DETERMINATION OF THE IMPACT OF A CULINARY MEDICINE NUTRITION EDUCATION PROGRAM ON DIETARY BEHAVIORS, MEAL PREPARATION, AND NUTRITIONAL KNOWLEDGE OF CANCER SURVIVORS

by

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Abstract

A healthy diet and physical activity can help manage weight and reduce the risk of cancer recurrence. Research reveals that cancer survivors want information regarding cancer therapy side effect management and how to consume a balanced diet. According to previous research, nutrition education should improve nutrition knowledge, quality of life, confidence, and motivation to make positive lifestyle changes. The purpose of this study was to assess the impact of a six-week culinary medicine nutrition education program on nutritional knowledge, motivation to make lifestyle changes, and self-efficacy of cancer survivors. Participants provided informed consent prior to completing initial and final surveys evaluating nutritional history, dietary and physical activity behaviors, and nutrition knowledge. Researchers coded and analyzed data using SPSS 24. Participants (N = 21) were 56.8+/−9.9 years of age. Although no significant difference was detected between initial and final nutrition knowledge scores, participants’ confidence scores preparing meals improved significantly from 0.89 to 1.56 (p≤0.05). Participants reported a significant increase in daily vegetable intake from 1.73 to 2.63 servings/day (p≤0.05). The lack of improvement in average knowledge scores could be attributed to inconsistent participant attendance throughout the six-week course and survey knowledge questions that did not focus on topics discussed in-depth during the course. The demonstration and hands-on cooking portion of the course positively impacted participants’ confidence and motivation to make healthy changes. Meal preparation confidence increased significantly with all participants stating they agreed or strongly agreed in feeling confident preparing meals in the final survey. Almost 100% of participants reported that they intend to make dietary changes and 100% would implement what they learned in the class into their lives. Study limitations include a
small sample size and frequently skipped survey questions. Further research is needed to
determine best practices to improve nutrition knowledge for cancer survivors in this setting.
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Cancer is the second leading cause of death in the United States.\textsuperscript{1} It is projected that in 2017, there will be over 1.5 million new cases of cancer, and the total number of cancer survivors in America continues to grow as survival rates and life expectancy increase with the advancements in early diagnosis and treatment of cancer. “Survivorship” is defined as the point of an individual’s diagnosis on into the rest of life. As a result of the growing number of survivors, more people are experiencing the physical, mental, and social effects brought about by cancer and the various cancer treatments. Survivors face many complications during and after cancer and cancer treatment that can significantly alter their quality of life, including those pertaining to nutrition.

Cancer and cancer treatment can drastically affect one’s nutritional status and overall health due to the intense methods of treatment required and resulting physiological changes. Chemotherapy and radiation treatments may result in cachexia, xerostomia, dysgeusia, malabsorption, nausea, and vomiting, and other symptoms that impact nutritional status. These symptoms often result in decreased food consumption and diets deficient in vital nutrients that the body requires in order to heal and maintain a strong immune system. Cancer survivors already have compromised immune systems, so it is even more crucial to nourish the body well to promote healing and protect from secondary illnesses or complications. Studies have shown that cancer survivors rarely meet the recommended daily intakes for fruits, vegetables, and dairy, nor achieve the recommended physical activity recommendations. Further, many patients report limited to no access to a registered dietitian for nutrition counseling. Therefore, an alarming gap exists between a growing population in need of dietary assistance and the opportunity to receive nutritional assistance.

Nutrition intervention has been shown to improve and better manage the common side
effects leading to a significantly enhanced quality of life in cancer survivors. Nutrition education and counseling is vital for individuals in this population because of their elevated risks for malnutrition and its associated comorbidities and mortality rates. Research shows one-on-one counseling with a registered dietitian (RD) positively affects outcomes for cancer survivors. However, little is known about the impact of group nutrition education classes with hands-on food preparation component. Research on developed models, such as the Theory of Planned Behavior, found that presence of social support, such as that from a group educational class, positively impacts the behaviors and improves the self-efficacy of cancer survivors.\(^2\)

Furthermore, theories such as the Social Cognitive Theory support a social-oriented approach to health changes. This model states that improving health and an individual’s self-efficacy hinges on social systems and the promotion of environmental and community-wide changes.\(^3\) This theory not only predicts the health habits and intent to change, but expands deeper than other theories and offers principles to educate, empower, and guide individuals to induce a change.

