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Dietary Behaviors and Nutrition Intervention Preferences of Breast Cancer Survivors

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DIETARY BEHAVIORS AND NUTRITION INTERVENTION PREFERENCES
OF BREAST CANCER SURVIVORS

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
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by
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ABSTRACT

Breast cancer is the most commonly diagnosed cancer among women and there are expected to be 1,665,540 new cases diagnosed in 2014. Advancements in early detection, have greatly improved treatment outcomes for the majority of these patients and the 5-year survival rate is 89.2%. The newly emerging field of survivorship care is an attempt to meet the unique needs of this expanding population. Research has demonstrated that an unhealthy body weight is an important modifiable risk factor for the recurrence of breast cancer. This study used an electronic version of the Block 2005 to collect dietary information on 30 breast cancer survivors presenting to a survivorship clinic for the first time. Key variables in The Dietary Guidelines for Americans 2010 were used to evaluate the dietary habits of these patients. Interest in receiving remote nutrition interventions was assessed through a separate questionnaire. Results demonstrated that the majority of the sample was overweight and failed to meet the recommendations for the key dietary variables. The results from the nutrition interest survey indicated that the patients were interested in receiving nutrition information from the hospital and the preferred remote nutrition intervention was email communication. This data is important because it indicates that this population of breast cancer survivors could benefit from dietary changes and are interested in receiving nutrition information. Given the large number of breast cancer survivors, interest in email communication is an important step in reaching this growing group of cancer survivors. Future nutrition research with breast cancer survivors should focus on the feasibility of remote nutrition interventions in assisting these patients to attain and maintain a healthy body weight.

DEDICATION

   With deepest gratitude and affection, I dedicate this thesis to my service dog, Mia

Bella. Without her daily assistance, this challenging work would have been an

insurmountable task. She willingly dedicates her life to me so that I can achieve my

greatest goals.

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INTRODUCTION

According to the American Cancer Society (ACS), the term "Cancer Survivor" includes "any person who has been diagnosed with cancer, from the time of diagnosis through the balance of life."[1] The ACS estimates that in the United States 1,665,540 new cancer cases will be diagnosed in 2014.[1] This rapidly expanding segment of the population is at increased risk for many chronic diseases including heart disease, osteoporosis, diabetes, secondary cancers, and treatment related sequelae.[1,2,3]

Research has demonstrated a consistent relationship between nutrition, obesity and the progression and recurrence of cancer.[4,5,6,7,8,9,10] The research in this area has shown a link between being overweight or obese and some types of cancer including breast (postmenopausal), colon, endometrial, gallbladder, pancreas, and kidney cancer.[1]

Based on this research, the ACS recommends that cancer survivors strive to attain and maintain a healthy body weight. The nutritional recommendations of the ACS are consistent with USDA and other governmental agencies with the goal of balancing energy intake and expenditure.[1] The ACS also emphasizes nutrition variables that are hypothesized to have an impact on cancer. Nutrition variables investigated for their possible link to cancer include fruits, vegetables, saturated fat, and alcohol. The plant-based diet focuses on 5 servings of fruits and vegetables and replacing animal based sources of protein with plant-based protein. However, evidence demonstrating a consistent link between cancer and specific nutrition variables is often weak and inconsistent. Given the inconsistent link between nutrition and cancer, the focus of the ACS recommendations is often based on the positive impact of a healthy diet on the

chronic diseases associated with cancer and the importance of a healthy body weight.[1]

One of the most commonly diagnosed cancers among American women is breast cancer. Emerging evidence suggests that overweight and obesity among breast cancer patients may be associated with poorer outcomes, metastases and mortality.[11] Post-treatment these breast cancer patients are at greater than double the risk of a recurrence.[12] Given the association between breast cancer and obesity, interventions focused on a achieving and maintaining a healthy body weight through lifestyle changes are important in the treatment of breast cancer survivors.

Many of these interventions have been carried out as part of a cancer survivorship program. These newly emerging programs are developing in response to the unique needs of cancer survivors and the increasing success in treating many types of cancer.[3,13,14] The goal of many of these programs is to provide a transitional step from primary cancer care to maintenance and cancer surveillance.[14] These programs are also designed to address lifestyle factors such as nutrition and are important to the successful treatment of comorbid chronic conditions.[15]

Research has demonstrated that lifestyle interventions with cancer survivors including breast cancer survivors can be effective in helping these individuals to meet dietary guidelines and to attain a healthy body weight.[13,14,15] An important limitation of these studies is the feasibility of these interventions for large numbers of cancer survivors. The primary modes of intervention delivery have been in-person interventions such as group and individual counseling.[16,17,18,19] Limitations of these studies are the high demand on resources, both human and financial, and the ability of the interventions to be

maintained beyond the study period or scaled up to meet the demand of a growing

population of cancer survivors. With the increasing number of cancer survivors, there is a

need to develop resource-efficient methods to sustainably reach a large numbers of

patients.

CHAPTER ONE
LITERATURE REVIEW

Cancer Survivors and the Importance of Post-Treatment Care

The American Cancer Society (ACS) estimates that 14.5 million adults and children with a past cancer diagnosis are currently living in the United States.[21] This number is expected to increase to 19 million by January 2024. Individuals free of cancer for 5 years or more are considered "free of disease." Post-treatment, quality of life for these patients can be impacted by long-term treatment effects, transitional care issues, chronic diseases, and many other issues.

Healthy lifestyle behaviors have been shown to have a positive impact on both treatment, post-treatment quality of life, and cancer recurrence.[21] The importance of healthy lifestyle behaviors is especially important considering that cancer patients are at increased risk for may lifestyle -related chronic diseases such as metabolic syndrome, osteoporosis, diabetes, and heart disease.[1,2,3,17,20,21]

Healthy lifestyle behaviors such as nutrition, physical activity, smoking cessation, and moderate alcohol consumption are important areas of cancer research. A considerable amount of research has been devoted to the impact of obesity on cancer treatment outcomes, recurrence, and chronic disease among cancer patients.[11,12,22] Researchers have demonstrated a link between obesity and breast (postmenopausal), colon, endometrial, gallbladder, pancreas, and kidney cancer occurrence and recurrence [1] This association between cancer variables and obesity highlights the importance of teaching post-cancer patients about healthy lifestyle behaviors. Nutrition and physical activity interventions with cancer survivors have been shown to be effective in the achieving and maintenance

of a healthy body weight.[11]

Breast Cancer and Nutrition

Breast cancer is the most common cancer in women regardless of race or ethnicity and is the second leading cause of cancer death among white, black, Asian, and Native American women.[22] In the United States an estimated 232,670 new breast cancer cases will be diagnosed in 2014. The state of South Carolina is expected to have 3,750 new breast cancer cases in 2014 and these patients have a 5 year survival rate of 89.2%.[1]

Obesity is an established modifiable risk factor for breast cancer in postmenopausal women.[1,11,21] Important research in this area has demonstrated that obese or overweight breast cancer patients have poorer treatment outcomes including increased mortality, metastases, and greater than double the risk of recurrence.[23,24,25,26,27,28,29] This is an important consideration because more than 50% of the patients diagnosed with breast cancer in Western countries fall into these unhealthy weight categories.[11]

The impact of obesity on breast cancer outcomes and recurrence has lead to the implementation of nutrition and physical activity interventions with breast cancer patients. These interventions have shown that weight loss interventions with breast cancer survivors can effectively help these patients to achieve a healthy weight through nutrition and physical activity programs. Many of these interventions lack the follow-up time needed to determine the impact of this weight loss on cancer recurrence. [11]

Dietary Behaviors of Breast Cancer Survivors

Studies evaluating the dietary behaviors of breast cancer patients post-treatment are limited. These studies often focus on nutrition variables thought to influence cancer such as fruits, vegetables, red meat, whole grains, processed meat, and alcohol intake as a measure of adherence to a healthy diet.[30,31,32,33,34] This narrow focus is primarily the result of the potential impact of these variables on cancer prevention and recurrence.[1] The relationship between cancer and many of these individual nutrition variables is biologically plausible but not well established. The importance of a healthy body weight has been consistently demonstrated in both cancer research and general post-treatment health. The relationship between healthy body weight and breast cancer highlights the importance of following a healthy dietary pattern. Given the importance of a healthy diet, a more holistic research perspective may be useful in exploring the relationship between nutrition and breast cancer recurrence.

