problem in older patients during and after cancer treatments. Evidence suggests that malnutrition is an

important predictor of poor QOL, treatment-related toxicity, increased morbidity, and poor prognosis in older cancer patients (McMahon, Decker & Ottery, 1998).

Despite the current evidence, strategies to assess and identify patients at risk for malnutrition are not fully integrated into routine oncology care. Possible causes include the following: 1) the definition of nutritional risk is poorly understood (Isenring & Elia, 2015; van Bokhorst-van der Schueren, et al., 2014), and 2) there is a deficiency in tools to assess nutritional risk that is relevant to older cancer survivors (Isenring & Elia, 2015; van Bokhorst-van der Schueren, et al., 2014).

Problem Statement

The World Health Organization (WHO) defines nutritional wellness/poor nutrition as, "The intake of food, considered in relation to the body's dietary needs. Good nutrition, an adequate, well-balanced diet combined with regular physical activity is a cornerstone of good health. Poor nutrition is the absence of a well-balanced diet which can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity" (WHO, 2014). For cancer patients, nutritional problems stem from a number of causes. Tumors in the gastrointestinal tract, for example, can cause obstruction, nausea, vomiting, impaired digestion, and/or malabsorption. In addition to the effects of the tumor, marked alterations in normal metabolism of carbohydrates, protein, and/or fats can occur (NCI, 2016). Malnutrition and accompanying weight loss can be part of an individual's presentation or can be caused or aggravated by treatments for the disease. Anticancer therapies can complicate nutritional status (Bens, 2015). In addition, significant weight loss at the time of diagnosis has been associated with decreased survival and reduced response to surgery, radiation therapy, and/or chemotherapy.

The nutritional prognostic indicators most recognized as being predictive of poor outcome include weight loss, wasting, and malnutrition (Bales, 2001). Nutritional relative risk

assessment is an approach to systematically place a specific risk factor in context of other contributing risk factors, including health and nutritional factors, to the overall disease outcome. The Institute of Medicine (IOM), (now renamed the National Academy of Medicine) report of 2013 mandates that a complete and ongoing nutritional status should be assessed and documented, according to the patient's unique vulnerabilities including physical, psychological, social, and spiritual needs (Extermann & Hurria, 2009; IOM, 2013). Since the 1980's many nutritional assessment tools have been developed; these include the Subjective Global Assessment (SGA), the Mini Nutritional Assessment (MNA-SF), the Malnutrition Universal Screening Tool (MUST) and Comprehensive Geriatric Assessment (CGA). Although many assessment tools exist, they are utilized sparsely and inconsistently (Isenring, Banks, Ferguson& Bauer, 2012).

Nutritional Risk Factors

The nutritional prognostic indicators most recognized as being predictive of poor outcome include weight loss, wasting, and malnutrition (Bales, 2001). Nutritional relative risk assessment is an approach to systematically place a specific risk factor in context of other contributing risk factors, including health and nutritional factors, to the overall disease outcome.

Effects of Nutritional Risk Assessment

Consequently, comprehensive nutritional risk assessment in older cancer patients remains an issue. Identification of nutritional problems has been shown to stabilize or reverse weight loss in 50% to 88% of oncology patients. Early identification and nutritional intervention for older cancer patients can decrease hospital admissions, morbidity, mortality, healthcare costs, resource utilization, and improve QOL (Isenring, Banks, Ferguson & Bauer, 2012).

Chapter 2. Review of the Literature

The purpose of chapter two is to present the literature synthesis that was completed in the area of nutritional risk assessment. The chapter presents the literature review methodology, findings, and implications for the proposed study.

This literature review explored and identified gaps in the current research related to assessment of nutritional risk in the cancer patient 65 and older undergoing systemic treatment via Phase I cancer therapy. The review focused on nutritional risk assessment, rather than the broad issue of nutrition. Review of actual instruments to assess nutritional risk status provided understanding of the factors influencing nutritional risk. Specifically, the systematized review is directed utilizing the Preferred Reporting Items of Systematic Reviews and Meta-analysis (PRISMA) statement (Hutton, et al., 2015; Moher, Liberati, & Altman, 2009).

Nutritional Risk in Older Cancer Patients

Nutritional risk assessment is an approach to systematically place a specific risk factor in context of other contributing risk factors, including health and nutritional factors, to the overall disease outcome. The definition of nutritional risk is poorly understood at best, and lacks consistency in its meaning (Isenring & Elia, 2015; van Bokhorst-van der Schueren, et al., 2014). The World Health Organization (WHO) definition of nutritional wellness is "the intake of food, considered in relation to the body's dietary needs." There is also a deficiency in the interpretation of the tools utilized in measuring nutritional risk.

Older cancer patients and their families experience numerous symptom and quality of life (QOL) concerns. Patient education is essential to support people in coping with multiple physical symptoms (anorexia, fatigue, dental issues, co-morbid conditions), psychological concerns (anxiety, depression), social concerns (finances, family burden, isolation), and spiritual issues (suffering, uncertainty) associated with advanced disease and

poor prognosis (Ferrell, Dow, Leigh, Gulasekaram, 1995; Hurria, et al., 2011). Placing the burden of a cancer diagnosis and the further encumbrance of oncology therapy (surgery, chemotherapy, or radiation) makes it difficult to distinguish the complexities surrounding nutritional risk in the older cancer patient undergoing therapy. However, identifying and treating nutritional risk before, during and after treatment may be crucial to positive clinical care outcomes.

Literature Review Methods

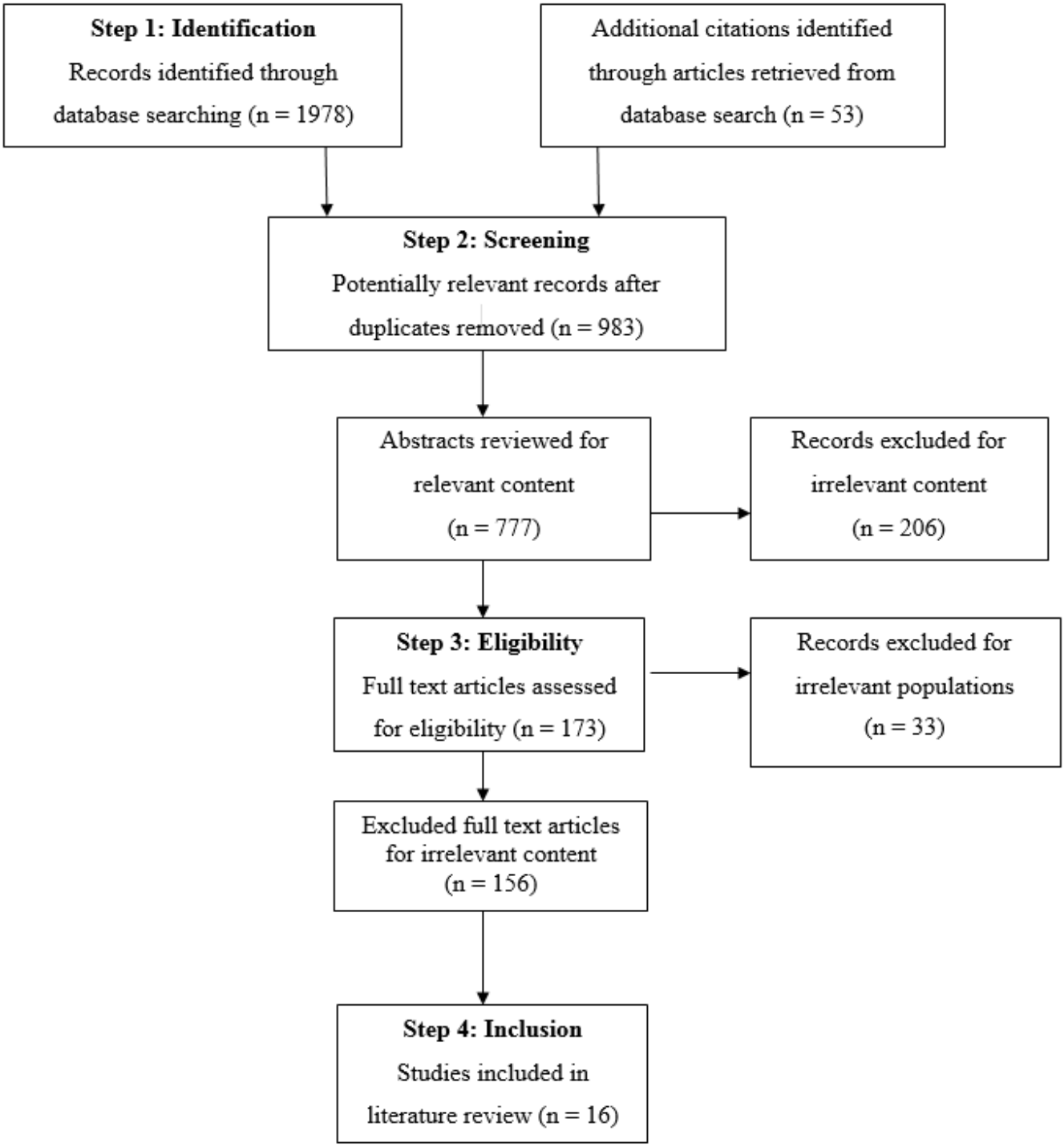
This review utilized Pub Med (using controlled vocabulary indexing of Medical Subject Headings [MeSH]), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Scopus electronic databases, and the PRISMA statement. Although a systematic review is most robust, for the purposes of this paper, a systematized review was used, as it is more appropriate for student work and single author efforts. The systematized review presents the same actions yet it does not include processes to establish inter-rater reliability within the literature review, as it is executed by one person only. This does make the analysis less reliable or comprehensive than a systematic review and there is a greater chance of study selection or exclusion bias (Grant & Booth, 2009). Multiple inclusion and exclusion criteria were applied as described below. The search was restricted to English language articles published between January of 2000 and March of 2015 and those related to humans. Posters, abstracts and oral abstracts were excluded. Studies addressing the nutritional risk, functional decline, and treatment reduction due to nutritional risk of the older cancer patient were included. Studies focusing on specific therapies, surgical interventions or younger populations were excluded. Standardized search terms were used when possible. Key words included geriatric, older adult, older, cancer, patient, nutrition, malnutrition, nutritional risk, nutritional assessment, QOL and therapy (Figure1).

Figure 1
Standardized Definitions of Search Terms

MeSH Term	Year Introduced	Definition
Older Adult	Not Identified	Having greater age than 65 years
Older	Not Identified	Having greater age than something or someone else
Cancer	400 B.C	A malignant and invasive growth or tumor, especially one originating in epithelium, tending to recur after excision and to metastasize to other sites
Patient	Not Identified	A person who is under medical care or treatment
Nutrition	1375-1425	The act or process of nourishing or of being nourished
Nutritional Risk	Not Identified	Not defined
Malnutrition	1950's	Lack of proper nutrition; inadequate or unbalanced nutrition
Nutritional Assessment	Not Identified	Not defined
Quality of Life	Not Identified	The standard of health, comfort, and happiness experienced by an individual or group.
Therapy	Not Identified	The treatment of disease or disorders, as by some remedial, rehabilitating, or curative process

A total of 1978 full-text articles were initially identified, including 53 retrieved from the reference lists of the articles identified. Of these, 16 articles were found to meet the inclusion criteria and used in this review (Figure 2). The current literature is replete on the issue of malnutrition in the older cancer patient. Along with the lack of an agreed-upon definition of nutritional risk, there is inconsistency in the interpretation of findings from the nutritional screening tools used. Furthermore, the nutritional screening tools used are utilized in a sparse and inconsistent manner.

Figure 2
PRISMA Flow Diagram Representing Selection of Studies



(Hutton, et al., 2015; Moher, Liberati, & Altman, 2009)

Results

The PRISMA statement calls for a four-step literature review procedure: 1) identification, 2) screening with duplicates and irrelevant content removed, 3) abstract review, and 4) full text article assessment for eligibility (Moher, Liberati, & Altman, 2009). The researcher screened titles, abstracts, and full-text items retrieved by the literature search. The choice for inclusion of an article in the sample was guided by the following principles: the article was written and published in English, included human cancer patients, the patients were older adults, were undergoing therapy, and there was a nutritional component to the article.

The 16 research studies included in the systematized review are identified and described in Table 1. The first column of Table 1 lists the author(s), title, and the year of publication. The second column states the purpose and concepts of the study, while column three lists the key words. Column four examine methods, designs, measures and samples utilized. Column five discusses the study findings while Column six details strengths and weaknesses. The 16 selected research articles consisted of prospective, descriptive studies, and two were pilots and two were randomized controlled trials. Although several of the articles addressed more comprehensive assessments than mere nutritional screening, in keeping with the focus of interest, this review focuses on nutritional risks of the older patient involved in the studies. To describe each study, the following details were characterized: author, title, journal, year, purpose of study, key words, major concepts, funding sources, and strengths and weakness (demographics, sample size, study design, content).