According to previous research, nutrition education should improve nutrition knowledge, quality of life, confidence, and motivation to make positive lifestyle changes.\(^7,9\) Nutrition education may also improve maintenance of a healthy weight. This research study seeks to pair the need for nutrition intervention with the need for increased social support among cancer survivors to enhance health and quality of life. The aim of this study is to assess the impact of an interactive nutrition education class, instructed by registered dietitians, on the nutritional knowledge, behaviors, and self-efficacy amongst cancer survivors.
Literature Review

Cancer affects men, women, and children of all races, ethnicities, and ages. Cancer survivorship begins at cancer diagnosis and continues throughout the remainder of life. In the United States alone, there are nearly 14 million cancer survivors. Although cancer incidence has increased since 1975 by about 13%, cancer mortality has decreased nearly 25%. Therefore, many cancer survivors are living longer and beating cancer. However, they are also dealing with recurrence and other aftermath of cancer not previously seen as widespread. The increasing quantity of survivors validates the increasing need to provide more services and support to manage the health outcomes from cancer, including nutrition.

The American Institute for Cancer Research (AICR) has developed eight principles for reducing cancer risk and risk of recurrence, all related to nutrition, physical activity, and lifestyle. These eight principles came out of the AICR and World Cancer Research Fund’s 2007 report *Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective.* The work took six years and is one of the most extensive reports on diet and cancer to ever be completed. The dietary recommendations include consuming a variety of fruits, vegetables, whole grains, and legumes as well as limiting sugary drinks, alcohol, energy-dense foods, red meats and processed meats, salty foods, and processed foods with added sodium. The recommendations also emphasize the importance of receiving vitamins and minerals from foods rather than relying on supplements. Physical activity recommendations include being physically active at least 30 minutes each day and limiting sedentary activities. Lifestyle recommendations include avoiding smoking, chewing tobacco, and being as lean as possible without being underweight. The AICR also utilizes the “New American Plate Method,” which visually depicts what an ideal plate of food should look like. Plates should be full of 2/3 or more fruits,
vegetables, whole grains, or beans and only 1/3 or less of meats. This method helps people to understand appropriate portion sizes and how to maximize intake of nutrient-rich foods full of phytochemicals to promote wellness and healing.

The AICR nutrition guidelines listed above are based on scientific research from the Continuous Update Project (CUP), specifically their Second Expert Report published in 2007. CUP is an ongoing, global program that compiles research from around the world. The research collected focuses on diet, nutrition, physical activity, and weight and how they each affect cancer risk and survivorship. A research team at Imperial College London analyzes and records the data, which is then reviewed by a panel of health professionals and experts from different backgrounds and disciplines around the world. The panel makes conclusions based on the scientific evidence and maintains that recommendations for cancer prevention stay relevant and up to date. The CUP also releases research reports addressing over fifteen different types of cancer, which is also updated frequently. Corrections to the 2007 report on food, nutrition, physical activity, and weight have already been released, and the panel will publish a full review of revisions later this year.

Published nutrition guidelines are helpful for generating education curriculum for cancer survivors, and are easily accessible the Internet. However, many are unable to navigate or access the Internet, and cancer survivors face added difficulties and obstacles surrounding nutrition due to various physiological changes. Cancer therapies, including chemotherapy and radiation, can lead to physical changes in the body that affect oral intake, nutrient absorption, energy, and appetite. Chemotherapy can cause numerous gastrointestinal (GI) problems including nausea, vomiting, diarrhea, constipation, and anorexia, appetite changes, and dysgeusia. These GI complications may result in decreased oral intake and eventually can lead to malnutrition. In
order to reduce the risk of malnutrition in cancer survivors, the nutritional side effects of chemotherapy must be managed properly through education provided by health experts regarding symptom management, medications, dietary alterations, and lifestyle factors.

Cancer treatments may also lead to weight gain or weight loss, which may increase risk of cancer recurrence. Obesity is a known risk factor for the development and recurrence of multiple types of cancer, including breast, colorectal, kidney, and prostate. In breast cancer survivors, weight gain is typical. More than 50% of breast cancer survivors followed for six years after their diagnosis, experienced weight gain from cancer treatment. A healthy diet and physical activity can help manage weight and reduce risk of cancer recurrence. Furthermore, Rock and Flatt conducted a behavioral weight loss intervention with overweight or obese breast cancer survivors, reporting that weight loss has a clinically significant impact on reducing cancer recurrence. Weight loss can be achieved through a diet high in fruits, vegetables, whole grains, and legumes and low in processed foods and red meats.