Current Recommendations of American Cancer Society (ACS)

Every five years the American Cancer Society (ACS) publishes Nutrition and Physical Activity Guidelines. The ACS published the most recent guidelines in 2012. Experts in cancer research, epidemiology, and public health policy develop these guidelines. They are consistent with the most current scientific research and provide the best evidence related to dietary patterns and physical activity, and cancer risk.[1]

The ACS recommendations are consistent with other governmental agencies including the 2010 Dietary Guidelines for Americans.[35] However, the main focus of the

American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention are on a limited number of food group variables. These variables include: fruits, vegetables, red meat, processed meat, and whole grains. The ACS highlights the importance of these variables in maintaining a healthy weight and the role of a healthy weight in decreasing cancer risk and recurrence. Some of the recommendations for these nutrition variables are not specific and the report frequently defers to the guidelines published by governmental agencies. The only one of these variables specified by in the ACS is the consumption of fruits and vegetables This review will examine the highlighted general recommendations of the ACS and follow that with the specific guidelines found in the 2010 dietary Guidelines for Americans.

ACS and Healthy Body Weight

The most consistent evidence linking nutrition and cancer is the impact of maintaining a healthy body weight on cancer risk reduction. The impact of nutrition on maintaining a healthy body weight is important for both decreasing the risk of recurrence, optimizing the outcome of cancer treatment, and preventing/treating the chronic diseases associated with cancer. The ACS recommends that cancer survivors achieve and maintain a healthy body weight as part of cancer prevention and a healthy lifestyle. According to research, a BMI of 25 or greater is associated with increased risk of cancer, chronic diseases associated with cancer, cancer related mortality, overall mortality, and cancer recurrence. [1,11,12,49] Other factors associated with an unhealthy body weight such as waist circumference and waist to hip ratio are also associated with overall mortality and multiple chronic diseases.[50,51,52] The association between cancer and waist circumference

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and waist to hip ratio has been demonstrated as an independent risk factor in cancer specific mortality or cancer recurrence.[53] Proposed mechanisms behind this relationship include the inflammation associated with an unhealthy body weight.[53] The ACS recommendation for a healthy body weight is a focus of current research and is the basis of the ACS nutritional recommendations.[1]

Plant-Based Diet - Fruit and Vegetable Intake

The ACS recommends 5 servings of fruits and vegetables each day. The basis of this recommendation is the potential protective role of the antioxidants in fruits and vegetables in the prevention of cancer. As part of this recommendation, the ACS supports the use of the plant-based diet. This diet includes a dietary pattern that focuses on increasing fruit and vegetable intake and decreasing saturated fat through the substitution of plant-based protein for animal protein sources. Epidemiological studies have found that greater consumption of fruits and vegetables are associated with a lower incidence of some types of cancer including lung, oral, stomach and colon.[1,7,36,37] However, epidemiological studies are not sufficient evidence to make any conclusions about causality of this potential relationship. Evidence of the association between the recommended fruit and vegetable intake and cancer in prospective studies is weak and inconsistent.[37,38,39] Some researchers propose that this relationship has not been observed due to the short-term nature of these studies.[38] More research is needed to determine if fruits and vegetables play role in cancer prevention and the role of specific nutrients. The current recommendations of the ACS for 5 servings of fruits and vegetables each day is based primarily on the impact of these food groups on maintaining a healthy body

weight.

Red Meat- High Fat Diets

The ACS recommends that people limit their intake of red meat and focus on lean meat and plant based sources of protein. The focus of the research on red meat and cancer has focused on the high saturated fat content of red meat. There is some evidence that a diet high in fat increases the risk for cancers of the colon, prostate, rectum, and endometrium.[40,41,42,43] These studies are not randomized controlled trials so the relationship is not well established. The relationship between breast cancer and high fat diets is weaker and more research is needed to determine if there is a consistent relationship.[1,44] There is additional evidence to suggest that processed meat has a greater impact on cancer risk than unprocessed red meat.[1,42] The position of the ACS on red meat intake and cancer focuses on this limited research and the overall impact of a high fat diet on a healthy weight. Each gram of fat contains greater than twice the amount of calories per gram of carbohydrate or protein. Given this important fact, the ACS recommends that people consume less red meat and focus on vegetable protein sources and lean meat.

Whole Grains

The ACS recommends that people consume diets rich in whole grains and limit their intake of refined grains and sugars. The focus of this recommendation is on the benefits of fiber in maintaining a healthy weight. There is mixed evidence that diets high in fiber reduce the risk of cancer.[45,46,47,48] The ACS claims that more research is needed to determine if fiber has a role in cancer prevention beyond a healthy body weight.[1]

Dietary Guidelines for Americans 2010 Key Nutrition Variables

The Dietary Guidelines for Americans 2010 was developed by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services. This comprehensive document is designed to provide nutrition and physical activity recommendations for Americans over the age of 2 years old. The evidence behind these recommendations are debatable and typically focus on correlational evidence. This seventh edition focuses on the importance of maintaining a healthy weight through a diet rich in nutrient dense foods. The key recommendations in the document emphasize the importance of a healthy body weight in the prevention and treatment of chronic diseases.

CARBOHYDRATE RECOMMENDATIONS

1. Fruits and Vegetables

One of the key recommendations in the Dietary Guidelines for Americans 2010 is to consume at least 5 cups of fruits and vegetables each day. This guideline is based on the evidence that fruit and vegetable intake is associated with decreased risk of chronic diseases and the moderate evidence that fruits and vegetables decrease the risks of some cancers. Another goal of this recommendation is the nutrient dense nature of fruits and vegetables and their potential to help people maintain a healthy body weight. Nutrient dense refers to foods that provide significant beneficial nutrients with relatively few calories. Fruits and vegetables are also rich in potassium and dietary fiber, which are two of the nutrients under consumed in the United States.

2. Whole Grains

According to the Dietary Guidelines for Americans 2010, whole grains should account for half the grains consumed. For a person on a 2,000 kcal diet this would mean that a total of 6 ounces of grains should be eaten each day with at least 3 ounces of those grains coming from whole grains. Whole grains are a rich source of many important nutrients including dietary fiber. The other part of this recommendation is a focus on decreasing refined grains with whole grains or at least ensuring that the refined grains consumed are enriched. Evidence that whole grain intake may be associated with a healthier body weight and a decrease in the risk of some chronic diseases including diabetes and cardiovascular disease is the basis of this recommendation.

3. Dietary Fiber

Dietary fiber is an indigestible portion of the plant that is primarily found in fruits, vegetables, whole grains, and legumes. The recommendation for dietary fiber is 25g/day for women and 38g/day for men. Dietary fiber is important in the promoting normal gastrointestinal function, normal lipid profiles and glucose tolerance. Consumption of dietary fiber takes longer to chew and promotes a full feeling that helps a person to feel fuller quicker and longer. All of these effects are beneficial in reducing caloric intake and maintaining a healthy body weight.

FAT RECOMMENDATIONS

1. Unsaturated Fat

2. Trans Fatty Acids - as low as possible

Trans fatty acids can occur naturally and are also produced in a manufacturing process called partial hydrogenation. Naturally, trans fatty acids are produced in the gut of ruminant animals and can be found in food products such as meat and milk. Artificial trans fatty acids produced during partial hydrogenation help to extend the shelf life and improve the texture of foods. Trans fatty acids are not physiologically necessary and artificial trans fats are associated with raising LDL cholesterol and cardiovascular disease. Given this important relationship, the current recommendation is that Americans consume as little trans fat as possible.

2. Saturated Fat

Major sources of saturated fat in the American diet include full fat dairy products, pizza, desserts, and fatty meat. The current guidelines for Americans suggest that people should strive to consume no more than 10% of their calories from saturated fat. Saturated fat should be replaced by monounsaturated and polyunsaturated fat, which are liquid at room temperature. Polyunsaturated fat and monounsaturated fat can be found in olive oil, safflower oil, flaxseed, and walnuts. Research is mixed on the ideal consumption of various types of fat but some evidence suggests that lowering saturated fat is associated with lower blood cholesterol levels and a lower risk of cardiovascular disease. Consuming lean protein sources is one of the recommendations for lowering saturated fat intake.