Table 1
Selected Research Articles

Authors/Title/Journal	Purpose/Concepts	Key Words	Design/Tools/n	Findings	Strengths/ Weaknesses
Chen, H., et al. (2003). Can older patients tolerate chemotherapy? *Cancer, 97*(4): 1107-1114	***Purpose:*** To identify predictors of toxicity from chemotherapy in older cancer patients ***Concepts:*** Examined barriers (such as poor nutritional intake) to older cancer pts receiving adequate treatment due functional decline	Cancer Older Geriatric Assessment Therapy	***Design:*** Prospective Pilot Study ***Tools:*** Instrumental Activities of Daily Living (IADL), Geriatric Depression Scale (GDS), Charlson Co-morbidity Index (CCI), Mini Nutritional Assessment (MNA-SF), Mini Mental Status Exam (MMSE), Functional Assessment of Cancer Therapy-General (FACT- G) (n = 37)	Older cancer patients undergoing chemotherapy may experience toxicity but generally can tolerate it with limited impact on independence, co-morbidity, and QOL levels. It is important to monitor these changes during geriatric oncology treatment	***Strengths***: Encompasses non- traditional end points in outcome research of cancer treatment. ***Weaknesses***: Small sample size (37) & short follow up (130 days)

Freyer, et al. (2005). Comprehensive geriatric assessment predicts tolerance to chemotherapy and survival in older patients with advanced ovarian cancer: a GINECO study. *Annals of Oncology, 16*: 1795-1800	***Purpose:*** To better define standards of care in older patients with advanced ovarian cancer ***Concepts:*** Effort to predict chemo tolerance and morbidity by pretreatment assessment (such as nutritional assessment/BMI)	Geriatric Assessment Older Patient Cancer Therapy	***Design:*** Prospective Clinical Trial Comprehensive Geriatric Assessment (CGA) (n = 60)	The CGA could predict severe toxicity and overall survival of older advanced ovarian carcinoma patients	***Strengths***: Simple parameters may be systematically assessed in pts, assisting MD to choose best treatment for pt. ***Weaknesses***: Lack of standardized geriatric assessment. Possible pt selection bias.
Ravasco, P., Monteiro-Grillo, I., Vidal, P.M., Camilo, M.E. (2005). Impact of nutrition on outcome: a perspective randomized controlled trial in patients with head and neck cancer undergoing radiotherapy. *Head and Neck:* 659-668	***Purpose*:** To determine the effect of dietary counseling ***Concepts:*** Demonstrated better outcomes & OS by pre & post treatment nutritional assessment, education, intervention & monitoring	Nutrition Patient Cancer Therapy	***Design:*** Prospective Randomized Controlled Trial ***Tools:*** Ottery's Subjective Global Assessment, European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ- C30) (n=75)	During radiation treatment, nutritional interventions positively influenced outcomes., and counseling was a similar/higher benefit; in the medium term, only counseling exerted a significant impact on patient outcomes	***Strengths***: 1st group to show that nutrition is a key determinant of QOL in pts with cancer ***Weaknesses***: Failed to mention cost or cost-savings of intervention

Hurria, A., et al., (2007). Identifying vulnerable older adults with cancer: Integrating geriatric assessment into oncology practice. *Geriatric Assessment in Oncology Practice, 55*: 1604-1608	***Purpose:*** To integrate the principles of geriatric assessment into standard of care for older patients with cancer ***Concepts:*** Utilizing CGA to assess functional & nutritional status to establish vulnerabilities in older cancer pts, along with establishing guidelines for appropriate multidisciplinary referrals (such as dietician)	Older Cancer Geriatric Assessment	***Design:*** Prospective Descriptive Study ***Tools:*** Abbreviated Comprehensive Geriatric Assessment (aCGA) (n = 245)	The aCGA, self-administered questionnaire is feasible for use in the outpatient oncology setting and helped identify the needs of geriatric oncology patients. Prospective trials are needed to determine the effectiveness of the interventions offered	***Strengths***: Introduction of a feasible geriatric tool identifying areas of vulnerability ***Weaknesses***: Population not representative of general population. Questionnaire content may not be objective. No threshold determined for nutritional referral and effectiveness of interventions
Stauder, R., Moser, K.Holxner, B., Sperner-Unterweger, B., & Kemmler, G. (2010). Six independent domains are defined by geriatric assessment in elderly cancer patients. *Clinical Reviews in Oncology/Hematology*: 97-105.	***Purpose:*** To assess geriatric assessment tools by determining the number of independent domains measured ***Concepts:*** Identified 6 domains for GA in older cancer pts (6^{th} domain is nutritional status) &	Geriatric Older Cancer Patient	***Design:*** Prospective Descriptive Study ***Tools:*** WHO Performance Status, Karnofsky Index (KPS), Activities of Daily Living (ADL), Instrumental	From the six domains described a basis for efficient application of the geriatric assessment instruments in older cancer patients is worked out. The classical instruments WHO and KI as well as the screening scores VES-13 and PPT, while capturing physical functioning well, fail to cover several other important GA domains	***Strengths***: Feasibility of GA was presented ***Weaknesses***: Evaluation of screening instruments not done. Done in Europe-cost in the U.S?

	determining the use of appropriate assessment instruments		Activities of Daily Living (IADL), Timed Get Up and Go (GUG), Physical Performance Test (PPT), Vulnerable Older Survey (VES-13), Functional Assessment of Cancer Therapy General Scale (FACT-G) Geriatric Depression Scale (GDS), Mini Mental Status Examination (MMSE), Cumulative Illness Rating Scale for Geriatricians (CIRS-G), Charlson Co-morbidity Index (CCI) (n = 78)		
Mudge, A.M., et al. (2011). Helping understand the nutritional gaps in the older: a prospective study of	***Purpose:*** To better understand patient-specific factors associated with poor intake to improve	Nutritional Older Older	***Design:*** Prospective Cohort Study	Inadequate nutritional intake is common, and patient factors contributing to poor intake should be considered	***Strengths***: Nutritional intake was direct observational. Inadequate intake was explicitly defined.

patient factors associated with inadequate nutritional intake in older medical inpatients. *Clinical Nutrition, 30*: 320-325	nutritional interventions ***Concepts:*** Identified nutritional gaps in older pts. Stressed the need for/possible guidelines for nutritional education & interventions		***Tools:*** Body Mass Index (BMI), Mini Nutritional Assessment (MNA-SF), Activities of Daily Living (ADL) ported (n = 134)	in designing nutritional interventions	Variables and confounders multidisciplinary perspective with validated measures ***Weaknesses***: Small sample size (134). Estimates of adequate nutritional intake may be optimistic. Single site study
Hurria, A., et al. (2011a). Implementing a geriatric assessment in cooperative group clinical cancer trials: CALBG 360401. *Journal of Clinical Oncology*, *29*(10):1290-1296	***Purpose:*** The geriatric assessment can predict morbidity and mortality in older adults, but are not routinely measured in cancer clinical trials ***Concepts:*** Examined the feasibility of integration of CGA in cancer clinical trials for geriatrics	Geriatric Assessment Cancer	***Design:*** Prospective Descriptive Cooperative Group Trial ***Tools:*** Comprehensive Geriatric Assessment (n = 85)	This brief, primarily self-administered geriatric assessment tool met the protocol specified criteria for inclusion in future cooperative group clinical trials	***Strengths***: Results may help to modify & develop CGA ***Weaknesses***: CGA may be too brief, missing subtle findings. May take too much time of MD/RN. Questionnaires were self-reported & may not be objective. Small sample size (85). Not representative of general population
Hurria, A., et al. (2011b). Predicting chemotherapy toxicity in older adults with cancer: a prospective multicenter study. *Journal of Clinical Oncology*,	***Purpose:*** To examine the toxicity of this vulnerable population, and identify the gaps in detecting those at risk, and develop a schema for studying	Therapy Older Cancer	***Design:*** Prospective Descriptive Multicenter Study ***Tools:*** Not reported	A risk stratification schema can establish the risk of chemotherapy toxicity in older adults. Geriatric assessment variables independently predicted the risk of toxicity	***Strengths***: Study fills critical gaps in frailty predictors for older patients ***Weaknesses***: Only reported grade 3 to 5 toxicities. Population may

29(25): 3457-3465	toxicity in the older adult ***Concepts:*** Study of older adults and factors affecting toxicity risk		(n = 500)		have been too heterogeneous. Findings need external validation
Isenring, E.A., Banks, M., Ferguson, M., & Bauer, J.D. (2012). Beyond malnutrition screening: appropriate methods to guide nutrition care for aged care residents. *Academy of Nutrition and Dietetics*, *112*(3): 376- 381	***Purpose:*** To determine the concurrent validity of several malnutrition screening tools and anthropometric parameters against validated nutrition assessment tools in the long-term care setting ***Concepts:*** Stressed the importance of nutritional screening in older pts. Attempted to examine the appropriate screening instruments	Nutritional screening Malnutrition Aged Nutrition	***Design:*** Prospective Cross-Sectional Observational Study ***Tools:*** Malnutrition Universal Screening Tool (MUST), Mini Nutritional Assessment Short Form (MNA-SF), Simplified Nutritional Assessment Questionnaire (SNAQ), Subjective Global Assessment (SGA), Body Mass Index (BMI) (n = 127)	MST, MUST, MNA-SF, and the anthropometric screens corrected arm muscle area and calf circumference have acceptable concurrent validity compared with validated nutrition assessment tools and can be used to triage nutrition care in the long-term setting	***Strengths***: Blinded research. Nutritional screens were randomized ***Weaknesses***: May have incorrect weighing of pts. Presence of malnutrition may have been underestimated due to population. Lack of standard tool makes classification difficult

Sourbeyran, P., et al. (2012). Predictors of early death risk in older patients treated with first-line chemotherapy for cancer. *Journal of Clinical Oncology, 30*: 1829	***Purpose:*** Exploring the gap in choices for treating the older cancer patient. To assist MDs in selecting appropriate treatments via factors predicting early death after initiating treatment ***Concepts:*** Comparison of usual care in functional & nutritional management vs. use of validated tools in an effort to predict at-risk pts for early death in older pts on chemo	Older Patient Therapy Cancer	***Design:*** Prospective Descriptive Study ***Tools:*** Abbreviated Comprehensive Geriatric Assessment (aCGA), Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Geriatric Depression Scale(GDS), Timed Get up and Go(GUG), Mini Nutritional Assessment (MNA-SF), Charlson Co-morbidity Index (CCI) (n = 348)	In patients greater than 70 years of age with cancer, advanced disease, a low MNA-SF score, and poor mobility predicted early death. It is recommended that the MNA-SF and GUG, performed by a trained nurse, be maintained as a part of routine pretreatment work up in these patients to identify at- risk patients and to inform the decision-making process of chemotherapy	***Strengths***: Broadens the scope for a standardized geriatric assessment. Study indicated prognostic power of MNA-SF in identification for early mortality ***Weaknesses***: No standardized tool for assessment. Different thresholds for intervention. Population may have been too heterogeneous
Hoppe, S., et al. (2013). Functional decline in older patients with cancer receiving first-line	***Purpose:*** To determine factors associated with early functional decline in	Older Cancer Therapy	***Design:*** Prospective Descriptive Study	There were associations between baseline depression, instrumental dependencies, and early functional decline during chemotherapy for older	***Strengths***: Specific consideration for definition of functional decline in older patients

chemotherapy. *Journal of Clinical Oncology*, *1*(31): 3877-3882	first-line therapy in older patients ***Concepts:*** The use of validated tools pre/during/post chemo to evaluate/predict/ prevent functional and nutritional decline		***Tools:*** Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Comprehensive Geriatric Assessment (CGA), Mini Nutritional Assessment (MNA-SF), Mini- Mental State Examination (MMSE), Geriatric Depression Scale (GDS), MAX2 index (n = 364)	patients.ADL should be sequentially evaluated early during treatment. Baseline evaluation of the GDS and the IADL may be proposed to anticipate this event	***Weaknesses***: Almost 18% of pts had to be excluded due to missing data. Unavailability of MD to assess pts. No descriptive analysis of targeted pt activity
Muffly, L.S., et al. (2013). Pilot study of comprehensive geriatric assessment (CGA) in allogeneic transplant: CGA captures a high prevalence of vulnerabilities in older transplant recipients. *ASBMT 19*:429-434	***Purpose:*** Studies the gap in evaluating the older adult transplant patient ***Concepts:*** Use of GA (& nutritional markers) in older Hematopoetic Cell Transplant (HCT) patients to predict/ prevent	Geriatric Assessmen t Older	***Design:*** Prospective Pilot Study ***Tools:*** Comprehen-sive Geriatric Assessment (CGA) (n = 228)	CGA uncovers a substantial prevalence of undocumented impairments in functional status, frailty, disability, and mental health in older allogeneic HCT patients	***Strengths***: Results are highly reproducible. Biological age gave good definition ***Weaknesses***: Single center study. Treatment regimens/dosing not consistent. Need for standardized tools. Inconsistency in

	vulnerabilities before transplant				Interventions
Chapman, A.E., Swartz, K., Schoppe, J., & Arenson, C. (2014). Development of a comprehensive multidisciplinary geriatric oncology center, the thomas jefferson university experience. *Journal of Geriatric Oncology*: 164-170	***Purpose:*** With the growth of the older population, we MUST determine the best assessment tools to examine this ever-growing population ***Concepts:*** Stressed importance of GA in older pts in order to develop an individualized education & intervention plan (such as dietary "navigation")	Geriatric Cancer	***Design:*** Prospective Descriptive Pilot Study ***Tools:*** Comprehensive Geriatric Assessment (CGA) (n = 211)	Potential discordance trends were observed with EGOG score and assessment of Fit/Vulnerable/Frail due to limitations in the data the paper was not able to illustrate definitive correlations. Several challenges with the development of the clinic include patient- related issues, navigation, financial reimbursement, referral patterns, and coordination of care during office hours. The authors felt the they were able to establish a model for a comprehensive multidisciplinary geriatric oncology evaluation center in the setting of a university-based cancer center	***Strengths***: Instituted use of pt navigator to assist with increasing data collection. Discussed territorial attitudes of MDs regarding referrals ***Weaknesses***: Missing data. Self- reported questionnaires may not be objective. Self-reports by pts conflicted with MD reports
Brugel, et al. (2014). Impact of comprehensive geriatric assessment on survival, function, and nutritional status in older patients with head and neck cancer; Protocol for a multicentre randomize controlled trial	***Purpose:*** To assess the impact of the CGA on overall survival, function, and nutritional status of older patients with head and neck cancer ***Concepts:*** Use of GA for all high-risk	Geriatric Assessment Older Patient	***Design:*** Multicenter Randomized Controlled Study ***Tools:*** Comprehensive Geriatric Assessment (CGA)	The authors expected the CGA to have a direct clinical benefit on the management of older cancer patients. If the expectation is fulfilled, the trial could lead to modification of the management model for older cancer patients	***Strengths***: 1st RCT evaluating the efficacy of the CGA in older cancer pts. Used validated tools only. Stressed need for multi-disciplinary approach to CGA. Nutritional consult should be standard of care. Adequate f/u times