MISCELLANEOUS RECOMMENDATIONS

1.Calcium and Vitamin D

Calcium and vitamin D are important in bone health and this is particularly important because many Americans are at risk for low bone mass and osteoporosis. Calcium is also important in muscle contraction, nerve signal transmission, and dilation and contraction of blood vessels. The most common sources of calcium in the American diet are dairy products. Many fortified foods including milk and cereal are good sources of both vitamin D and calcium. The body can also produce vitamin D in the presence of adequate sunlight. Recommendations for calcium and vitamin D intake are based on age, sex and risk factors for bone disease.

Adult Recommendations Calcium

19-50 year old females and males 1000 mg

51-70 year old females 1200 mg

51-70 year old males 1000 mg

71+ year old females and males 1200 mg

Adult Recommendations Vitamin D

19-70 year old females and males 600 mg

71+ year old females and males 800 mg

2. Potassium

The recommended intake for potassium is 4700 mg each day. Potassium is essential in the regulation of fluid balance, blood pressure regulation, and muscle

contraction. Deficiency in potassium can contribute to hypertension, fatigue, and feelings of irritability. Bananas, dark leafy greens, white beans, salmon, and avocados are rich sources of potassium.

3. Sodium

Sodium is an essential nutrient that is important in the regulation of blood volume and water balance. The body requires a relatively small amount to carry out this function and the average American diet far exceeds this amount. The Dietary Guidelines for Americans emphasize that a diet high in sodium is associated with hypertension and cardiovascular disease. The recommendation is that Americans consume less than 2300 mg of sodium each day. Sodium is naturally present in food but the largest portion of sodium consumed is added during food processing. Sodium as a food additive is important in extending shelf life, enhancing flavor, curing meat, and retaining moisture. Consuming more fresh foods, paying attention to food labels, and preparing foods at home are suggestions to help reduce sodium intake.

4. Cholesterol

The primary sources of dietary cholesterol in the American diet are eggs, chicken, and beef. Recommended daily intake of cholesterol is less than 300 mg per day for both men and women. The Dietary Guidelines for Americans 2010 base this key recommendation on the potential relationship between dietary cholesterol and increased LDL cholesterol and cardiovascular disease. However, the authors of these guidelines

point out that the impact of dietary cholesterol on LDL and cardiovascular risk is relatively small compared to saturated fat and trans fat.

5. Added Sugars - As low as possible

Added sugars are sugars that are added to foods during processing and preparation of foods and beverages with the purpose of improving palatability, preservation, and texture. According to the Dietary Guidelines for Americans 2010, added sugars are responsible for an average of 16% of the total calories in an American diet. Common sources of added sugars are soda/sweetened beverages, grain based desserts, and sugar-sweetened fruit drinks. Foods rich in added sugars often provide additional calories but are not rich in essential nutrients. Decreasing added sugars is essential to attaining and maintaining a healthy weight. The recommendation is to consume no more than 15% of calories from added sugars and saturated fat combined.

6. Alcohol - 1 drink for women and 2 drinks for men

Moderate amounts of alcohol can be associated with decreased cardiovascular disease. Moderate alcohol intake is 1 drink per day for women and 2 drinks per day for men. Heavy or high risk drinking is the consumption of more than 3 drinks on one day or more than 7 in a week for women. For men, heavy drinking is the consumption of greater than 4 drinks in one day or more than 14 drinks per week. Some evidence suggests that even moderate alcohol intake may increase the risk for some types of cancer including breast cancer.

Nutrition Interventions

Research suggests that cancer patients both at diagnosis and post-treatment are ready and willing to make lifestyle changes.[9,54,55,56] This "teachable moment" is valuable opportunity to encourage patients to adopt healthier eating habits, which can help them to attain and maintain a healthy body weight. Many studies have demonstrated that lifestyle interventions with cancer survivors can be successful in helping these patients to adopt a healthier lifestyles including increased physical activity and improved dietary habits.[2,14,15,18,27]

Nutrition interventions with cancer patients have primarily focused on fruits and vegetables as a measure of a healthy diet and for their potential impact on cancer recurrence.[5,14,54,57] Increased emphasis on a healthy body weight has lead to a greater emphasis on fat consumption and total caloric intake.[5,14,54,57] These weight loss studies typically have a broader interest including quality of life measures and physical activity.[11] The vast majority of the studies with a focus on the American Cancer Society recommendations have limited their analysis to fruits and vegetables and have not followed included an analysis of other ACS dietary recommendations.[14,59,60,61]

Nutrition Intervention Mode

The mode used to deliver the nutrition intervention is an important consideration in the long-term implementation of a program. The increasing number of cancer survivors necessitates the implementation of cost-effective interventions capable of reaching large numbers of patients. Nutrition interventions with this population have

typically used face-to-face modes to deliver the nutrition intervention and have been maintained over a short period of less than one year and many were designed to be much shorter.[5,11,14,54,60]

Face-to-Face Interventions

Face-to-face interventions involve direct contact between the participant and researcher. Modes used in face-to-face interventions include individual counseling, group sessions, and phone calls. Face-to-face interventions are the most commonly used methods in both cancer nutrition research and other fields. These modes have effectively helped cancer survivors to lose weight, increase physical activity, and change dietary behaviors.[11,14,19,60,61] Sample sizes in group counseling and individual counseling are often smaller than those that use telephone calls to deliver information.[11] The C-Steps intervention was important in demonstrating the effectiveness and importance of transitional care for cancer survivors. [14] This intervention involved a series of 6 private telephone calls designed to target nutrition, physical activity, stress, and provide medical follow-up. Two-week follow-up measures demonstrated an increase in fruits and vegetables, increased physical activity, and decreased distress. One common issue in this study and many others in this area is the lack of post-intervention assessment. Follow-up measures beyond one year are uncommon and limit assessment of the long-term impact of face-to-face interventions.[2,4] One likely explanation for the small sample sizes and lack of follow-up is the cost and feasibility of reaching large numbers of participants through direct contact.

Remote Nutrition Interventions

Remote interventions involve using modes of information delivery that do not involve direct contact between the participant and the researcher. These remote interventions have been used in a very limited number of studies with cancer survivors. This research as well as research in other domains suggests that remote modes of information delivery can be successful in promoting dietary change.[62,63,64,65,66,67] Remote interventions have targeted small samples as well as entire communities with the goal of dietary change.

The use of the internet and social media as a mode to deliver nutrition interventions is a relatively new area of research. A review of the literature revealed that one study successfully used a Facebook intervention strategy to increase physical activity among cancer survivors.[62] This study investigated the impact of a 12 week Facebook intervention on the physical activity habits of young cancer survivors. Post-intervention measurement of physical activity showed an increase in physical activity of 67 minutes. An interesting component of this research was the complete use of the internet for intervention delivery and outcome measurements. There is a lot of information posted on the internet but the literature search did not produce any other systematic evaluation of the efficacy of this mode of information delivery with cancer patients post-treatment. However, research with cancer patients during treatment and in other areas demonstrates that a variety of internet based methods can encourage positive dietary behaviors. Email, Facebook, websites, text messages, and blogs have successfully used to deliver nutrition

information.[68,69,70,71,72,73,74] Internet based modes of information delivery have great potential because of the potential to cost effectively reach large numbers of people.

Email delivery is an increasingly common intervention mode used with younger populations and is an appealing method for large populations. One recent study investigated the feasibility of implementing an email based nutrition intervention on fruit and vegetable consumption among 110 young adults. Participants indicated an interest in increasing fruit and vegetable intake and there was a low attrition rate among participants. These results suggest that email based nutrition interventions may be a feasible option for reaching large populations.

One possible concern is the internet access required for these interventions and the feasibility of implementing these interventions with older or low income cancer survivors. The majority of the research in this area has targeted an adolescent and young adult population.[62,72,73] Some research suggests that internet access and computer literacy in these populations is improving in the area of health care.[75,76] However, several studies suggest that older adults are less computer literate and that this literacy issue can impair their ability to understand health care information.[77,78] More research is needed to determine whether internet based nutrition interventions are a feasible option for the majority of cancer survivors.

CHAPTER TWO
CENTER FOR INTEGRATIVE ONCOLOGY AND SURVIVORSHIP

The Center for Integrative Oncology and Survivorship (CIOS) is an integral part of the Cancer Institute of Greenville Health System. CIOS is dedicated to providing supplementary care for cancer patients both during and after treatment. CIOS is a multidisciplinary clinic that provides services to cancer patients at all GHS satellite offices across the upstate of South Carolina. Each month 300 patients receive care at CIOS for a wide variety of needs including: nutrition, genetic counseling, lymphedema, primary care, and counseling.

Patients are referred to the Cancer Survivorship Clinic by their oncologist after primary cancer care has ended. Currently, the Cancer Survivorship Clinic represents 23% of the total patients seen at CIOS. The size of the Survivorship Clinic is expected to increase dramatically over the next year because referral to the cancer survivorship clinic is becoming a standard of care for oncologists at GHS. Currently, the clinic sees 60-70 patients each month and on average half of those patients are breast cancer patients.

The Cancer Survivorship Clinic is a one-time visit designed with the goal of providing transitional guidance to cancer patients after completion of cancer treatment. Patients receive a treatment summary that includes their pathology reports, cancer treatment information, long-term side effects, and guidance for cancer screening. An emphasis on nutrition is an area of current growth within the Cancer survivorship Clinic. The program focuses on the nutrition variables emphasized by the American Cancer Society; including healthy weight and a plant based diet. During the one-time visit, the patient meets with a registered dietitian who emphasizes the plant-based diet of 5

servings of fruits and vegetables and the importance of a healthy weight. Patients interested in receiving additional nutritional counseling are encouraged to come back for individual or small group nutrition counseling. Due to staffing and budget constraints, these additional sessions are designed for small groups and have limited appointment availability. Furthermore, the wide geographic area served by the Center for Integrative Oncology and Survivorship make routine visits to the clinic unfeasible for many patients.

A goal of CIOS is to reach a larger number of the survivorship patients with continued nutrition services. However, the large number of patients and limited staff make this a difficult task. Implementation of the current group and individual session on a large scale is not possible. The large area and many satellite offices covered by CIOS also present a challenge to providing adequate follow-up care. The development of nutrition interventions, which are cost effective and can be maintained on a large scale are needed to achieve this goal. There is currently no information available about these patients' dietary habits, interest in receiving nutrition information, or preference for mode of receiving nutrition information.

The current body of literature with cancer survivors does not provide the information needed to make decisions about whether this population is likely to meet all of the American Cancer Society recommendations or the feasibility of remote based nutrition interventions. The purpose of this study was to provide valuable nutrition information about this rapidly expanding population.

CHAPTER THREE
OBJECTIVES OF THE STUDY

Research Questions

a. What are the dietary behaviors of breast cancer survivors presenting for the first time to the Center for Integrative Oncology and Survivorship at GHS?

b. Are the dietary habits of breast cancer survivors presenting for the first time at the Center for Integrative Oncology and Survivorship consistent with the recommendations of the American Cancer Society?

c. Could breast cancer survivors presenting for the first time to the Center for Integrative Oncology and Survivorship at GHS benefit from receiving nutrition information?

d. Are breast cancer survivors presenting to the Center for Integrative Oncology and Survivorship at GHS interested in receiving nutrition information from the hospital?

e. Are breast cancer survivors presenting to the Center for Integrative Oncology and Survivorship at GHS interested in participating in remote nutrition interventions?

Specific Aims

a. Describe the dietary habits of breast cancer survivors presenting to the Center for Integrative Oncology and Survivorship at GHS using the Block 2005 nutrition screener.

b. Evaluate the dietary habits of breast cancer survivors presenting to the Center for Integrative Oncology and Survivorship at GHS using the key guidelines in the Dietary Guidelines for Americans 2010.

c. Determine the interest of breast cancer survivors presenting to the Center for

    Integrative Oncology and Survivorship at GHS in receiving remote nutrition

    interventions.

CHAPTER FOUR
METHODOLOGY

Study Design

      This study used a cross-sectional design to collect information about the dietary habits and interest in home-based nutrition interventions of breast cancer survivors presenting to the Center for Integrative Oncology and Survivorship (CIOS) at GHS for the first time.

Population and Recruitment

      The population selected for this study was breast cancer survivors presenting to the Center for Integrative Oncology and Survivorship at GHS for the first time. Due to the nature of the scheduling process at GHS, a convenience sample was used in this study. All of these patients had been released from primary cancer care and were referred to CIOS for post-cancer care by their oncologist. All breast cancer patients scheduled for first time visits from July 7, 2014 - August 11, 2014 were contacted by phone and invited to participate in this study. An investigator explained the purpose of the study to the patient and told them that they would receive a $15 gift card for their participation. Patients interested in participating in the study were asked to arrive an hour early on their scheduled appointment date. Due to funding limitations, participation in the study was limited to 30 participants. 40 patients were initially recruited to participate in the study, 5 withdrew and another 5 were not included. The 5 participants were not included due to the sample limit of 30 participants and an investigator canceled their appointments.

Survey Selection and Development

Two online surveys were administered on a laptop. The dietary habits of participants were assessed using the Block 2005 citation and need to test for reliability and validity and interest in home-based nutrition interventions was evaluated with the Nutrition Interest Survey.[79,80] The Nutrition Interest Survey was created by the researcher and tested for face validity by hospital practitioners and members of the clinical trials research committee.

The Block 2005 is a 110-item food frequency questionnaire designed to estimate the usual intake of a wide variety of nutrients and food groups consumed in the past year. The Block 2005 is based on the NHANES dietary recall and the USDA nutrient database. An electronic version of the Block 2005 was selected due to ease of data analysis and immediate feedback for the patients. Individual portion size is asked for each food and pictures are provided on the screen to enhance the accuracy of self-reported portion sizes. Validation studies of the Block full-length questionnaires have confirmed the use of these tools for the assessment of intake frequency compared to 4 day diet record and four 2 day diet records.[1,2,3] The Block 2005 used in this study was administered and maintained by Nutritionquest.

The Nutrition Interest Survey is a 16 question electronic survey developed by the investigator for the purpose of evaluating patient interest in receiving home-based nutrition interventions. The Nutrition Interest Survey was designed to take 5-10 minutes to complete. Intervention formats evaluated in the survey include: Facebook, Twitter, email, text messages, private phone calls, and group phone calls. The survey also

included questions about availability of internet access, mode of internet access, income level, education, and home zip code.

Data Collection

Prior to recruiting any participants for the study, Institutional Review Board (IRB) approval was obtained from both the Cancer Institute of GHS Institutional Review Board and the Clemson University Institutional Review Board. An investigator explained the purpose of the study and all patients signed an informed consent prior to completing the two surveys.

Both surveys were self-administered on a laptop in a private room inside the Cancer Institute on the Memorial campus of GHS. The 5-10 minute Nutrition Interest Survey was given first and the 30 minute Block 2005 was administered second. An investigator was available to answer questions and to assist any patients that were unable to self-administer the surveys. An investigator verbally read each question and recorded the participant's response for the six participants who were unable to self-administer the surveys. Each patient was weighed prior to completing the Block 2005 and the investigator entered the weight into the Block 2005 for the patient. Weight was used to calculate BMI and self-report was not used to ensure the accuracy of weight. No identifying information was entered into either survey.

After completing the Block 2005, the patients were given a $15 gift card and a nutrition print out that is generated automatically at the end of the Block 2005. Patients were also given the opportunity to go over the print out with a registered dietitian and 21

of the 30 patients expressed interest in speaking to the registered dietitian. Patients were thanked for participating and directed to the appropriate location for their scheduled appointment.