(EGESOR). *BMC Cancer, 14*(427)	older cancer pts (head & neck) by evaluating functional & nutritional status/needs to customize treatment & follow up needs/ issues		(n = 704)		***Weaknesses***: GA is time consuming & proof of lack of resources in many clinics & centers. May have had contamination between intervention and control pts
Wakabayashi, H. & Sashika, H. (2014). Malnutrition is associated with poor rehabilitation outcomes in older inpatients with hospital associated reconditioning: A prospective cohort study. *Journal of Rehabilitative Medicine, 46*: 277-282	***Purpose:*** To investigate the association between nutritional status and rehabilitation outcomes in older patients with hospital-related de-conditioning ***Concepts:*** Examined the prevalence of malnutrition in older inpatients & associated poor outcomes	Malnutrition Older	***Design:*** Prospective Cohort Study ***Tools:*** Mini Nutritional Assessment (MNA-SF), Body Mass Index (BMI) (n = 169)	Most older inpatients with hospital-associated deconditioning are malnourished. Nutritional status, albumin, and chronic disease-related malnutrition are associated with poor rehabilitation outcomes in hospital-associated deconditioning	***Strengths***: Identified consistent gaps in nutritional assessment and wellness of patients ***Weaknesses***: No validated criteria used in intervention guidelines. MNA-SF may underestimate inadequate intake. May have confounding factors between outcomes. Intervention inconsistently performed
Kenis, C., Decoster, L., Ban Puyvelde, K., De Greve, J., Conings, G., Milisen, K., Flamaing, J., Lobelle, J.P., & Wildiers, H. (2014). Performance of two geriatric screening tools in older patients with cancer. *Journal of Clinical Oncology, 32*(1)	***Purpose:*** To compare the diagnostic characteristics of two geriatric screening tools to identify patients with a geriatric risk of functional decline and overall survival	Geriatric Older Patient Cancer	***Design:*** Prospective Multicenter Non-interventional Study ***Tools:*** G8, Triage Risk Screening Tool (TRST) (n = 937)	Both geriatric tools G8 and TRST (triage risk screening tool), are simple and useful instruments in older patients with cancer for identifying patients with a geriatric risk profile and have a strong prognostic value for functional decline and overall survival	***Strengths***: Use of (2) highly sensitive and easily used CA tools with strong prognostic factors for functional decline. Good time f/u points ***Weaknesses***: Could not define geriatric risk profile

	Concepts: Comparison of Triage Risk Screening Tool (TRST) & G8 to determine the feasibility & most effective tool in GA of older cancer pts				

Demographic Representation

Thirteen of the 16 studies reviewed identified populations of ≥ 65 years of age, with the other 2 including those ≥ 50 years, which was acceptable to the population being examined, due to the content of the study. The median age of participants in all articles was 72.5 years of age.

Types of Instrumentation and Measurement

Medical, nursing, psychological, and social work validated measures and tools were used in the selected 16 studies examining functional and nutritional well-being and risk. Tools examining risk(s) of functional and nutrition, such as the Comprehensive Geriatric Assessment (CGA), Abbreviated Geriatric Assessment (aCGA), Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Mini Nutritional Assessment Short Form (MNA-SF), Nutritional Risk Index (NRI).Malnutrition Screening Tool (MST), Malnutrition Universal Screening Tool (MUST), Simplified Nutritional Assessment Questionnaire (SNAQ), Subjective Global Assessment of Nutritional Status (SGA), Body Mass Index (BMI), and the G8 Screening Tool were identified in the literature. For the purposes of this review, only the nutritional content of tools will be discussed.

The use of surveys was evident in the selected literature and all papers employed previously published survey instruments (Figure 3). Instrumental Activities of Daily Living (IADL) were utilized by five studies (Chen, et al., 2003; Stauder, et al., 2010; Sourbeyran, et al., 2012 & Hoppe, et al., 2013).

Figure 3
Tools and Scales

Tools and Scales	Studies Using Tool or Scale (n)
Instrumental Activities of Daily Living (IADL)	5
Geriatric Depression Scale	4
Charlson Co-morbidity Index	3
Mini Nutritional Assessment (MNA-SF)	6
Comprehensive Geriatric Assessment	8
Functional Assessment of Cancer Therapy-General (FACT –G)	2
Mini Mental Status Examination (MMSE)	3
Activities of Daily Living	4
Body Mass Index	3
Subjective Global Assessment	2
European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30)	1
Karnofsky Index (KPS), Timed Get Up and Go (GUG), Physical Performance Test (PPT), Vulnerable Older Survey (VES-13), and Cumulative Illness Rating Scale for Geriatricians (CIRS-G).	1
Malnutrition Universal Screening Tool (MUST) and Simplified Nutritional Assessment Questionnaire (SNAQ).	1
G8 and Triage Risk Screening Tool (fTRST)	2

Synthesis of the Literature

Although most of the articles utilized more than one tool, the aCGA/CGA/SGA were most often employed (Freyer, et al., 2005; Hurria, et al., 2007; Hurria, et al,. 2011a; Sourbeyran, et al., 2012; Hoppe, et al., 2013; Muffly, et al., 2013; Chapman, et al., 2014 & Brugel, et al., 2014), followed by the MNA-SF (Chen, et al., 2003; Mudge, et al., 2011; Isenring, et al., 2012; Soubeyran, et al., 2012; Hoppe, et al., 2013 & Wakabayashi & Sashika, 2014). Freyer, et al. recruited 83 patients with the mean age of 76 and attempted to evaluate if the CGA could predict treatment tolerance and overall survival, and they concluded that it was successful. Hurria, et al. (2011a), advocated for the GA to identify vulnerable older adults with cancer. Their study consisted of 245 patients with a mean age of 76 and demonstrated that the GA is a valid tool for identifying vulnerable older cancer patients. These researchers emphasized the need to integrate the GA into daily oncology practice. In research by Hurria, et al. (2011b), the purpose of the study was to predict chemotherapy toxicity using the GA pre-treatment. There were 500 patients in this research with a mean age of 73. The results revealed the ability to predict chemotherapy toxicity in the older cancer patient.

Soubeyran, et al. (2012) aimed to predict early death risk in older cancer patients using the aCGA. The study consisted of 348 participants with a mean age of 77.45. The research demonstrated that those patients over the age of 70 and a low MNA-SF and GUG (part of the aCGA) predicted an early death. They recommended the use of both tools by a trained nurse for routine pre-treatment evaluation. Hoppe, et al. (2013), measured functional decline in 364 older cancer patients receiving first- line chemotherapy. The tool of choice was the CGA (including the MNA-SF). Their research yielded the recommendation for the ADL, GDS, and IADL to all be conducted at baseline.

Muffly, et al., conducted a study using the CGA in transplant patients in an effort to capture the high prevalence of vulnerability in older transplant patients. There were 228 patients over age 50. They found that the CGA uncovered a host of undocumented impairments in functional status, along with frailty, disability, and mental health concerns in this population.

Chapman, et al. (2014), were striving to develop a comprehensive multidisciplinary geriatric oncology center. Realizing that the older population was growing rapidly, they noted the need to provide standardized care for this vulnerable group. Using the CGA, they identified interesting trends involving Eastern Cooperative Oncology Group (ECOG) scores and assessment of fitness and frailty, yet noted challenges in being able to develop a comprehensive clinic. In a study by Brugel, et al. (2014), the researchers examined the impact of the CGA on survival, function, and nutritional status in a multi-center randomized controlled study with patients aged 70 or older. The CGA was administered before treatment began. Findings were that the use of a CGA, improved survival, reduced admission rates, and enhanced functional status of this population.

The MNA-SF was utilized by Chen, et al. (2003), in order to determine if older patients (n=37) can tolerate chemotherapy. The researchers concluded that older cancer patients undergoing therapy may experience some toxicities, yet generally tolerate treatment with limited impact. They recognized the importance of careful monitoring of these patients in order to maintain QOL and functional status. The MNA-SF was selected for this dissertation and the rationale is discussed in chapter 3 in the measures section

Mudge, et al. (2011), realizing that malnutrition is an enormous problem in older adults, were striving to identify study gaps in nutrition of the older adult patient. There were 134 participants in the study with a mean age of 80. The researchers concluded that inadequate nutritional intake is common, and a major factor contributing to this issue was a

lack of strong intervention design. Among various tools used, the MNA-SF revealed that 31% of the patients were malnourished with an additional 37% at-risk for malnutrition. In a similar study, Isenring, et al.(2012), sought to examine appropriate methods to guide nutritional screening. There were 127 residents in the study, all over the age of 55. The investigator's results showed that the MST, MUST, and MNA-SF were acceptable methods of nutritional assessment, and all useful in triaging cases for the older client.

The research by Soubeyran, et al. (2012), (n=348) utilized several tools (among them the MNA-SF) to assist in predicting early death risk in older patients treated with first-line chemotherapy. The research documented that those patients over the age of 70, with cancer, advanced disease, and a low MNA-SF score predicted early death. They recommended the MNA-SF and GUG be administered by a trained nurse as part of the routine pre-treatment work up. Hoppe, et al. (2013), studied the functional decline in older cancer patients receiving first-line chemotherapy. There were 364 participants in this study who were aged 70 or above. The results showed association between depression, IADLs, low MNA-SF, and functional decline. Wakabayashi & Sashika (2014) evaluated malnutrition with poor rehabilitation outcomes in older hospital patients. The study consisted of 187 patients who were aged 65 and over. Conclusions were that the MNA-SF and BMI were adequate tools to measure for malnutrition, and 87.6% of the patients were determined to be malnourished.

Although several other tools were used to measure nutritional risk, each of the studies showed the MNA-SF to be a valid, acceptable tool for which to measure nutritional risk. The aCGA/CGA/SGA were more comprehensive, yet very time consuming and deemed not cost effective in the clinical setting. The MNA-SF was short, succinct, and easy to use.

Of all the literature reviewed, it is interesting to note that all the studies dealt with the older adult cancer patients, and some assessed QOL scores or psychological

dimensions, while others assessed only physical aspects, such as whether the patient was on chemotherapy (what drugs were used, weight loss). Most studies recognized BMI as an important risk factor, therefore, there is very strong agreement about this. However, across the studies there was great variability in terms of what other concepts or variables were included. All the studies recognized nutritional assessment as important and that older adults are at higher risk. They also focused on the time of active treatment as particular risk.

Discussion

Studies reviewed show that severe malnutrition and weight loss play a significant role in one of five cancer deaths, yet nutrition is often an afterthought in the healthcare arena. Identification of nutritional risk and treatment of nutrition-related symptoms have been shown to stabilize or reverse weight loss in 50-88% of oncology patients (NCI, 2016). At the time of diagnosis, up to one fourth of patients are suffering anorexia, and most treatments bring with them additional side effects such as nausea, vomiting, and diarrhea. Older patients deal on a daily basis with co-morbidities, malabsorption, dental and financial issues.

To make the right treatment decisions for older patients with cancer, an approach involving a CGA is advocated in several studies (Freyer, et al.; Hurria, et al; Hoppe, et al.; Muffly, et al.; and Brugel, et al., 2014). Older patients are more likely than their younger counterparts to present with functional dependence, co-morbidity, polypharmacy, malnutrition, cognitive dysfunction, and depression. It has been shown that a routine clinical evaluation including assessment of performance status does not capture the full range of problems these patients may have (Sourbeyran et al., 2012). In addition to identifying remediable conditions influencing treatment, CGA is thought to be helpful in establishing treatment goals (SIOG, 2015). The CGA is a mixture of validated screening tools (several different models of the CGA exist), such as G8, ECOG, fTRST, VES-13,

ADL, IADL, MMSE, GDS, MNA-SF, GUG, CIRS-G, ACE 27, MAX2, and the. QLQ-C30. The validity of CGA assessment questionnaires to predict outcome and adverse events during the management of the older patients with cancer is now established (Hurria, et al., 2011a). Yet a comprehensive CGA is often not feasible in all older patients with cancer (SIOG, 2015) and although it has a nutritional component, its aim is to assess for frailty in the older adult patient population. It has been often documented that it is time-consuming and resource excessive (SIOG, 2015).

Investigators suggest that patients could be first screened with the MNA-SF (or the MNA-SF) before considering the more comprehensive CGA. The patient information needed to assess for nutritional risk is easily collected utilizing the MNA-SF. The MNA-SF is the most widely used tool for patients 65 and older, a highly sensitive and specific (98 and 100%, respectively), validated and reliable nutrition screening and assessment instrument that can identify geriatric patients who are malnourished or at risk of malnutrition. Studies have demonstrated internal consistency to range from 0.81 to 0.89 (Kaiser, et al., 2011). It is recommended by national and international clinical and scientific organizations and has been validated in over 400 studies (Kondrup, et al., 2003; Salva, et al., 2004). The MNA-SF was developed nearly 20 years ago and is the most well validated nutrition screening tool for the older patient.

Originally comprised of 18 questions, the current MNA-SF now consists of six questions and streamlines the screening process. The current MNA-SF retains the validity and accuracy of the original MNA-SF in identifying older adults who are malnourished or at-risk of malnutrition (Rubenstein, et al., 2001). The revised MNA-SF Short Form (MNA-SF) (with a sensitivity of 96% and specificity of 98%) makes the link to intervention easier and quicker (usually taking less than five minutes to complete), and is now the preferred

form of the MNA-SF for clinical use (Rubenstein, et al., 2001). It can be used in a wide variety of settings, requires no special training, no lab data, and is available in 24 languages.

The MNA-SF targets the frail older and at-risk geriatric population and identifies the malnourished so intervention can begin immediately. It also identifies at-risk persons before weight loss occurs and serum protein levels fall, and facilitates earlier intervention when response is most successful (Delacorte, et al., 2004). The MNA-SF identifies at-risk persons before other validated nutrition screening tools do (Bauer, et al., 2005), and also those who may respond to treatment or may have poor outcomes. The tool not only detects people who are at nutritional risk, but allows healthcare professionals to target interventions to specific causes of malnutrition (Gregorio, et al., 2003).

Implications for Future Studies

Current studies do not support the assumption that older patients are unable to undergo cancer therapy. Certainly, they suffer more co-morbid conditions, but this does not support exclusion from treatments such as chemotherapy or radiation or participation in clinical trials. Future research should evaluate aggressive nutritional risk screening in the older cancer patient before, during, and post-treatment. The outcome measures need to be comprehensive enough to capture clinical, psychological, social, spiritual, and QOL aspects of each patient's life with robust and validated tools.

Conclusion

Advanced healthcare professionals can provide timely, comprehensive, nutritional assessment and education to older cancer patients undergoing therapy. Gaps remain in the literature regarding how to identify nutritional risk in the older cancer adult undergoing therapy. While many tools are available, they are not utilized consistently. Additionally, few studies include older cancer patients.

Cancer treatments are increasingly being done in the outpatient setting, which makes it even more important for oncology professionals to monitor these individuals continuously, which is not being done. Thus, research should be conducted at baseline in the outpatient setting. Nutritional risk screening should be done as an interdisciplinary, ongoing process throughout the cancer trajectory.

Chapter 3. Methodology

The purpose of chapter 3 includes an overview of the study design, sample and population, description of measures used in the proposed study, research methods, and statistical analysis plan. In addition, the chapter will include an overview of the plan for human subject's protection and ethical considerations. Finally, the chapter will close with a summary of the overall timeline for the study.

Study Purpose

The overall purpose of this study describes the nutritional risk of cancer patients 65 years and older who are receiving systemic treatments via Phase I clinical trials. It describes the relationship between nutritional risk and the four domains of QOL (physical, social, emotional, and functional).

Hypotheses

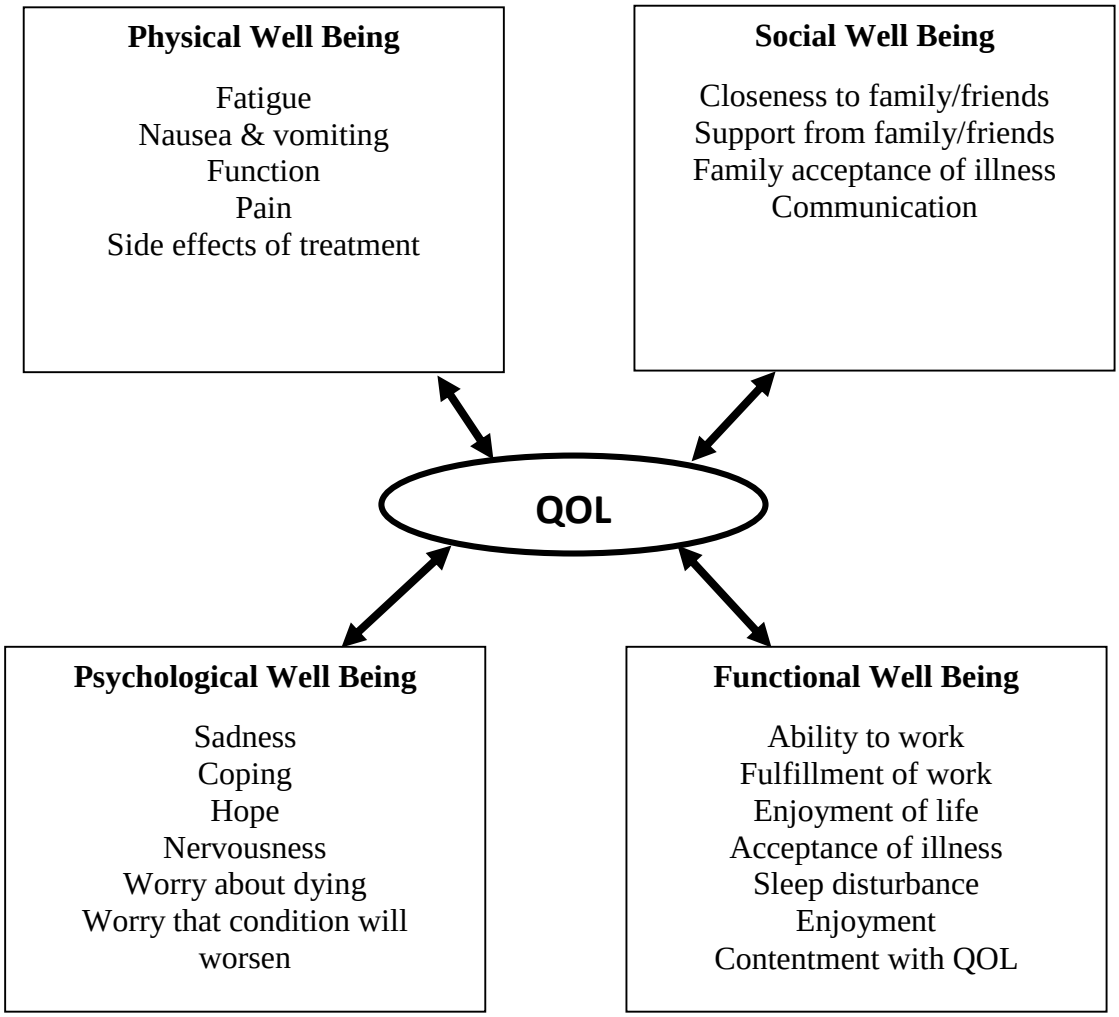
1) Nutritional risk is associated with demographic and disease/treatment variables of age, gender, and time since diagnosis and treatments.
2) Nutritional risk is associated with QOL including physical, emotional, social, and functional well-being and overall QOL.

Conceptual Model

This study was guided conceptually by an adapted version of the City of Hope QOL model that addresses nutritional risk in older cancer patients, focusing on the four key domains of QOL (Ferrell, Dow, Leigh, Gulasekaram, 1995). The World Health Organization defines QOL as ''individuals' perceptions of their position in life in the context of the culture and value system in which they live and in relation to their goals, standards, and concerns'' (Revicki et al., 2000). The definition includes six broad domains: physical health, psychological state, levels of independence, social relationships, environmental features, and spiritual concerns. This broad definition includes aspects such as the environment (food and

nutrition, etc.) not usually included in the perspective of QOL for cancer patients. This conceptual framework of the City of Hope QOL Model is defined as consisting of four dimensions or domains (Figure 4). Physical well-being issues are focused on common disease or treatment- related symptoms that may impact nutritional status and/or put patients at high-risk for malnutrition. These include pain, fatigue, and nausea. Emotional well-being issues include anxiety, depression, fear of recurrence and coping. Social well-being domain issues include family distress, social support, communication, and isolation, all of which can impact patient's ability to access foods and nutrition. Functional well-being concerns ability to work, enjoyment, sleep disturbance, and overall QOL. The City of Hope QOL model acknowledges that a person's QOL is 1) subjective, 2) based on the self-report, 3) always changing and dynamic, and 4) a multidimensional concept (Ferrell, Dow, Leigh, Gulasekaram, 1995). This study does measure physical, emotional, social, and functional well-being consistent with the City of Hope QOL Model.

Figure 4
City of Hope QOL Model Applied to Nutritional Risk in Older Cancer Patients



(Ferrell, Dow, Leigh, Ly, & Gulasekaram, 1995)

Overall Research Design

The study was a retrospective, descriptive, cross-sectional, descriptive correlational survey study done at a single point in time. Baseline assessment was done only.

Sample and Setting

The sample consisted of solid tumor cancer patients receiving disease-directed therapies in Phase I clinical trials. Patients were enrolled in a National Cancer Institute (NCI)-funded R01 that evaluated the efficacy of a palliative care intervention. The sample provided patients for this dissertation. Inclusion criteria are as follows:

- Patients diagnosed with solid tumors who are eligible for participation in Phase I clinical trials of investigational cancer therapies.
- Patients who have signed an informed consent for participation in Phase I clinical trials.
- Age 65 years or over.
- Able to read or understand English – this is included because the intervention and study materials (including outcome measures) are only in English.
- Ability to read at a fifth grade level and/or understand the study protocol requirements, and provide written informed consent.

Exclusion criteria includes patients diagnosed with hematologic (as a population distinct from solid tumors and different trials) cancers.

Participants were enrolled in the ambulatory clinic of an NCI-designated comprehensive cancer center in Southern California. The study utilized a cross-sectional sampling of eligible patients enrolled in the Randomized Controlled Trial (RCT). All solid tumor patients who have signed an informed consent for participation in a Phase I clinical trial and who also meet the inclusion criteria for this study were identified by their treating oncologist who then notified the investigator, the PhD candidate (PhDc), for screening. After eligibility screening,

the investigator, contacted eligible patients and explained the study purpose, answer any questions, and ascertain interest in participation. If the patient agrees, written informed consent was obtained (Appendix A). Accrual began March 3, 2017, and continued through the month of February 2019.

Measures

The Mini Nutritional Assessment Short Form (The MNA-SF) (Appendix B) - is a reliable and valid measure for nutritional risk in older cancer patients. The patient information needed to assess for nutritional risk is easily collected utilizing the MNA-SF as it gathers all the pertinent data in which to assess for nutritional risk in the older adult cancer patient. The MNA-SF is the most widely used tool in older adults, and is a highly sensitive and specific, validated and reliable nutrition screening and assessment instrument that can identify geriatric patients age 65 and above who are malnourished or at-risk of malnutrition. Validity was established confirming the six items of the MNA-SF scores with other measures of nutritional status (such as BMI and anthropometric parameters) with correlations of .83 to .86 (Kaiser, et al., 2009). It is recommended by national and international clinical and scientific organizations and has been validated in over 400 studies (Kondrup, et al., 2003; Salva, et al., 2004). The revised MNA-SF makes the link to intervention easier and quicker (usually taking less than five minutes to complete), and is now the preferred form of the MNA-SF for clinical use (Rubenstein, et al., 2001). It can be used in a wide variety of settings, requires no special training, no labs, and is available in 24 languages. It also identifies at-risk persons before weight loss occurs and serum protein levels fall, and facilitates earlier intervention when response is most successful (Delacorte, et al., 2004). A representative from Nestle granted approval for use of the eight-item instrument (Appendix C).

Other measures used in this study included the following:

Demographic and Disease Tool (Appendix D) – This tool was developed by the RO1 investigators (Ferrell, et al., (2019) and used to compile information on each patient at baseline. It includes information on age, ethnicity, education level, religious affiliation, marital status, living situation, employment, annual income, past treatment, co-morbidities, social support, functional status, cancer diagnosis, and time since diagnosis.

Functional Assessment of Cancer Therapy-General (FACT-G) (Appendix E) – The FACT-G (Version 4), created by Cella, et al. (1993), is a cancer specific version of the FACIT (Functional Assessment of Chronic Illness Therapy) Measurement System. It contains a 27-item compilation of general questions divided into four QOL domains: Physical Well-Being, Emotional Well-Being, Social/Family Well-Being and Functional Well-Being. For each item, the respondent indicates on a 5-point Likert scale (0=not at all; 5=very much) how true each statement is for him/her during the past seven days. The FACT-G yields a total score for the overall QOL as well as subscale scores. Internal consistency and reliability measures revealed a Cronbach's coefficient alpha of 0.89 for the total FACT-G. Coefficients for the four subscales are as follows: 0.82 for physical well-being, 0.74 for emotional well-being, 0.69 for social well-being and 0.80 for functional well-being. Validity of the FACT-G was established by Cella, et al. (1993), using ANOVA of scores from four groups of patients/survivors. Comparisons demonstrated construct validity for the FACT-G Total Score and four subscales of $<.05$ to $<.001$.

Timeline

Data in the parent study (the RO1 focused on Phase I clinical trial patients), was collected at baseline and at four, twelve, 16, and 24 weeks from September, 2014 to March, 2019. This study began accrual in February 2017, to February, 2019. Only baseline data was used since the purpose of this study describes the nutritional risk of cancer patients 65 years and older who are beginning systemic treatments via Phase I clinical trials.

Data Analysis

Procedures

Demographic data was collected for eligible patients at baseline. The MNA-SF and FACT-G tools were also administered at baseline (Table 2).

Table 2
Measures and Tools

Measures/Tools	Reliability	Validity	Sensitivity	Specificity
Demographic and Disease Tool	The tool is completed via chart audit by the PhDc with any questions clarified with the patient and/or primary physician	The tool is limited to demographic variables	The tool has been used extensively by City of Hope investigators and designed for the oncology population	The tool was designed specific to the oncology population with items 10-14 specific to oncology treatment and item 15 to capture comorbidities of specific interest for older patients
FACT-G	Cronbach's alpha .89 for total tool and .69 -.82 for the four subscales	Construct validity established by comparison of patient groups for scale and subscales by ANOVA ($p < .05$)	The FACT-G is sensitive to variables of interest for this study including physical, social, emotional and functional items which would be related to nutritional risk	The FACT-G is the cancer-specific tool within the FACIT measurement library
MNA-SF	Internal consistency for the 6 items have been established at .81 - .89	Validity was established through concurrent measures (BMI and anthropometrics) at .83 - .86	The 6 items reflect variables of importance in oncology	The items reflect concerns of significance to older cancer patients in treatment (e.g. food intake, weight loss, mobility, stress and sadness)

The City of Hope Biostatistics Core designed and implemented a relational data management system that serves three functions: a tracking function (screening, consent, enrollment, data collection and tracking accrual), a reminder function, and a data entry and storage function. Queries were available to address data validity and integrity, data collection inconsistency, data inaccuracy or incompleteness.

Data packets which were scanned are designed using the Telescan system to minimize time and inherent error in keyed data entry. Completed instruments were numbered according to group, data point, and unique identification number. The Principal Investigator, the PhDc kept the list of subject names and identification numbers in a locked file cabinet. Each completed instrument was numbered appropriately, copied, and the copies filed in a locked cabinet, while originals were transferred for data entry and analysis. Data scanned from Telescan forms were stored in the SQL database on a secured network. Data were read using Statistical Analysis Software (SAS). All multi-item instruments were scored according to the scoring manuals or other formal scoring rules as appropriate.

Demographic data were analyzed using descriptive statistics (means, ranges, and percentiles). Hypothesis 1, is Nutritional risk is associated with demographic and disease variables of age, gender, race, cancer diagnosis, and time since diagnosis. Data for this hypothesis was analyzed using multiple regression to determine factors influencing MNA-SF scores. Hypothesis 2, is nutritional risk associated with QOL including physical, emotional, social, and functional well-being and overall QOL. This hypothesis was also analyzed through multiple regression using FACT-G Total and Subscale Scores and MNA-SF Total Score.

Human Subjects

1. Risks To The Subjects

1a) Characteristics, Inclusion of Women, Minorities and Children - The sample included older adult patients with solid tumors who are participating in Phase I clinical trials. Additional effort was made to recruit minorities. Children were not included as the study was limited to men and women 21 years and older with a solid tumor diagnosis.

1b) Sources of Research Materials - All data collection was limited to written surveys used widely in cancer research and selected to minimize subject burden. Privacy was provided for all data collection.