Data Analysis

The data in this study was analyzed using SAS 9.3 statistical software. (Version 9.3 SAS Institute Inc., Cary, NC, 1989-2009). Descriptive statistics were generated to determine the response distribution of the sample. A one-tailed t-test was used to determine whether the dietary patterns of the sample were significantly different than the recommendations of the American Cancer Institute and The Dietary Guidelines for Americans. Frequencies were used to evaluate the percentage of the sample above and below each key recommendation. The level of significance was set at 0.05.

CHAPTER FIVE
RESULTS

Demographic Data

The sample included a convenience sample of thirty participants. The mean age of the participants was 59.20 years old. The race of the majority of participants was white (80%) followed by African American (16.67%). The most common education level among participants was GED/high school diploma (43.33%) followed by college degree (30.00%), graduate or professional degrees (23.33%), and some high school (3.33%). Reported annual household income had the following frequencies: <$20,000 (20%), $20-40,000 (20%), $40-60,000 (16.67%), $60-80,000 (16.67%), $80-100,000 (13.33%), $100-150,000 (10.00%), >$150,000 (3.33%). Participants reported a mean distance from the hospital of 15.28 miles (Table 1).

Weight Data

The mean weight of the participants was 193.80 lbs. (Table 1) and the mean BMI of the group was 33.15. The majority of the patients' BMI fell into the morbidly obese category (30.00%), which is a BMI of greater than 35. The BMI of 26.67% of the participants fell into the obese category (BMI 30-34.9), and 23.33% of the sample had a BMI within the overweight category (BMI 25-29.9). Only 20% of the sample had a BMI in the normal range of 18.5-24.9 and none of the participants fell into the underweight category (BMI<18.5). There was no correlation between BMI and kcal or weight and kcal. The majority of participants (67.67%) reported that they were currently trying to lose weight (Table 3)

Dietary Variables with Ranges

Macronutrient data for the sample is reported as a percentage of kcal (Table 4)

and as a percentage below, within, and above the recommended ranges (Table 5). The

mean carbohydrate consumption as a percentage of kcal for the sample was 46.86%.

The recommended range for carbohydrates is 45-65% of kcal. Forty percent of the

sample fell below the recommended range, 60% fell within the recommended range,

and 0% of the sample was above the recommended range for carbohydrate

consumption. The mean fat consumption as a percent of kcal was 39.22%. The

recommended range for fat is 20-35% of kcal. None of the participants fell below the

recommended range for fat consumption, 23.33% fell within the range, and 76.67%

were above the recommended range. The mean protein consumption as a percentage

of kcal for the sample was 15.74%. The recommendation for protein consumption is

10-35% of kcal and 100% of the sample fell within this range. The Dietary Guidlines

for Americans recommend that saturated fat and added sugars combined (SOFAS)

should be no more than 5-15% of kcal. The mean SOFA consumption for the sample

was 22.37% of kcal. The recommended range for SOFAS is 5-15% of kcal. None of

the sample fell below this recommendation, 6.67% fell within this range, and 93.33%

of the sample consumed above the recommended range.

Key Dietary Variables Compared to Dietary Guidelines for Americans 2010

Sample means (Table 6) was used to compare the sample data with daily

recommendations in The Dietary Guidelines for Americans 2010. The key dietary

variables compared are: fruit, vegetables, fruit and vegetables combined, dietary fiber, alcoholic drinks, potassium, sodium, whole grains, cholesterol, trans fat, saturated fat, calcium, and vitamin D.

Sample as a Percentage Above and Below Recommendations

The recommendation for fruit intake is 2.5 cups per day. The mean sample consumption was 1.23 cups and 96.67% of the sample fell below the 2.5 cup recommendation. The recommendation for vegetable intake is 2.5 cups per day. The mean sample intake was 2.15 cups and 56.67% of the sample fell below the 2.5 cup recommendation. The recommendation for combined fruit and vegetable consumption is 5 cups per day. The mean sample consumption was 3.38 cups and 86.67% of the sample fell below the 5 cup recommendation. The dietary fiber recommendation is 25 grams per day. The mean sample consumption was 17.44 grams and 93.33% of the sample fell below the 25 gram recommendation. The recommendation for alcohol consumption for women is no more than one drink per day. The mean alcohol consumption for the sample was .14 drinks per day and 96.67% of the sample fell below the one drink recommendation. The recommendation for potassium is 4600 mg per day. The mean sample potassium intake was 2561.41 mg and 100% of the sample fell below the 4600 mg recommendation. The recommendation for sodium intake is less than 2300 mg per day. The mean sample intake of sodium was 2840.80 mg and 60% of the sample exceeded the 2300 mg recommendation. The recommendation for whole grains is

50% of total grain consumption each day. On average 26.60% of the total grains consumed by the sample were whole grains and 96.67% of the population fell below the 50% recommendation. The recommendation for cholesterol is no more than 300 mg per day. The mean cholesterol consumption of the sample was 234.11 mg and 76.67% of the sample consumed less than the recommended 300 mg of cholesterol. The recommendation for trans fat is to consume as little as possible and to look at this variable the recommendation was set at 0 g. The mean sample consumption of trans fat was 71.14 g and all participants reported consuming at least some trans fat. The recommendation for saturated fat intake is less than 10% of kcal. On average 11.84% of the participants kcal came from saturated fat and 76.67% of the sample exceeded the 10% recommendation. Calcium recommendations vary by age and are reported in the age range 19-50 years old n=6 and greater than 50 years old. The recommendation for 19-50 year olds n=24 is 1200 mg per day. The mean sample consumption for participants in this age range was 734.21 mg and 100% of the sample fell below the 1200 mg recommendation. The recommendation for people over the age of 50 is 10000 mg. The mean sample consumption for participants in this age range was 746.40 mg and 91.67% of the participants fell below the 1000 mg recommendation. Vitamin D recommendations vary by age and are reported for the age range 19-70 years old n=26 and greater than 70 years old n=4. The recommendation for the age range 19-70 years old is 600 IU per day. The mean sample intake of vitamin D for this age range was 143.46 IU and 100% of the sample fell below the 600 IU. The recommendation for people over 70 years old is 800 IU. The mean sample intake for

participants in this age range was 105.90 IU and 100% of the sample fell below the 800 IU recommendation.

One tailed t-test results

Results of the t-test demonstrated that sample consumption of fruit (t=-9.31, p<.0001), vegetables (t=-1.89, p=.0341), combined fruit and vegetables (t=-6.36, p<.0001), dietary fiber (t=-7.41, p<.0001), potassium (t=-14.85, p<.0001), sodium (t=2.78, p=.0047), whole grains (t=-8.63, p<.0001), trans fat (t=8.16, p<.0001), saturated fat (t=4.52, p<.0001), calcium age range 19-50 years old n=6 (t=-3.66, p=.0073), calcium age range greater than 50 years old n=24 (t=-7.43, p<.0001), vitamin D age range 19-71 years old n=26 (t=-22.43, p<.0001), vitamin D age range greater than 71 years old n=4 (t=-25.35, p<.0001). Cholesterol (t=-2.28, p=.9852) and alcohol consumption (t=-17.27, p=1.0000) were the only two dietary variables that did not significantly differ from the recommendations. (Table 7).

Nutrition Interest Survey Results

A secondary survey was administered that collected data on patient preference for receiving nutrition information (Table 3). Ninety-three percent of the participants reported regular access to the internet. The most commonly used tool in accessing the internet was the laptop (68.97%). Followed by phone (58.62%), tablet (44.83%, and desktop (41.38).

The majority of the participants reported interest in receiving nutrition

information (96.67%). Emails (82.76%) were the most preferred mode of receiving

nutrition information. The next preferred mode was private telephone calls (48.28%),

followed by text messages (37.93%), Facebook (37.93%), group telephone calls

(20.69%), and Twitter (3.45%).

CHAPTER SIX
DISCUSSION

According to the American Cancer Society (ACS), 79% of new breast cancer cases occur in women 50 years of age and older. The median age of breast cancer diagnosis is 61 years of age and 68.8% of patients diagnosed with breast cancer are between the age of 45 and 74.[21] The mean age of the sample (59.20) was consistent with this data and provides support that the sample data is representative of the age range of patients typically seeking care for breast cancer.