1c) Potential Risks – All contacts with the patient was arranged at the patient's convenience and in the setting preferred (clinic or home visit). The only potential risk involved was emotional distress in discussing their symptoms and QOL needs. The time required for data collection was approximately 30 minutes. In any situation where a patient was experiencing uncontrolled symptoms, the PhDc contacted the treating oncologist immediately.

2. Adequacy of Protection Against Risks

2a) Recruitment and Informed Consent – Patients were identified through selection of eligible patients through the treating oncologist. Potential subjects had their first contact with the PhDc through identification by the treating oncologist. The PhDc and oncologists ascertained patient interest in the study. The PhDc and oncologists verified eligibility and contacted the patient in the clinic or by phone. The PhDc informed the patient about the nature of their participation and the duration of the study. The PhDc informed patients of all data collection methods, the time required, and potential risks. Patients had the opportunity to ask questions, and were free to withdraw from the study at any time. Patients were also provided the opportunity to refuse to answer any specific questions. The PhDc obtained written consent, (Appendix A) approved by COH, from all subjects.

2b) Protection Against Risks – Participation was voluntary and all data were kept anonymous and confidential. Subjects' names were not included on data instruments and all data were maintained in the PhDc's locked files.

3. Potential Benefits of the Proposed Research to the Subjects and Others

3a) Included recognition of nutritional risks, QOL concerns, and symptoms.

4. Importance of the Knowledge to be Gained – Knowledge to be gained from this study may potentially benefit present and future cancer patients by addressing nutritional risks, QOL concerns and symptoms. The knowledge from this study will also likely be applicable to other patients receiving active treatment for advanced cancers.

5. Data and Safety Monitoring Plan – This protocol was approved by the COH Cancer Protocol Research Monitoring Committee (CPRMC), Data Safety and Monitoring Board (DSMB), and the Institutional Review Board (IRB) of both COH and the UoH. Institutional procedures for quality control, data management and analysis was obtained prior to patient recruitment. The PhDc password protected the database containing the sampling frame of potentially eligible patients. The outcome data, process data, and quality control data was stored with a coded number, in a locked cabinet. No patient identifiers were listed in the database and only numerical identifiers were used.

Potential Limitations

Limitations include a relatively small sample size at one facility, which is oncology-focused. It is a convenience sample which is part of a larger study of Phase I clinical trial patients. Participant recruitment was limited due to little to no incentive to complete the survey. Generalizability is limited to the sample and not other various populations for replication.

Summary of Chapter 3

Despite the current evidence, strategies to assess and identify patients at risk for malnutrition are not fully integrated into routine oncology care. Possible causes for this include the following: 1) the definition of nutritional risk is poorly understood (Isenring & Elia, 2015; van Bokhorst-van der Schueren, et al., 2014), and 2) there is a deficiency in tools to assess nutritional risk that is relevant to older cancer patients. It is our responsibility as healthcare professionals to provide timely, comprehensive, nutritional assessment and education to our older cancer patients undergoing therapy - a vulnerable population. Cancer treatments are increasingly being done in the outpatient setting, which makes it even more important to monitor these individuals continuously. Nutritional risk screening should be done as an interdisciplinary, ongoing process throughout the cancer trajectory. In this study the PhDc described the methodology of a study to describe the nutritional risk of older cancer patients (65 years and older) who are receiving systemic treatments via Phase I clinical trials. The PhDc aimed to determine the utility of the MNA-SF as a valid nutritional risk assessment, and seeks to identify high-risk populations by assessing factors that predict malnutrition and weight loss in older cancer patients.

Chapter 4. Results

This chapter presents the results from the completed quantitative, descriptive study of cancer patients 65 and older undergoing systemic cancer treatments using a cross-sectional survey method. A discussion of the sample, data analysis and summary of the results is included.

Research Approval and Site

This study was conducted in the Southern California area location at the City of Hope National Medical Center campus. The Institutional Review Board for the City of Hope approved the parent RO1 IRB reference # 13193/138023 (Appendix F) and an amendment to add the MNA-SF as a nutritional aspect and focus of this dissertation. The Institutional Review Board for the University of Hawaii approved this retrospective study using the RO1 data in January of 2019 Reference # 2018-01098 (Appendix G). Data included in this study were collected from February 2017 to February 2019.

Sample

Description of Participants

The sample consisted of patients 65 years or older with solid tumor cancers receiving disease-directed therapies in Phase I clinical trials. Patients were enrolled in a National Cancer Institute (NCI)-funded R01 that evaluated the efficacy of a palliative care intervention. The sample for this dissertation research consisted of a total of 73 patients. Inclusion criteria were as follows:

- Patients diagnosed with solid tumors who were eligible for participation in Phase I clinical trials of investigational cancer therapies.
- Patients who had signed an informed consent for participation in Phase I clinical trials.
- Age 65 years or over.

- Able to read or understand English. This is included because the intervention and study materials (including outcome measures) were available only in English.
- Ability to read at a fifth grade level and/or understand the study protocol requirements, and provide written informed consent.

The investigator used the data from the RO1 study to conduct a secondary analysis focused on the older patients and their nutritional needs.

Results

Data Analysis Methods

Patient characteristics were summarized using mean, standard deviation, median and range for continuous data such as age, BMI, number of comorbidities, and all QOL scores. Categorical data were summarized using frequencies and percentages. QOL metrics from the FACT-G questionnaire were further detailed by individual questions within the questionnaire, and summarized by subscale and overall score. The MNA-SF questionnaire contained six questions, the detailed summary of which is provided along with the overall score. In addition, MNA-SF scores were examined in more detail with respect to several key patient characteristics.

The Pearson correlation coefficient was calculated to observe the strength and significance of the association between demographic variables as well as QOL metrics and the overall MNA-SF score obtained at baseline. Univariate and multivariate linear regression was then conducted to see how well the overall MNA-SF score could be predicted using age, BMI, gender, treatment (surgery, chemotherapy and radiation), the FACT-G overall score, and FACT-G subscales. Predictors included in the univariate analysis were entered into the multivariate model using the stepwise method. Variables were entered into the multivariate model if their corresponding p-value fell below the threshold of 0.15, and were retained in the model if the p-value remained below 0.10 once

combined with the remaining variables sustained in the previous step or iteration (Tabachnick & Fidell, 2018). Since the data used in this analysis involved baseline data only, the data completions rate was high (>99%), and occurrence of missing values in the data was infrequent. Thus, no imputations or interpolation was needed or done.

Baseline patient demographics and other characteristics are summarized in Table 3, and disease and treatment variables are summarized in Table 4. QOL metrics from the FACT-G questionnaire were further detailed by individual questions within the questionnaire, and summarized by subscale as well overall score in Table 5. Responses to the six questions from the MNA-SF questionnaire, as well as the overall MNA-SF summary score are reported in Table 6. Additional MNA-SF score distributions were examined with respect to patient age group, gender, BMI, race/ethnicity, and time since cancer diagnosis (Table 7).

Demographic Data

The demographics of the sample (n=73) are presented in Table 3. The average age was 71.4, and 53.4% of the participants were female. Over 76% were Caucasian with 23% were minorities. African Americans accounted for 2.7%, there were 8.2% Asian, Hispanics made up 8.2%, Native Americans plus "other race" accounted for 1.4%, and Native Hawaiian/Pacific Islander made up 2.7% of the population. The educational level yielded 79.5% of college-educated subjects, and 34.2% were Protestant as the most common religious group. Sixty-nine percent (69.9%) were either married or partnered with 69% living with a spouse or child. Seventy-three percent (72.6%) were retired and 61.6% had a family income of greater than $50,000.

Table 3
Patient Demographics

Patient Characteristics	**n (%), mean(std) or median (min, max)**
Age (y)	71.4 (5.1) 70 (65, 90)
Gender	
Female	39 (53.4%)
Male	34 (46.6%)
Race	
African American	2 (2.7%)
Asian	6 (8.2%)
Caucasian	56 (76.7%)
Hispanic Latino	6 (8.2%)
Native American plus Other Race	1 (1.4%)
Native Haw/Pacific Islander	2 (2.7%)
Education	
Did not complete High School	1 (1.4%)
High School	7 (9.6%)
College	58 (79.5%)
Graduate/Professional School	6 (8.2%)
Not Reported	1 (1.4%)
Religion	
None	12 (16.4%)
Catholic	20 (27.4%)
Jewish	11 (15.1%)
Protestant	25 (34.2%)
Other	5 (6.8%)
Marital Status	
Never married	3 (4.1%)
Married or partnered	51 (69.9%)
Divorced	10 (13.7%)
Widowed	9 (12.3%)
Other members	
Alone	14 (19.7%)
Children/Parents/Relatives	5 (6.8%)
Friend	3 (4.2%)
Spouse/Children	49 (69.0%)
Other	2 (0.3%)
Employment Status	
Employed full time	7 (9.6%)
Employed part time	8 (11.0%)
Homemaker	2 (2.7%)
Retired	53 (72.6%)
Unemployed	3 (4.1%)
Family Income	
$20,001 to $30,000	1 (1.4%)
$40,001 to $50,000	15 (20.5%)
Greater than $50,000	45 (61.6%)
Not Reported	12 (16.4%)

Disease and Treatment Characteristics

Disease and treatment characteristics are described in Table 4. The sample included several types of solid tumors with ovarian followed by colon as the most predominant cancers.

In terms of year of cancer diagnosis, 19.2% were diagnosed in 2010 or earlier, with 37.9% being diagnosed from 2011-2015. Thus, the majority of these patients were diagnosed eight or more years ago which is representative of patients who are now being placed on a Phase I clinical trials. Most patients had previous surgery and chemotherapy and approximately 43% had previous radiation therapy.

Only 21.9% had tried alternative therapies. The average number of co-morbidities was 2.2. Over 35% of the participants had an advanced care directive and only 39.7% had named a proxy decision maker. The 60 patients reporting on code status were equally divided between having a Do Not Resuscitate (DNR) order and having a full code status. Only 11% had been referred to the Pain and Palliative Care service and only 56.2% had been referred to Social Work.

Table 4
Disease and Treatment Characteristics

Disease/Treatment Characteristics	**n (%), mean(std) or median(min, max)**
Type of Cancer	
Ovarian	11 (15.1%)
Colon	9 (12.3%)
Lung	8 (11.0%)
Prostate	8 (11.0%)
Bladder	4 (5.5%)
Breast	4 (5.5%)
Pancreatic	4 (5.5%)
Rectal	3 (4.1%)
Other	22 (30.1%)
Year of Cancer Diagnosis	
2010 or earlier	14 (19.2%)
2011-2015	35 (37.9%)
2016	10 (13.7%)
2017	13 (17.8%)
2018	1 (1.4%)
Current/Previous Surgical Procedure	59 (80.8%)
Current/Previous Chemotherapy	59 (80.8%)
Current and Previous Radiation Therapy	32 (43.8%)
Tried Alternative Therapies	16 (21.9%)
Number of Comorbidities	2.2 (1.3) 2 (0, 5)
Advanced care directive	
Yes	26 (35.6%)
No	47 (64.4%)
Proxy decision maker	
Yes	29 (39.7%)
No	44 (60.3%)
Code Status	
DNR	30 (41.1%)
Full Code	30 (41.1%)
Not Reported	13 (17.8%)
Referred to Pain/Palliative	8 (11.0%)
Referred to Social Work	41 (56.2%)

Nutritional Risk and Demographic/Treatment Variables

Hypothesis 1 was: Nutritional risk is associated with demographic and disease/treatment variables of age, gender, and time since diagnosis and treatments. To test this hypothesis, the Pearson correlation coefficient was calculated to show association between MNA-SF score and various demographic and clinical factors. These variables are described in Table 5 and the correlations are presented in Table 6. There is a very slight negative association between MNA-SF and age ($r=-0.12$), indicating that older patients tend to have slightly lower MNA-SF scores. However, this is not a statistically significant result ($p=0.3$). There was very low or no association between MNA-SF score and gender, prior/current surgical treatment, prior/current chemotherapy, or radiation ($r<0.1$ for all). The largest association is seen with BMI, with $\boldsymbol{\rho} = 0.47$ ($p<0.0001$).

Table 5
MNA-SF Score Statistics by Demographic Variable Stratification

Demographic Variable	*MNA Total Score*		
	n	**mean (std)**	**median (min, max)**
Age group (y)			
65-69	31	10.5 (1.9)	12 (5, 12)
70-74	22	8.8 (2.6)	8 (5, 14)
75-79	15	9.5 (2.0)	10 (6, 13)
80+	5	9.8 (3.1)	11 (6, 13)
Gender			
Female	39	9.6 (2.4)	10 (5, 14)
Male	34	9.9 (2.2)	10.5 (6, 13)
BMI			
<18.5 (underweight)	5	5.8 (1.3)	5 (5, 8)
18.5-24.9 (normal wt)	41	9.5 (2.1)	9 (5, 13)
25.0-29.9 (overwt)	20	10.8 (1.7)	12 (7, 12)
30.0-34.9 (obese)	4	10 (3.6)	9.5 (7, 14)
≥ 35 (morbidly obese)	3	12 (0)	12 (12,12)
Years Since Dx			
2010 or earlier	14	10.3 (2.4)	12 (5, 12)
2011-2015	35	9.6 (2.3)	10 (5, 13)
2016	10	9.8 (2.7)	9 (7, 14)
2017	13	9.5 (2.3)	10 (6, 12)
2018	1	7 (--)	7 (7, 7)

Table 6
Pearson Correlation Coefficient, Between MNA-SF Score and Demographic/Clinical Variables

	MNA-SF Total Score	
Demographic and Clinical Factors	**r**	***p-value***
BMI	**0.47**	**<.0001**
Age	-0.12	0.30
Male (1=male;0=female)	0.063	0.60
Physical Subscale Score	0.17	0.16
Social Subscale Score	-0.01	0.93
Emotional Subscale Score	0.05	0.70
Functional Subscale Sore	0.10	0.39
FACT-G Index Total Score	0.12	0.30
Surgery (1=surg; 0=no surg)	-0.07	0.54
Chemo (1=chemo; 0=no chemo)	-0.0025	0.98
Radiation (1=XRT; 0=no XRT)	0.092	0.44
# Total Therapies*	0.024	0.84

Note: All variables continuous unless otherwise noted as dichotomous

* Total therapies counts the number of therapy modalities (previous surgery, previous chemotherapy, previous radiation, collected at baseline) that the patient listed, and ranges from 0 to 3.