In the 1970's a women's risk of breast cancer was 1 in 11 and in 2013 the risk has increased to 1 in 8.[22] The importance of obesity as a modifiable risk factor is the current focus of the ACS nutritional guidelines. It is estimated that greater than 50% of breast cancer patients in western countries are overweight or obese.[11] Research consistently demonstrates that a BMI greater than 25 is associated with increased risk of breast cancer, metastases, death, and recurrence.[1,11,12,49] The mean BMI of the sample was 33.15 and the majority of the sample (80%) had a BMI of greater than 25. This indicates that the majority of the sample fell into the BMI range associated with increased risk for breast cancer and more important to post-treatment, an increased risk of recurrence. BMI was the only measure used in this study to assess healthy body weight. In certain cases BMI may not be a good indication of a healthy body weight and must be interpreted in the context of body composition. However, the majority of the sample (30.00%) was morbidly obese and classification into the morbidly obese category is most likely associated with an unhealthy body weight and body composition. The BMI results of this study suggest a strong need for interventions in this population that target behaviors

associated with achieving and maintaining a healthy body weight.

Dietary habits are an important variable to target in interventions focused on achieving and maintaining a healthy body weight. Nutrition education and modification of dietary habits plays a key role in these interventions. This study used the Block 2005, a nutrition screener, to evaluate the dietary habits of the sample. The results of the Block 2005 were compared to the key dietary recommendations in The Dietary Guidelines for Americans 2010, which are consistent with the nutritional recommendations of the American Cancer Society. The Dietary Guidelines for Americans 2010 emphasizes the importance of a healthy body weight in the prevention and treatment of chronic diseases. The key variables are highlighted because they are identified as variables that can help individuals maintain a healthy body weight or are common deficiencies in the American diet. The results of this comparison indicate that the intake of the key variables was significantly different than the recommendations for the majority of the variables.

Carbohydrate Intake

Total carbohydrate consumption for the sample was above the recommended range of 45-65% of kcal (46.86). However, 60% of the sample was within the recommended total carbohydrate range. The specific carbohydrate recommendations highlighted in The Dietary Guidelines for Americans 2010 focus on nutrient dense choices and the satiety associated with higher consumption of fruits, vegetables, dietary fiber, and whole grains. The sample consumption of fruits, vegetables, and whole grains were all below the recommended intake. This is a concern because fruits, vegetables, and

whole grains are rich in valuable nutrients such as fiber and antioxidants and are also low calorie choices. Increasing intake of fruits, vegetables, and whole grains could be an important part of helping this population to achieve a healthy body weight without sacrificing quantity of food or necessary nutrients.

Fat Intake

Total fat intake as a percentage of kcal for the sample was above the recommended range of 20-35% of kcal (39.22%). This is concerning because 76.67% of the sample fell above the recommendation for fat intake. Fat can be an important source of the two essential fatty acids, linolenic and linoleic acid. However, per gram fat is higher than any other macronutrient in calories. High consumption of fat can be associated with a high calorie diet that is characteristic of individuals with an elevated body weight. The sample consumption of saturated fat was also significantly different than the recommendation and the vast majority of the participants (76.67%) consumed more than the 10% of kcal recommendation. Trans fat is difficult to interpret because the recommendation is as low as possible and the consumption of 0 grams of trans fat would be almost impossible in a healthy diet. The results of fat intake for this sample clearly indicate that a majority of their calories are coming from fat. Decreasing the consumption of fat to the recommended amount could be an important suggestion because this would greatly reduce the number of calories consumed and help with weight loss in this population.

SOFAS

Sample consumption of saturated fat and added sugars combined was significantly different than the recommended 5-15% of kcal. The average sample consumption of SOFAS was 22.37% of kcal and 93.33% of the sample was above the 5-15% kcal recommendation. This is very concerning because SOFAS are often associated with nutrient poor food choices which are high in calories. Nutrient poor foods are high in calories but provide relatively few beneficial nutrients such as antioxidants and fiber. Decreasing consumption of SOFAS should be an important focus for this population and would contribute to the goal of achieving and maintaining a healthy body weight.

Dietary Recommendations

Overall, the results of this study suggest that the unhealthy dietary habits of this sample may provide a reasonable explanation for the healthy body weigh of the sample. Altering the consumption of carbohydrates, fats, and added sugars could be a first step in helping these patients to achieve and maintain a healthy body weight. Decreasing consumption of fat and increasing consumption of complex carbohydrates such as fruits and vegetables would decrease calorie consumption and assist in weight loss goals. Making this change could also help these patients to meet other key recommendations. For example, increasing consumption of fruits and vegetables could help these patients to meet potassium recommendations. Sixty percent of the sample exceeded the recommended sodium limit of 2300 mg. An important consideration would be the sodium that can be associated with processed or canned fruits and vegetables. However, washing

canned vegetables or choosing frozen vegetables is a cost effective solution to this

sodium problem. Replacing processed foods high in SOFAS with whole grains and

complex carbohydrates would also be an important step in achieving a healthy body

weight. Substituting SOFAS for healthier choices would help to decrease caloric intake

and may also be important in reducing sodium intake.

Mode of Intervention Preference

The sample data indicate a remote intervention preference for email

communication (82.76%). Private telephone calls were the next highest preference

(48.28%) for this sample. None of the other remote interventions (Facebook, Twitter,

private phone calls, group phone calls) included in the Nutrition Interest Survey were

greater than 40%. This seems to suggest that the best remote nutrition intervention for

this population would be email communication. Since 93.10% of the sample indicated

that they have regular access to the internet, email communication may be a economically

feasible to provide nutrition information to large numbers of patients. Email

communication would be a good way to provide small amounts of nutrition information

and links to more in depth information. Email would also be a good way to provide links

to online surveys, which could provide a method for easy data collection.

Limitations

The main limitations of this study were the small sample size (n=30) and the

possible underestimation of the Block 2005. The small sample size was chosen because

of the availability of funds for this research project. Since the majority of the sample failed to meet the recommendations, it is reasonable to assume that this population could benefit from a nutrition intervention. The small sample size is more of an issue for the Nutrition Interest Survey because some information like distance from the hospital had a very large range and was difficult to interpret. The preference for email communication was much higher than the other remote methods and this suggests that the preference for a larger sample may not change the most preferred method. However, it is possible that a close second option such as private telephone calls may emerge as another possibility. Results from the Block 2005 failed to demonstrate a correlation between BMI and kcals or weight and kcals. Investigators also reported that the patients' actual serving size was sometimes not an available choice because the serving sizes in the Block 2005 were not large enough for certain foods. Combined, this supports the idea that the Block 2005 may have underestimated the consumption of some foods. Future research may consider correcting for this underestimation or consider using a more labor-intensive approach such as a 24-hour recall. Given the difficulty in accurate recall over a short period, screeners such as the Block 2005 provide a good starting point and are easy to use for data collection.

Future Directions

Future research with this population should begin with a larger sample for the Nutrition Interest Survey. Since the Center for Integrative Oncology and Survivorship (CIOS) serves all cancer survivors, including other genders, cancer types, and ages could

help to provide a more complete picture of preferences for types of remote interventions. The Nutrition Interest Survey only takes 5 minutes to complete so this would be an easy addition to the paper work completed before an appointment. The results of this study provide sufficient evidence that the dietary habits of these patients could benefit from a nutrition intervention and email was a clear choice among this sample. Thus, the first remote nutrition intervention with this population should utilize email communication. Email communication would be a good intervention mode to provide small amounts of information and links for those interested in learning more about a topic. Given the brief nature of email, it would be important to focus on a limited number of nutrition variables in each email. The results of this research suggest that fruits, vegetables, whole grains, and SOFAS may be good topics to start with.

Email communication is a resource efficient method that could help CIOS to achieve the goal of reaching more patients with nutrition information. The Center for Integrative Oncology and Survivorship has started a cancer survivor database for research and patient education. These patients have consented to be contacted by email and phone with educational materials and for research studies. This database of patients could provide a convenient method of pilot testing an email nutrition intervention.