Nutritional Risk and QOL Variables

Hypothesis 2 was: Nutritional risk is associated with QOL including physical, emotional, social and functional well-being and overall QOL.

Data from the FACT QOL tool used in the regression analysis is presented in Table 7. The actual items and subscales are presented here in order to describe the specific factors associated with QOL. Hypothesis 2, Nutritional risk is associated with QOL including physical, emotional, social and functional well-being and overall QOL. It is in keeping with what the FACT-G QOL tool showed regarding the predictors of nutritional risk. The three predictors were BMI, previous chemotherapy, and the FACT-G physical subscale. These showed the importance of assessing BMI, previous chemotherapy and looking at other physical factors.

Variables were selected to be included in the regression analysis based on a review of the literature and recognition of the variables which are most commonly known to be associated with nutritional risk. Additionally, because this study was a secondary analysis of an existing database this study was limited to the data available.

Table 7
Quality of Life Metrics*

Quality of Life Items, Subscales and Total	mean(std) /median(min,max)
Physical well-being subscale	**23.1 (4.4), 24 (3, 28)**
Lack energy	2.4 (1.1)
Have nausea	3.6 (0.7)
Trouble meeting family needs	3.3 (0.9)
Have pain	3.1 (0.9)
Bothered by side effects	3.6 (0.8)
Feel ill physically	3.7 (0.7)
Forced in bed	3.4 (0.9)
Social well-being subscale	**25.5 (3.5), 26 (6. 28)**
Close to friends	3.7 (0.8)
Emotional support from family	3.9 (0.7)
Support from friends	3.8 (0.7)
Family accepted illness	3.8 (0.7)
Satisfied with communication about illness	3.9 (0.3)
Feel close to partner	3.5 (1.3)
Satisfied with sex life	2.8 (1.5)
Emotional well-being subscale	**17.4 (4.4), 18 (7, 24)**
Feel sad	3.4 (0.9)
Coping with illness	3.7 (0.7)
Losing hope with fighting illness	2.5 (0.9)
Feel nervous	3.0 (1.0)
Worry about dying	2.8 (1.3)
Worry condition will get worse	2.0 (1.2)
Functional well-being subscale	**21.6 (4.3), 22 (6, 28)**
Able to work	3.0 (0.9)
Work is fulfilling	3.1 (0.9)
Able to enjoy life	2.9 (1.1)
Accepted illness	3.8 (0.5)
Sleeping well	3.0 (1.0)
Enjoying things for fun	3.1 (1.1)
Content with quality of life	2.6 (1.0)
Overall FACT-G Index	**87.5 (11.0), 89 (57, 108)**

***QOL Scale: 0=Not at all to 5=Very much**

Data from the MNA-SF is presented in Table 8. The instrument (MNA-SF) was selected to assess nutritional risk and was successfully implemented for all eligible subjects. Scores on the MNA-SF dictate that a score regarding a decline of food intake in the last three months was a score from 0, a severe decrease, 1 a moderate decrease, and 2 being no decrease in food intake. As far as weight loss in the last three months, the scores were 0 being a loss of >7 pounds, the score of 1 meant patient did not know the amount of weight loss, 2 was a loss between 2 and 7 pounds, and 3 was no weight loss or that of 2 or less pounds. Currently mobility was scored as 0 being unable to get out of bed without assistance, 1 was able to get out of bed or chair, but unable to leave the home, and 2 equaled able to leave the home. The next question asks if the patient has been severely stressed or ill in the last 3 months with 0 being yes and 2 being no. Question "E" asks if the patient is currently experiencing dementia or severe sadness with 0 being yes, 1 being a mild yes, and 2 measuring neither dementia of prolonged sadness. Those scores are then tallied and copied to page 2. The height and weight (BMI in essence) is then gathered and the patient is put into one of 3 groups, 0 being the worst and 3 being the best. That score is then added to the score from the first page and that is the total MNA-SF score. From 0-7 means a patient is malnourished, 8-11 is at-risk for malnutrition, and a score from 12-14 reveals a normal nutritional status. Results from the investigators database illustrated that 25 patients were normally nourished, 33 were at nutritional risk, and 15 were malnourished. The mean score of the MNA-SF was 9.7. This revealed that a substantial number of patient were either malnourished or at risk for malnutrition.

Table 8
MNA-SF Scores (possible values range 0 to 14) and BMI Data

MNA-SF Items	Screening Scale Score/values	n (%)
1. Food intake Declined over last 3 months	0=severe 1=moderate 2=no decrease	6 (8.2%) 34 (46.6%) 33 (45.2%)
2. Weight loss in last 3 months	0=>7 lbs 1=do not know amount of weight lost 2= between 2 to 7 lbs 3=no weight loss	21 (28.8%) 1 (1.4%) 18 (24.7%) 33 (45.2%)
3. Current mobility	0=unable to get out of bed 1=able to get out of bed with assistance 2=able to leave home	0 (0%) 0 (0%) 73 (100%)
4. Stress or severe illness past 3 months	0=yes 2=no	67 (91.8%) 6 (8.2%)
5. Dementia or severe sadness	0= severe dementia or sadness 1=mild dementia and no severe sadness 2=neither dementia nor sadness	0 (0%) 0 (0%) 73 (100%)
6. BMI group	0= BMI ≤19 1= BMI 19 to <21 2= BMI 21 to <23 3= BMI ≥23	5 (6.8%) 11 (15.1%) 13 (17.8%) 44 (60.3%)
7. Overall MNA-SF Score*	0 – 7 8 – 11 12 – 14	15 (20.6%) 23 (45.2%) 25 (34.2%)

*Total all items. Groups: 12-14=normal nutrition, 8-11, at risk, 0-7= malnourished

Regression Analysis

To address Hypothesis 2, stepwise multiple regression was used to find significant predictors of total MNA-SF score (Table 9).

All 73 patients were included in the regression model, as there were no issues with missing data or any pertinent variables. In the univariate model, only BMI was found to be a significant predictor. We found that a four point increase in BMI was associated with a one point increase in MNA-SF score. The stepwise selection method was used to find a multivariate model from the list of predictors tested in the univariate analysis, using 0.15 level for entry into the model and 0.10 significance level to remain in the model. The resulting model contained three final predictors: BMI, previous chemotherapy, and FACT-G physical subscale score.

Physical subscale totals were positively associated with higher MNA-SF scores, with an 8-point increase in the subscale score corresponding to a one point increase in MNA-SF scores. Receiving chemotherapy tended to increase MNA-SF scores by 9%, but was only approaching significance, with p=0.09. Overall, the coefficient of determination for the model was rather low (R-square=0.26), which means our multivariate model only explains 26% of the variability of the response variable (MNA-SF scores) using the predictors available. Thus, we believe that there may be predictors that are omitted that may help better explain the changes of MNA-SF scoring.

Table 9
Regression Analysis Results

	Univariate Analysis		Multivariate Analysis	
Predictor	**Parameter Estimate (stderr)**	**p-value**	**Parameter Estimate (stderr)**	**p-value**
Age (continuous)	-0.057 (0.054)	0.30		
BMI (continuous)	0.24 (0.054)	<0.0001	0.28 (0.055)	<0.0001
Male (vs. female)	0.29 (0.55)	0.60		
Surgery (vs. no surgery)	-0.43 (0.70)	0.54		
Chemo (vs. no chemo)	0.15 (0.70)	0.98	1.09 (0.63)	0.09
Radiation (vs. no XRT)	0.43 (0.55)	0.44		
Number of Therapies (cont)*	0.071 (0.36)	0.84		
Physical Score	0.090(0.063)	0.16	0.12 (0.055)	0.03
Social Score	-0.0068 (0.078)	0.93		
Emotional Score	0.024 (0.063)	0.70		
Functional Score	0.055 (0.064)	0.39		
FACT-G Index Total Score	0.026 (0.025)	0.30		

Chapter 5. Discussion

Study Purpose

The overall purpose of this study was to describe the nutritional risk of cancer patients 65 years and older who are receiving systemic treatments via Phase I clinical trials. It describes the relationship between nutritional risk and the four domains of QOL (physical, social, emotional, and functional) (Figure 4).

Summary of Findings and Implications

A sample of 73 patients, with a mean age of 71, were successfully accrued for this study from an NCI RO1 aimed at integrating supportive care for cancer patients on Phase I clinical trials using the MNA-SF instrument to assess for nutritional risk. Based on the previous literature this tool is a reliable and valid measure for nutritional risk in older cancer patients. The patient information needed to assess for nutritional risk is easily collected utilizing the MNA-SF as it gathers all the pertinent data in which to assess for nutritional risk in the older adult cancer patient. The MNA-SF is the most widely used tool in older adults, and is a highly sensitive and specific, validated and reliable nutrition screening and assessment instrument that can identify geriatric patients age 65 and above who are malnourished or at-risk of malnutrition. Validity was established confirming the six items of the MNA-SF scores with other measures of nutritional status (such as BMI and anthropometric parameters) with correlations of .83 to .86 (Kaiser, et al., 2009). It is recommended by national and international clinical and scientific organizations and has been validated in over 400 studies (Kondrup, et al., 2003; Salva, et al., 2004). The revised MNA-SF makes the link to intervention easier and quicker (usually taking less than five minutes to complete), and is now the preferred form of the MNA-SF for clinical use (Rubenstein, et al., 2001). It can be used in a wide variety of settings, requires no special training, no labs, and is available in 24 languages. It also identifies at-risk persons before weight loss occurs and

serum protein levels fall, and facilitates earlier intervention when response is most successful (Delacorte, et al., 2004).

The population was predominantly Caucasian and overall well-educated. Most of the patients were Protestant and were married or partnered, living with a spouse or child. Most were retired with an annual income of $50,000 or greater. The participants were almost equally divided by male and female.

As to the sample demographics (Table 3), it was interesting to note the mean age of 71: this may indicate the need for the nursing profession to pay even more attention to older adults as the population ages. As most of the sample was married or partnered, this would be an important factor to consider in future research or clinical practice, as other patients may be living alone and have less nutritional support (Bales, 2001).

The study findings related to Hypothesis 1, nutritional risk is associated with demographic and disease/treatment variables of age, gender, and time since diagnosis and treatments, was of interest. Very few of the patients were newly diagnosed. Almost half were diagnosed in 2015 or earlier, thus most had a diagnosis of cancer for 4 or more years. This reflects that people are now living longer with their illness, having undergone multiple previous treatments and are now on a Phase I clinical trial. The effects of treatment may be cumulative and nurses should consider the entire treatment trajectory and treatment history to assess nutritional risk (Berry, et al., 2019). It is also interesting to note that these people with cancer had 2.2 other co-morbid conditions. This is very important to acknowledge as they may be experiencing symptoms from other comorbidities, which in turn are likely to affect their nutrition (Brugel, et al., 2014). It is disturbing to find that only 35% of this group had an advanced directive, and only 39% had identified a proxy decision maker. An important issue is that nutritional problems associated with advanced disease leads to decision making regarding instituting tube feedings or nutritional supplementation (Delacorte, et al., 2004). If

these people have no advanced directive or proxy designated, they may receive more aggressive treatments for nutrition than is clinically beneficial.

As to nutritional risk assessed through the MNA-SF and correlated with demographics, the only variable which showed a significant correlation was the BMI which is basically a computation of height and weight (Table 5). It is very important for nurses to closely monitor a patient's weight because it is a huge predictor of a patient's nutritional status (Berry, et al., 2019).

Table 7 reveals some interesting information in the 4 domains of QOL, the physical, social, emotional, and functional. Physically the scale showed low energy being by far the biggest physical factor. This could easily be related to nutrition or weight loss and should be a symptom monitored closely (Freyer, et al., 2005). Socially, overall good scores were reported except in sexuality, which could also be a QOL issue and related to nutrition due to lack of energy, weight loss or body image. Emotionally, worry over their condition or worry about dying was a factor of most concern. This is also important to overall QOL and could well be related to nutritional status (Freyer, et al., 2005). Functional well-being revealed that the lowest item was their ability to enjoy life and satisfaction with overall QOL. These findings reveal how low QOL scores on the FACT-G could be related to nutritional risk. Nutrition is very closely associated with QOL and should be a priority in nursing care of the patient (Freyer, et al., 2005).

The MNA-SF scores presented in Table 8 show a moderate problem with food intake over the past 3 months, a little decrease in weight loss in the last 3 months, and stress or severe illness was very notable. It was interesting to see that the mean overall MNA-SF score was 9.7 (8-11 being at risk). This reinforces the need to closely monitor these patients. The MNA-SF allows the nurse to inquire of patients in a comprehensive manner as to food intake, weight loss, stress, and sadness, and yields much better information than merely taking a

person's weight. It is the most validated tool for the elderly, yielding accurate and important information. It also requires minimal training of healthcare personnel and may be filled out in less than five minutes.

Comparison with Other Studies

A study by Chen, et al. (2003) notes, as does this study that older cancer patients undergoing chemotherapy may experience toxicity but generally can tolerate it with some impact on independence, co-morbidity, and QOL levels. It is important to monitor these changes during geriatric oncology treatment. Chen's study did have weaknesses such as small sample size and short follow-up. This study also was concerned with the older population due to recognizing the significance of this vulnerable population and their nutritional risk.

In a study done by Freyer, et al. (2005) which was also in the chemotherapy population utilized the CGA (of which the MNA is part) to predict tolerance to chemotherapy along with survival in older cancer patients. They found that the GCA could predict severe toxicity and overall survival of their patient population. A weakness found that geriatric assessment lacks standardization and there may have been patient bias. As with this study, there was a small sample size (n=60). This study was limited to a one-time assessment so survival was not assessed.

Research by Ravasco, et al., (2005) noted that during treatment, nutritional interventions positively influenced outcomes and counseling was a similar/higher benefit.

An additional study done by Hurria, et al. (2007) conducted a study identifying vulnerable older adults with cancer by administering the aCGA questionnaire and found that it was feasible for use in the outpatient oncology setting and helped identify the needs of geriatric oncology patients. The researcher also noted that prospective trials

are needed to determine the effectiveness of the interventions offered. Again, this study was only assessed at baseline, so effectiveness of interventions was not measured.

The Stauder, et al. (2010) study hoped to assess geriatric assessment tools by determining the number of independent domains measured. A plethora of instruments were used in the research. A strength found was that the GA was feasible. Unlike this study, evaluation of screening instruments was not done, nor the cost of use in the United States (study done in Europe).

One study by Mudge, et al. (2011) utilized the BMI and MNA-SF instruments to understand the nutritional gaps in the older adult. The study is consistent with this investigator's findings that inadequate nutritional intake is common, and patient factors contributing to poor intake should be considered in designing nutritional interventions.

Another study by Hurria, et al. (2011a), like others desired to measure the toxicity of a vulnerable population by using the CGA in cancer clinical trials, and did so by assisting to modify and develop the CGA (again, the MNA is part of this tool). Additionally, Hurria, et al. (2011b) found that their study filled critical gaps in addressing frailty predictors for older patients, well within the parameters of this study. This study also found critical gaps in addressing risk in older patients.

Research by Isenring,, et al.(2012) also used a multitude of tools attempting to establish validity of them. The MNA-SF was used and among the other instruments it was found that validity was established and can be used to triage nutritional care. A weakness pointed out was that there was a lack of a standard tool, making nutritional classification difficult.

A study conducted by Soubeyran, et al. (2012). The researchers attempted to use validated tools in an effort to predict at-risk patients for early death in older patients on chemotherapy. They found that in patients older than 70, with cancer, a low MNA-SF

score predict early death. This would be in keeping what this study would expect to find in this population.

In research done by Hoppe, et al. (2013) a host of tools were utilized (the MNA-SF included). The study discovered that there is a correlation between low scores and early decline of older cancer patients. Some weakness revealed missing data, the lack of a physician to assess patients, and that there was no descriptive analysis of targeted patient activity. This study also revealed the lack of nutritional referrals, even though a low MNA-SF score was evident.

Muffly, et al. (2013) conducted a pilot study evaluating the gaps in caring for the older adult cancer patient. The research found that the CGA, (again, the MNA is included), found that they uncovered a substantial prevalence of undocumented impairments in functional status, indicating what this study points out. There are huge gaps in the use of validated tools with a lack of a standardized program for evaluating these patients.

In research done by Chapman, et al. ((2014), the CGA was also used to stress the importance of using this tool to assess and develop an individualize education and intervention plans. Several discordant trends were observed, along with challenges of territorial attitudes of physicians. However, the researchers felt they were able to establish a model of comprehensive geriatric oncology care in a cancer-based center. This researcher feels that a standard of care could easily be established in a comprehensive cancer center.

Brugel, et al. (2014) expected to fine a direct clinical benefit using the CGA to the benefit of older cancer patients. The study did find this to be true, along with the need for a multidisciplinary approach to geriatric oncology care. This researcher also believes and nutritional program should be multidisciplinary.

A study by Wakabayashi & Sashika (2014) utilized the MNA-SF and BMI to assess the association between nutritional status and outcomes in older patients in rehabilitation. They found that most patients with low scores were malnourished and had poorer outcomes, just as this study would expect to find. However, it was pointed out that a weakness could be that interventions were inconsistently performed.

Lastly, Kenis, et al. (2014) desired to compare the G8 and TRST tools (parts of the larger GA tool) to identify patients with a geriatric risk of functional decline and overall survival. Although these tools were found to be useful and simple to use, they could not define geriatric risk profiles. Again, this study measured nutritional risk at baseline only, therefore, overall survival was not measured.

More recent articles cite that identifying malnutrition is common among patients with cancer, but there is very little attention given to its risks and consequences (Krishnasamy, et al., 2019).

The present study reinforces the literature review, newer articles and the need for nutritional risk assessment and prevention. The only difference noted by this investigator was that the MNA-SF was the only tool used in this study, and it is believed to render an adequate and accurate account of the older cancer patient 65 years and older who may be at nutritional risk and/or malnourished.

Clinical Implications

A key clinical implication was that age is a significant factor, indicating that the older adult cancer patient beginning a Phase I clinical trial should be closely monitored regarding his/her nutritional assessment. Another recommendation would be to assure that patients and caregivers are educated by nurses on the information regarding nutrition and referred to nutritional services, as necessary (Berry, et al., 2019). Also, nurses in the clinical setting should be educated about the nutritional needs and assessment of older patients entering

Phase I clinical trials. The MNA-SF should be included as a standard of care for this population, as the nutritional aspect of care for older patients is very important (Kaiser, et al., 2011). Weight should be monitored throughout the cancer trajectory. Other physical, social, emotional, and functional symptoms should also be assessed which could impact nutrition (for example fatigue, living alone, access to food, mobility, low income and depression). Many cancer patients are monitored and treated on an outpatient basis making it all that much more important for nurses to monitor them closely, identifying those at risk (Krishnasamy, et al., 2019). Research has also shown that systematic screening followed by nutrition referral for appropriate interventions is rare (Berry, et al., 2019). It has been found that only 50% of patients received professional dietary counseling (Hartmuller & Desmond, 2014). Regarding oncology nurses, 43% believed they were ill-equipped in having sufficient knowledge to provide advice on nutrition. This reflects the need to education nursing staff on this very important subject in order to provide the best nutritional care to oncology patients.

Research implications show that more research is needed in this area, with larger sample sizes. Clinical implications reveal the need to educate both healthcare professionals, along with patients and caregivers. Also, a better standard of care system should be in place.

Limitations

This study included a small sample size (n=73), and patients were assessed at one time point, and not followed throughout the Phase I clinical trial trajectory. The participants were also accrued at a specialized national cancer center, on Phase I clinical trials, thus, were closely monitored. Lastly, the regression analysis accounted for 26% of variance and there may be other issues affecting a patient's nutritional status.

Recommendations for Future Research

A recommendation for this study is to repeat the work within a larger sample. As this study was conducted with one assessment, at baseline, a more longitudinal study may be in

order to obtain better information. Future studies should include patients from other settings such as community medical centers and healthcare systems. Samples might include a larger age (such as the oldest old) range and follow-up for nutritional risk over a longer period of time. Future research should look at other variables impacting nutrition.

Conclusion

Nutrition is of the utmost importance to patients. It is part of the human element. Without it there is very little in life. Nurses are an integral part of nutritional assessment and risk, and this subject should be a very basic part of nursing education.

Nutrition impacts all dimensions of QOL and will be even more important in an aging population. Nursing research can contribute greatly to advancing this area of practice.

Appendix A
Informed Consent for Nutritional Risk

Informed Consent

Title of the Study: Nutritional Risk in Cancer Patients 65 and Older Undergoing Phase I Clinical Trials.

Principal Investigator: Anna Cathy Williams, MSN, PHN, Ed

You are being asked to participate in a research project. This is a research project of Anna Cathy Williams, a PhD candidate, at the University of Hawai′i, School of Nursing. This study is being conducted as part of Anna Cathy Williams' dissertation towards completion of her PhD degree. This is a consent form to provide you with information about this study.

The purposes of this study are to examine the nutritional risk of cancer patients 65 and older undergoing Phase I clinical trials, and if age, education, gender, employment status, and income are related to or contribute to nutritional risk. You are being asked to participate in this study because you are a cancer patient and you meet the criteria for this study: you are 65 or older; you can understand, speak, and write English.
This study will consist of filling out 1 form: a demographic form about your background information and a questionnaire consisting of the physical, psychological, social, and functional domains of life. There is also a short nutritional form you will fill out. No personal identifying information such as name, date of birth, or social security number will be included with the study results. Anna Cathy Williams will have access to your medical records. Completion of the forms will last no longer than 30 minutes. Sixty-five older adults will be needed to complete this study.

There will be little or no risk to participating in this study. Although name and date of birth will not be included in this project, small risk that you may experience include psychological pain when giving away information about your background information such as income, occupation, living arrangements, education, marital status, age, and gender.

Although you may not benefit directly from this study, you may gain further understanding of nutritional risk. This study may also help the health care professionals in delivering health care to geriatric patients at nutritional risk.

Please take your time to review this consent form and discuss any questions you may have with Anna Cathy Williams. If there are any words or sections in this consent form that you do not understand, please ask Anna Cathy Williams to explain them. Anna Cathy Williams will be available in the clinic during completion of the questionnaires. If you agree to take part in this research project, you will be asked to sign this consent form. It is important that you understand that taking part in this study is of your own free will (voluntary). You may decide not to participate, or you may decide to stop being in the study at any time, and it will not affect your health care services and/or your relationship with your physician now, or in the future.

If you have questions about this study, please contact Anna Cathy Williams directly. If you have questions about your rights as a research subject, contact the University of Hawai′i Committee on Human Studies at (808) 956-5007.

Participant:

I have read and understand the above information and agree to participate in this study. I have had the opportunity to discuss this study with Anna Cathy Williams, and I have had my questions answered. I take part in this study of my own free will, and I understand that I may withdraw from participation at any time. A copy of this consent form has been given to me.

_____

Participant's Name (print) Signature Date

Principal Investigator:
I, the undersigned, have fully explained the relevant details of this study to the participant named above and believe that the participant has understood and has knowingly given their consent.

_____

Principal Investigator's Name (print) Signature Date

Appendix B
MNA-SF (Mini Nutritional Assessment Short Form) For Adults 65 years of Age and Older

Nestlé Nutrition Institute

Self-MNA®

Mini Nutritional Assessment

For Adults 65 years of Age and Older

Last name: First name:

Date: Age:

Complete the screen by filling in the boxes with the appropriate numbers. Total the numbers for the final screening score.

Screening		
A Has your food intake declined over the past 3 months? [ENTER ONE NUMBER] *Please enter the most appropriate number (0, 1, or 2) in the box to the right.*	0 = severe decrease in food intake 1 = moderate decrease in food intake 2 = no decrease in food intake	☐
B How much weight have you lost in the past 3 months? [ENTER ONE NUMBER] *Please enter the most appropriate number (0, 1, 2 or 3) in the box to the right.*	0 = weight loss greater than 7 pounds 1 = do not know the amount of weight lost 2 = weight loss between 2 and 7 pounds 3 = no weight loss or weight loss less than 2 pounds	☐
C How would you describe your current mobility? [ENTER ONE NUMBER] *Please enter the most appropriate number (0, 1, or 2) in the box to the right.*	0 = unable to get out of a bed, a chair, or a wheelchair without the assistance of another person 1 = able to get out of bed or a chair, but unable to go out of my home 2 = able to leave my home	☐
D Have you been stressed or severely ill in the past 3 months? [ENTER ONE NUMBER] *Please enter the most appropriate number (0 or 2) in the box to the right.*	0 = yes 2 = no	☐
E Are you currently experiencing dementia and/or prolonged severe sadness? [ENTER ONE NUMBER] *Please enter the most appropriate number (0, 1, or 2) in the box to the right.*	0 = yes, severe dementia and/or prolonged severe sadness 1 = yes, mild dementia, but no prolonged severe sadness 2 = neither dementia nor prolonged severe sadness	☐
Please total all of the numbers you entered in the boxes for questions A-E and write the numbers here:		☐☐

Now, please CHOOSE ONE of the following two questions – F1 or F2 – to answer.

Question F1

Height (feet & inches)	Body Weight (pounds)			
4'10"	Less than 91	91 – 99	100 – 109	110 or more
4'11"	Less than 94	94 – 103	104 – 113	114 or more
5'0"	Less than 97	97 – 106	107 – 117	118 or more
5'1"	Less than 100	100 – 110	111 – 121	122 or more
5'2"	Less than 104	104 – 114	115 – 125	126 or more
5'3"	Less than 107	107 – 117	118 – 129	130 or more
5'4"	Less than 110	110 – 121	122 – 133	134 or more
5'5"	Less than 114	114 – 125	126 – 137	138 or more
5'6"	Less than 118	118 – 129	130 – 141	142 or more
5'7"	Less than 121	121 – 133	134 – 145	146 or more
5'8"	Less than 125	125 – 137	138 – 150	151 or more
5'9"	Less than 128	128 – 141	142 – 154	155 or more
5'10"	Less than 132	132 – 145	146 – 159	160 or more
5'11"	Less than 136	136 – 149	150 – 164	165 or more
6'0"	Less than 140	140 – 153	154 – 168	169 or more
6'1"	Less than 144	144 – 158	159 – 173	174 or more
6'2"	Less than 148	148 – 162	163 – 178	179 or more
6'3"	Less than 152	152 – 167	168 – 183	184 or more
6'4"	Less than 156	156 –171	172 – 188	189 or more
Group	**0**	**1**	**2**	**3**

Please refer to the chart on the left and follow these instructions:

1. Find your height on the left-hand column of the chart.
2. Go across that row and circle the range that your weight falls into.
3. Look to the bottom of the chart to find out what group number (0, 1, 2, or 3) your circled weight range falls into.

Write the Group Number (0, 1, 2, or 3) here: ☐

Write sum of questions A-E (from page 1) ☐

Lastly, calculate the sum of these 2 numbers. This is your SCREENING SCORE: ☐

Question F2

DO NOT ANSWER QUESTION F2 IF QUESTION F1 IS ALREADY COMPLETED.

Measure the circumference of your LEFT calf by following the instructions below:

1. Loop a tape measure all the way around your calf to measure its size.
2. Record the measurement in cm: _____
   - If less than 31cm, enter "0" in the box to the right.
   - If 31cm or greater, enter "3" in the box to the right.

☐

Write the sum of questions A-E (from page 1) here: ☐☐

Lastly, calculate the sum of these 2 numbers. This is your SCREENING SCORE: ☐☐

Screening Score (14 points maximum)

12–14 points: Normal nutritional status
8–11 points: At risk of malnutrition
0–7 points: Malnourished

Copy your SCREENING SCORE: ☐☐

If you score between 0-11, please take this form to a healthcare professional for consultation.

Appendix C
Author Approval

Hello Anna Cathy,

Thank you for your interest in Nestlé's Mini Nutritional Assessment Short Form (MNA-SF®) and for inquiring about permission to use the MNA® in your study in older cancer patients at-risk for malnutrition. Nestlé is pleased to see the MNA-SF® being using in research and in clinical practice.