No remote nutrition intervention is likely to meet the needs of all of this population and there will be a need to continue to provide face-to-face nutrition services to patients at the hospital. The remote nutrition interventions would probably not be able to assist patients who are in need of intensive nutrition education or who are not self-motivated. However, remote nutrition interventions may provide an excellent stepping

stone for patients who are considering dietary changes or those that are interested in

learning independently. Most importantly, a population that does not currently receive

any nutrition follow-up can be followed and offered services in the future.

TABLES

Table 1. Demographic Characteristics

Table 1 Sociodemographic Characteristics		
N = 30		
	Mean	Std Dev
Age	59.20	11.25
Weight	193.80	54.27
Distance from hospital (miles)	15.28	11.14
Race %		
White		80.00
African American or Black		16.67
Asian		0.00
Native Hawaiian or Pacific Islander		0.00
American Indian or Alaska Native		0.00
Other		3.33
Education %		
Some High School		3.33
GED or High School Diploma		43.33
College Degree		30.00
Graduate or Professional Degree		23.33
Annual Household Income %		
< $20,000		20.00
$20-40,000		20.00
$40-60,000		16.67
$60-80,000		16.67
$80-100,000		13.33
$100-150,000		10.00
>$150,000		3.33

Table 2. BMI

Table 2 BMI and BMI % by Category		
N = 30		
	Mean	SD
BMI	33.15	9.69
BMI Categories %		
Underweight (<18.5)	0.00	
Normal (18.5-24.9)	20.00	
Overweight (25-29.9)	23.33	
Obese (30-34.9)	26.67	
Morbidly Obese (>35)	30.00	

Table 3. Nutrition Interest Survey

Table 3 Nutrition Interest Survey	
N = 30*	
Question	Frequency
Do you have regular access to the internet?	
Yes	93.10
No	6.90
What type of access to the internet do you currently have?	
Laptop	68.97
Desktop	41.38
Tablet	44.83
Phone	58.62
Other	0.00
Are you interested in receiving nutrition information?	
Yes	96.67
No	3.33
Would you be interested in receiving **Emails** with nutrition information from the Cancer Institute at GHS? n = 29	
Yes	82.76
No	17.24
Would you be interested in receiving **Text Messages** with nutrition information from the Cancer Institute of GHS? n = 29	
Yes	37.93
No	62.07
Would you be interested in participating in a private **Facebook** Page with nutrition information from the Cancer Institute of GHS? n = 29	
Yes	37.93
No	62.07
Would you be interested in using **Twitter** to receive nutrition information from the Cancer Institute of GHS? n = 29	
Yes	3.45
No	96.55
Would you be interested in receiving nutrition information from **Group Telephone Calls**? n = 29	

Table 3. Continued

Yes	20.69
No	79.31
Would you be interested in receiving nutrition information from **Private Telephone Calls**? n = 29	
Yes	48.28
No	51.72
Are you currently trying to lose weight?	
Yes	67.67
No	33.33
*Except where n = 29. Participant not interested in nutrition information did not complete entire survey	

Table 4. Descriptive Statistics for Macronutrients

Table 4 Descriptive Statistics for Macronutrients		
N = 30		
Macronutrient	Mean	SD
Carbohydrate % of kcal	46.86	7.52
Fat % of kcal	39.22	5.95
Protein % of kcal	15.74	2.80

Table 5. Dietary Variables with Ranges by Percent Recommendation

Table 5 Dietary Variables with Ranges by Percent Recommendation				
N = 30				
Macronutrient	Recommendation%	% Below Recommendation	% Within Recommendation	% Above Recommendation
Carbohydrate	45-65	40.00	60.00	0.00
Fat	20-35	0.00	23.33	76.67
Protein	10-35	0.00	100.00	0.00
SOFAS	5-15	0.00	6.67	93.33

Table 6. Descriptive Statistics for Key Dietary Variables

Table 6 Descriptive Statistics for Key Dietary Variables		
N = 30*		
Dietary Variable	Mean	SD
Fruit (cups)	1.23	0.75
Vegetables (cups)	2.15	1.00
Fruit and Vegetables (cups)	3.38	1.39
Dietary Fiber (g)	17.44	5.59
Alcohol Drinks per Day	0.14	0.27
Potassium (mg)	2561.41	788.81
Sodium (mg)	2840.80	1065.06
SOFAS (% of kcal)	22.37	4.99
Added Sugars (% of kcal)	10.53	4.58
Whole Grains % of Total Grain	26.60	14.85
Cholesterol (mg)	234.11	157.97
Trans Fat (g)	71.14	25.16
Saturated Fat (% of kcal)	11.84	2.23
Calcium (mg)		
Calcium 19-50 years old n = 6	734.21	177.82
Calcium 51+ years old n = 24	746.40	299.10
Vitamin D (IU)		
Vitamin D 19-70 years old n= 26	143.46	103.78
Vitamin D 71+ years old n = 4	105.90	54.75
* N = 30 except for Calcium and Vitamin D reported by age range		

Table 7. Percentage Above and Below Recommendation

Dietary Variable	Recommendation	% Below Recommendation	% Above Recommendation
Table 7 Percentage Above and Below Recommendation			
N = 30*			
Fruit (cups)	2.50	96.67	3.33
Vegetables (cups)	2.50	56.67	43.33
Fruit and Vegetables (cups)	5.00	86.67	13.33
Dietary Fiber (g)	25.00	93.33	6.67
Alcohol Drinks Per Day Female	1.00	96.67	3.33
Potassium (mg)	4700.00	100.00	0.00
Sodium (mg)	2300.00	40.00	60.00
Whole Grain/Total Grain (%)	50.00	96.67	3.33
Cholesterol (mg)	300.00	76.67	23.33
Trans Fat	0.00	0.00	100.00
Saturated Fat/kcal (%)	<10.00	23.33	76.67
Calcium (mg)			
Calcium 19-50 years old n = 6	1200.00	100.00	0.00
Calcium 51+ years old n = 24	1000.00	91.67	8.33
Vitamin D (IU)			
Vitamin D 19-70 years old n =26	600.00	100.00	0.00
Vitamin D 71+ years old n = 4	800.00	100.00	0.00
* N = 30 except for Calcium and Vitamin D reported by age range			

Table 8. One Tailed T-test Comparison to Recommendations

Table 8 One Tailed T-test Comparison to Recommendations			
Dietary Variable	Mean	*t*	*p*
Fruit (cups)	1.23	-9.31	*<.0001*
Vegetables (cups)	2.15	-1.89	*0.0341*
Fruit and Vegetables (cups)	3.38	-6.36	*<.0001*
Dietary Fiber (g)	17.44	-7.41	*<.0001*
Alcohol Drinks per Day	0.14	-17.27	1.0000
Potassium (mg)	2561.14	-14.85	*<.0001*
Sodium (mg)	2840.80	2.78	*0.0047*
Whole Grains % of Total Grain	26.60	-8.63	*<.0001*
Cholesterol (mg)	234.10	-2.28	0.9851
Trans Fat (g)	2.40	8.16	*<.0001*
Saturated Fat (% of kcal)	11.84	4.52	*<.0001*
Calcium (mg)			
Calcium 19-50 years old n = 6	734.20	-3.66	*0.0073*
Calcium 51+ years old n = 24	746.40	-7.43	*<.0001*
Vitamin D (IU)			
Vitamin D 19-70 years old n= 26	143.50	-22.43	*<.0001*
Vitamin D 71+ years old n = 4	105.90	-25.35	*<.0001*
* N = 30 except for Calcium and Vitamin D reported by age range			

APPENDICES

Appendix 1. Nutrition Interest Survey

Default Question Block

Participant Code

[   ]

Cancer Diagnosis

[   ]

The following questions are to help us understand patient interest in nutrition information and will help us to provide better nutrition services for our patients. Answering these questions does not commit you to receiving these services and all answers will remain confidential. By selecting next you are consenting to participating in this survey.