Special permission is not required to use the tool in your study as long as absolutely no changes are made to the MNA-SF® form as downloaded from the MNA-SF® website (www.mna-elderly.com). After completing your study, you will need to request permission to include the MNA-SF® in any manuscripts that you submit for publication. You may submit that request to this same e-mail address.

We look forward to seeing the results of your study. Please let me know if you have further questions.

Kind regards,

Janet Skates

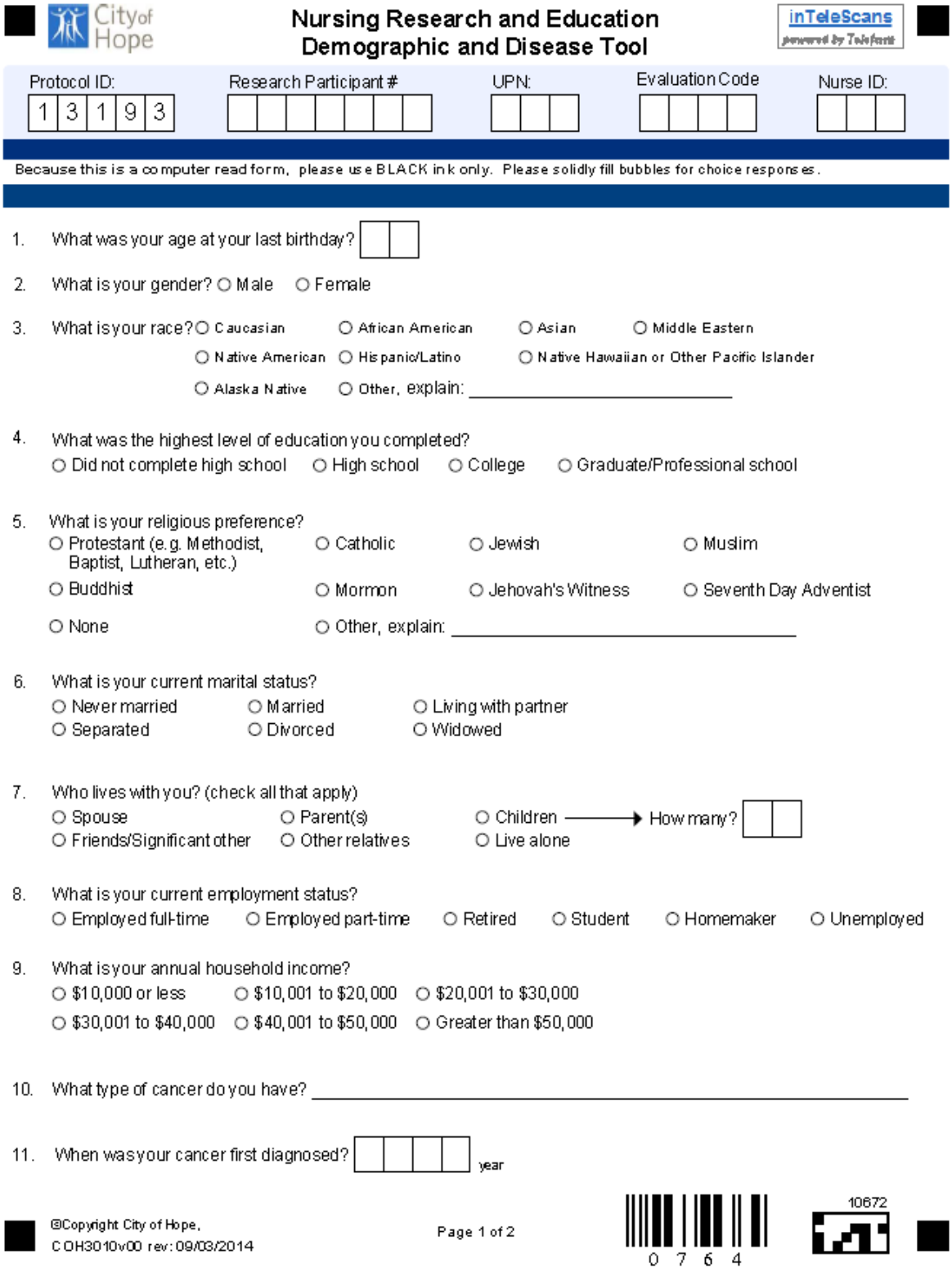
Nestlé Health Science Consultant

MNA-SF® Mini Nutritional Assessment Short Form Application

1 (423) 239-7176

janetskates@yahoo.com

Appendix D
Demographic Disease Tool



City of Hope

Nursing Research and Education
Demographic and Disease Tool

inTeleScans
powered by TeleForms

Protocol ID: 1 3 1 9 3 | Research Participant # | UPN: | Evaluation Code | Nurse ID:

Because this is a computer read form, please use BLACK ink only. Please solidly fill bubbles for choice responses.

1. What was your age at your last birthday? ☐☐

2. What is your gender? ○ Male ○ Female

3. What is your race? ○ Caucasian ○ African American ○ Asian ○ Middle Eastern
○ Native American ○ Hispanic/Latino ○ Native Hawaiian or Other Pacific Islander
○ Alaska Native ○ Other, explain: _____

4. What was the highest level of education you completed?
○ Did not complete high school ○ High school ○ College ○ Graduate/Professional school

5. What is your religious preference?
○ Protestant (e.g. Methodist, Baptist, Lutheran, etc.) ○ Catholic ○ Jewish ○ Muslim
○ Buddhist ○ Mormon ○ Jehovah's Witness ○ Seventh Day Adventist
○ None ○ Other, explain: _____

6. What is your current marital status?
○ Never married ○ Married ○ Living with partner
○ Separated ○ Divorced ○ Widowed

7. Who lives with you? (check all that apply)
○ Spouse ○ Parent(s) ○ Children → How many? ☐☐
○ Friends/Significant other ○ Other relatives ○ Live alone

8. What is your current employment status?
○ Employed full-time ○ Employed part-time ○ Retired ○ Student ○ Homemaker ○ Unemployed

9. What is your annual household income?
○ $10,000 or less ○ $10,001 to $20,000 ○ $20,001 to $30,000
○ $30,001 to $40,000 ○ $40,001 to $50,000 ○ Greater than $50,000

10. What type of cancer do you have? _____

11. When was your cancer first diagnosed? ☐☐☐☐ year

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Page 1 of 2

0 7 6 4

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City of Hope

Nursing Research and Education Demographic and Disease Tool

inTeleScans powered by Telefonix

Protocol ID: 13193 | Research Participant #: | UPN: | Evaluation Code: | Nurse ID:

Because this is a computer read form, please use BLACK ink only. Please solidly fill bubbles for choice responses.

12. Current and previous treatment(s):
    - A. Surgery? ○ Yes ○ No
    - B. Chemotherapy? ○ Yes ○ No
    - C. Radiation therapy? ○ Yes ○ No

13. Have you tried any alternative/complimentary therapies? ○ Yes ○ No

14. Are you currently being followed by supportive services?
    - ○ Yes → **If Yes,** who are you currently seeing for support services?
      - ○ Palliative Care Medicine ○ Psychologist ○ Psychiatrist
      - ○ Social Worker ○ Chaplain ○ Nutritionist
      - ○ Other, explain: _____
    - ○ No

15. Co-morbidity

○ None	○ Anxiety/Depression/etc. (on meds)	○ Arthritis
○ Heart disease (MI, angina)	○ Autoimmune disease (Lupus, Grave's Disease, M.S., etc.)	○ h/o DVT
○ Hypertension	○ Pleural Effusion	○ Ascites
○ Diabetes	○ Pulmonary disease (Asthma, chronic bronchitis, Emphysema, Pulmonary fibrosis, etc.)	○ Hypothyroid
○ CNS (stroke, seizure, etc.)	○ Renal (CRI, dialysis)	○ GI (hepatitis, jaundice, colitis)
○ CHF	○ COPD	○ Obesity
		○ Other, specify: _____

COH3010v00 rev: 09/03/2014

0 7 6 4

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Ferrell et al., 2019

Appendix E
FACT-G Version 4

City of Hope

Nursing Research and Education
FACT-G (Version 4)

inTeleScans powered by Telefonix

Protocol ID:	Research Participant #	UPN:	Evaluation Code	Nurse ID:
1 3 1 9 3				

Because this is a computer read form, please use BLACK ink only. Please solidly fill bubbles for choice responses.

Below is a list of statements that other people with your illness have said are important. Please select one bubble per line to indicate your response as it applies to the **past 7 days**.

PHYSICAL WELL-BEING		Not at all	A little bit	Somewhat	Quite a bit	Very much
GP1.	I have a lack of energy	○	○	○	○	○
GP2.	I have nausea	○	○	○	○	○
GP3.	Because of my physical condition, I have trouble meeting the needs of my family	○	○	○	○	○
GP4.	I have pain	○	○	○	○	○
GP5.	I am bothered by side effects of treatment	○	○	○	○	○
GP6.	I feel ill	○	○	○	○	○
GP7.	I am forced to spend time in bed	○	○	○	○	○

SOCIAL/FAMILY WELL-BEING		Not at all	A little bit	Somewhat	Quite a bit	Very much
GS1.	I feel close to my friends	○	○	○	○	○
GS2.	I get emotional support from my family	○	○	○	○	○
GS3.	I get support from my friends	○	○	○	○	○
GS4.	My family has accepted my illness	○	○	○	○	○
GS5.	I am satisfied with family communication about my illness	○	○	○	○	○
GS6.	I feel close to my partner (or the person who is my main support)	○	○	○	○	○

Regardless of your current level of sexual activity, please answer the following question.
If you prefer not to answer it, please check this box ☐ *and go to the next section.*

GS7.	I am satisfied with my sex life	○	○	○	○	○

COH3013v00 rev: 09/05/2014

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City of Hope

Nursing Research and Education
FACT-G (Version 4)

inTeleScans powered by Teleform

Protocol ID:	Research Participant #	UPN	Evaluation Code	Nurse ID
13193				

Because this is a computer read form, please use BLACK ink only. Please solidly fill bubbles for choice responses.

By selecting one (1) bubble per line, please indicate your response as it applies to **the past 7 days**.

EMOTIONAL WELL-BEING		Not at all	A little bit	Somewhat	Quite a bit	Very much
GE1.	I feel sad	○	○	○	○	○
GE2.	I am satisfied with how I am coping with my illness	○	○	○	○	○
GE3.	I am losing hope in the fight against my illness	○	○	○	○	○
GE4.	I feel nervous	○	○	○	○	○
GE5.	I worry about dying	○	○	○	○	○
GE6.	I worry that my condition will get worse	○	○	○	○	○

FUNCTIONAL WELL-BEING		Not at all	A little bit	Somewhat	Quite a bit	Very much
GF1.	I am able to work (include work at home)	○	○	○	○	○
GF2.	My work (include work at home) is fulfilling	○	○	○	○	○
GF3.	I am able to enjoy life	○	○	○	○	○
GF4.	I have accepted my illness	○	○	○	○	○
GF5.	I am sleeping well	○	○	○	○	○
GF6.	I am enjoying the things I usually do for fun	○	○	○	○	○
GF7.	I am content with the quality of my life right now	○	○	○	○	○

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(Cella, et al., 1993)

Appendix F
City of Hope IRB Approval

City of Hope

INSTITUTIONAL REVIEW BOARD (IRB) ACTION NOTICE

TO:	Betty Ferrell, Ph.D., Principal Investigator City of Hope - Nursing Research MC
FROM:	David Holt, JD, Interim IRB Operations Manager Office of Human Research Subjects Protection
DATE:	February 27, 2017
STUDY TITLE:	Integration of Palliative Care for Cancer Patients on Phase I Trials
IRB#/REF#:	13193 / 138023
SUBMISSION:	Submission Correction for Amendment
REVIEW PROCESS:	Expedite
IRB ACTION DATE:	02/25/2017

IRB ACTION:

APPROVAL OF SUBMISSION REFERENCED ABOVE (COH AMENDMENT 03; PROTOCOL DATED 01/13/17; VERSION 03)

NOTE: DURING THE PERIOD COVERED BY IRB APPROVAL ANY CHANGES IN THE PROTOCOL, OR ANY UNEXPECTED PROBLEMS INVOLVING HUMAN SUBJECTS, MUST BE SUBMITTED TO THE IRB VIA iRIS FOR REVIEW. NO STUDY CHANGES CAN BE INITIATED UNTIL APPROVAL HAS BEEN OBTAINED FROM THE IRB.

If you have questions or concerns about this submission, please contact Joyanna Ko.

Appendix G
University of Hawaii IRB Approval

UNIVERSITY of HAWAI'I SYSTEM

Office of Research Compliance
Human Studies Program

TO:	Ceria-Ulep, Clementina, PhD/RN, University of Hawaii at Manoa, School of Nursing and Dental Hygiene
	Williams, Anna, PhDc/RN/MSN/Ed/Phn, School of Nursing and Dental Hygiene, University of Hawaii at Manoa
FROM:	Rivera, Victoria, Dir, Ofc of Rsch Compliance, Biomedical IRB
PROTOCOL TITLE:	Nutritional Risk in the Older Cancer Patient Undergoing Phase I Clinical Trials
FUNDING SOURCE:	
PROTOCOL NUMBER:	2018-01098
	Approval Date: January 24, 2019 Expiration Date: December 31, 2999

NOTICE OF APPROVAL FOR HUMAN RESEARCH

This letter is your record of the Human Studies Program approval of this study as exempt.

On January 24, 2019, the University of Hawaii (UH) Human Studies Program approved this study as exempt from federal regulations pertaining to the protection of human research participants. The authority for the exemption applicable to your study is documented in the Code of Federal Regulations at 45 CFR 46.101(b)5.

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at the OHRP Website www.hhs.gov/ohrp/humansubjects/guidance/belmont.html.

Exempt studies do not require regular continuing review by the Human Studies Program. However, if you propose to modify your study, you must receive approval from the Human Studies Program prior to implementing any changes. You can submit your proposed changes via email at uhirb@hawaii.edu. (The subject line should read: Exempt Study Modification.) The Human Studies Program may review the exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so. Signed consent forms, as applicable to your study, should be maintained for at least the duration of your project.

This approval does not expire. However, please notify the Human Studies Program when your study is complete. Upon notification, we will close our files pertaining to your study.

1960 East-West Road
Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-8683

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