Are you interested in receiving nutrition information that may be beneficial to your health and may help prevent cancer recurrence?
- ○ Yes
- ○ No

Do you have regular access to the internet?
- ○ Yes
- ○ No

What type of access to the internet do you currently have? Check all that apply.
- ☐ Laptop Computer
- ☐ Desktop Computer
- ☐ Tablet
- ☐ Phone
- ☐ Other

Would you be interested in receiving **Text Messages** with nutrition information from the Cancer Institute of GHS?
- ○ Yes
- ○ No

Would you be interested in participating in a private **Facebook Page** with nutrition information from the Cancer Institute of GHS?
- ○ Yes
- ○ No

Would you be interested in using **Twitter** to receive nutrition information from the Cancer Institute of GHS?
- ○ Yes
- ○ No

Would you be interested in receiving **Emails** with nutrition information from the Cancer Institute at GHS?
- ○ Yes
- ○ No

Would you be interested in receiving nutrition information from group telephone calls?
- ○ Yes
- ○ No

1 of 3

Would you be interested in receiving nutrition information from private telephone calls?

○ Yes

○ No

Please rank your interest in receiving nutrition information in the following ways. Slide the bar to indicate your interest level with "0" being not interested and "100" being very interested.

	0	10	20	30	40	50	60	70	80	90	100
Facebook Page											
Text Messages											
Emails											
Private Phone Calls											
Group Phone Calls											
Twitter											

What is your 5 digit zip code?

[   ]

What is your gender?

○ Male

○ Female

○ Other

What race do you consider yourself to be?

○ Black or African American

○ White

○ Asian

○ American Indian or Alaska Native

○ Native Hawaiian or other Pacific Islander

○ Other

Select your age

○ Less than 18

○ 18-24

○ 25-39

○ 40-64

○ 65-85

○ Above 85

Select your household annual income.
- ○ Below $20,000
- ○ $20,000-40,000
- ○ 40,000-60,000
- ○ $60,000-$80,000
- ○ $80,000-100,000
- ○ $100,000-$150,000
- ○ Above $150,000

Please select the highest level of education you have completed.
- ○ Some High School
- ○ GED or High School Diploma
- ○ College Degree
- ○ Graduate or Professional Degree

Appendix 2. Patient Consent Form

CONSENT FORM AND INFORMATION

Survey to Assess Cancer Survivor Nutrition Needs and Preferences

STUDY TO BE CONDUCTED BY: Center for Integrative Oncology and Survivorship
                    LOCATION: Cancer Institute 900 West Faris Rd. Greenville, SC 29605

Principal Investigator: Mark O'Rourke, MD and Sherry Stokes

Study Sponsor: Center for Integrative Oncology and Survivorship

Introduction
This is a research study. The Institutional Review Board of the Greenville Health System has reviewed this study for the protection of the rights of human participants in research studies in accordance with federal and state regulations. Research studies include only participants who choose to take part. Please take your time to make your decision. You may want to discuss it with your family and friends. The information in this consent form is not meant to frighten or alarm you; it is only meant to better inform you of all possible risks or benefits of the research study.

This consent form gives you detailed facts about the research study. This information will help you decide if you would like to take part in this study. Your signature on this consent form will acknowledge that you received all of the following information and explanations verbally and have been given an opportunity to discuss your questions and concerns with the principal investigator or a co-investigator.

Purpose of Study
You are being asked to take part in this research study because you had breast cancer.

The purpose of this research study is to: Evaluate the dietary habits of breast cancer survivors and evaluate your interest in receiving nutrition information

This research study is being done because the Center for Integrative Oncology of GHS wants to meet the nutrition needs of patients and there is currently no detailed dietary information on this population.

The study sponsor expects to enroll 50 participants in the study.

Your participation will last for 35-40 minutes.

How the Study Works
If you choose to participate in this research study, you will take two computer surveys. The first survey will assess your dietary habits and the second is designed to evaluate your interest in receiving nutrition information.

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Participant's Initials

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Risks and Discomforts
There are no known medical risks related to participation in this study. The greatest risk is the possible release of your personal health information. Your study records are considered confidential but absolute confidentiality cannot be guaranteed. This study may result in presentations and publications, but steps will be taken to make sure you are not identified by name.

Benefits
Participation in this research study will provide you with detailed information about your dietary habits. It is not possible to know whether or not you will receive any personal benefit by participating in this study. The goal is to improve nutrition services for all patients presenting to the Center for Integrative Oncology and Survivorship of GHS.

Cost as a Result of Study Participation
There will be no cost to you for participating in this study.

PAYMENT FOR PARTICIPATION
To You: You will be given a $15 gift card and a print out with information about your dietary habits for participating in this study.

To Investigators: Neither the investigators nor professional staff will receive any special compensation above and beyond their regular salaries for time and effort to perform procedures, tasks, and accurately collect and submit data.

To Institution: The Greenville Health System is not receiving compensation to conduct this study.

Voluntary Participation
Participation in this research study is voluntary. You may refuse to participate or withdraw from the study at any time. If you refuse to participate or withdraw from the study, you will not be penalized or lose any benefits and your decision will not affect your relationship with your doctor or hospital.

Contact Persons
For more information concerning this research study and research-related risks or injuries or to give comments or express concerns or complaints, you may contact the principal investigator, ***(Mark O'Rourke, MD or Sherry Stokes (864) 455-1346)***,

You may also contact a representative of the Institutional Review Board of the Greenville Health System for information regarding your rights as a participant involved in a research study or to give comments or express concerns, complaints, or offer input. You may obtain the name and number of this person by calling (864)522-2097.

For more information related to cancer, you may contact:

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Participant's Initials

- NCI's Cancer Information Service at 1-800-4-CANCER (1-800-422-6237) or Text Telephone (TTY): 1-800-332-8615
- NCI Web Site: cancernet.nci.nih.gov

Authorization to Use and Disclose (Release) Medical Information
As part of this research study, your study doctor and his/her research team will keep records of your participation in this study. These study records may be kept on a computer and will include all information collected during the research study, and any health information in your medical records that is related to the research study. Your study doctor and his/her research team will use and disclose (release) your health information to conduct this study. To evaluate the results of the study and for compliance with federal and state law, your health information may be examined and copied by the Food and Drug Administration (FDA), other governmental regulatory agencies, the Institutional Review Board of the Greenville Health System, the study sponsor and the sponsor's authorized representative(s). This study may result in scientific presentations and publications, but steps will be taken to make sure you are not identified.

Under federal privacy laws, your study records cannot be used or released for research purposes unless you agree. If you sign this consent form, you are agreeing to the use and release of your health information. If you do not agree to this use, you will not be able to participate in this study.

The right to use your health information for research purposes does not expire unless you withdraw your agreement. You have the right to withdraw your agreement at any time. You can do this by giving written notice to your study doctor. If you withdraw your agreement, you will not be allowed to continue participation in this research study. However, the information that has already been collected will still be used and released as described above. You have the right to review your health information that is created during your participation in this study. After the study is completed, you may request this information.

Once your health information has been released, federal privacy laws may no longer protect it from further release and use.

If you have any questions about the privacy of your health information please ask your study doctor.

Consent to Participate
My study doctor _____, has explained the nature and purpose of this study to me. I have been given the time and place to read and review this consent form, or it has been read to me, and I choose to participate in this study. I have been given the opportunity to ask questions about this study and my questions have been answered to my satisfaction. I have been given a copy of my study doctor's Notice of Privacy Practices. I agree that my health information may be used and disclosed (released) as described in this consent form. After I sign this consent

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form, I understand I will receive a copy of it for my own records. I do not give up any of my legal rights by signing this consent form.

_____
Printed Name of Participant

_____ _____ _____
Signature of Participant   Date   Time

_____ _____ _____
Signature of Witness   Date   Time

Investigator Statement
I have carefully explained to the participant the nature and purpose of the above study. The participant signing this consent form has (1) been given the time and place to read and review this consent form; (2) been given an opportunity to ask questions regarding the nature, risks and benefits of participation in this research study; and (3) appears to understand the nature and purpose of the study and the demands required of participation. The participant has signed this consent form prior to having any study-related procedures performed.

_____ _____ _____
Signature of Investigator   Date   Time

Principal Investigator(s)   ***Phone***

 Mark A. O'Rourke, MD   (864) 455-1346
                                           (864) 455-1347
 Sherry A. Stokes
Co-Investigators   ***Phone***
 Regina Franco, MSN   (864) 455-1346
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 Jessica Menig, RD   (864) 455-2862
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