To maintain a healthy weight and follow the AICR guidelines to reduce risk of cancer recurrence, cancer survivors need nutrition education and counseling by a qualified health care professional. However, Thompson and Silliman found that only 21% of cancer survivors received nutrition counseling from an RD. Less than half of the cancer survivors received dietary counseling from any health care professional. Cancer survivors report a desire for nutrition education and counseling over all other types of cancer education due to the desire to manage cancer therapy side effects and consume a balanced diet. Nutrition education conducted through oral conversation was preferred over written materials, showing the importance of nutrition counseling or education classes. In fact, 58% of these cancer survivors felt that it was very important to receive some form of nutrition education during their cancer treatment. However,
only 37% of these cancer survivors actually received nutrition education from a health care professional.7

A major concern for cancer survivors the potential for a decrease in quality of life due to physical illness, aggressive cancer treatments, and emotional stress. Baur and Capra examined the effect of nutrition intervention on quality of life in cancer survivors actively receiving treatment. They found that nutrition counseling over eight weeks led to improved outcomes concerning quality of life.9 Nutrition education and counseling should address the side effects of cancer treatments as well as AICR principles. Along with nutrition education and counseling, physical activity may help to improve quality of life. Cancer survivors who consumed greater than or equal to five fruits or vegetables each day and walked daily for exercise reported an increase in quality of life and hope.10

The aim of this study is to analyze the impact of nutrition education courses on cancer survivors’ nutrition knowledge, self-efficacy, and motivation. The participants took part in the nutrition course over six weeks. The course focused on the AICR nutrition guidelines to reduce the risk of cancer recurrence and improve quality of life. The study evaluated knowledge, feelings, and measurements through an initial and final survey that each cancer survivor completed on the first and last class of the six-week series.

Methods

Survey Development:

To establish a baseline of participants’ knowledge of nutrition, dietary patterns, medical history of cancer, and attitudes about their health before the start of the six-week class an initial survey was developed. A final survey was also created, which included the same initial questions in addition to questions assessing the participants’ opinions concerning the effectiveness and
impact of the class. The survey included 57 total questions assessing past medical history, lifestyle and behavior patterns, nutrition knowledge and self-efficacy.

Knowledge questions were multiple choice; past medical history questions were open-ended; and lifestyle, behavior pattern, and self-efficacy questions were assessed using a five-point Likert scale (-2=strongly disagree, -1=disagree, 0=neither agree nor disagree, 1=agree, 2=strongly agree). Nutrition knowledge questions reflected the class curriculum, which was based on the AICR nutrition recommendations for cancer survivors. Topics covered in the class from this curriculum included the importance of phytochemicals, the new American Plate Method, complementary proteins, and recommended intakes of fruits, vegetables, meats, fats, fiber, and sodium. Past medical history questions assessed type, stage, and treatment of cancer as well as previous exposure to counseling and education from a registered dietitian. Other open-ended questions asked about supplement usage, special dietary regimens, and intake of alcohol, tobacco, and soda. A set of five questions gathered how many servings of each major food group participants consumed daily. These questions included examples of proper serving sizes for vegetables, fruit, meat, grains, and dairy.

The survey was reviewed and approved by two RDs at Moncrief Cancer Institute (MCI) in Fort Worth, Texas. The survey was distributed to two separate culinary medicine classes offered at MCI, which were taught by the same two RDs who reviewed the survey. Both classes covered the same material; one class was held from July to August 2016 and the second from September to October 2016.
**IRB Review & Approval:**

All study measures and materials were reviewed and approved by the Texas Christian University Institutional Review Board and the Texas Christian University Department of Nutritional Sciences.

**Sample & Recruitment of participants:**

The study was a convenience sample including clients of MCI in Fort Worth, Texas, who signed up for the six-week “Fresh Foundations: Americana” culinary medicine nutrition education class. Clients taking the class were eligible to participate in the research study if, at the start of the class, they were considered cancer survivors, defined as individuals who currently have or have had cancer. Clients were eligible to participate without regard to cancer type, age, or gender. Exclusion criteria included individuals taking the class who were not cancer survivors. All study participants signed “informed consent” forms before taking the initial survey as well as a written HIPAA agreement detailing the terms of confidentiality with their provided healthcare information. Participants were aware of their ability to withdraw from the study at anytime. No compensation was given for participation in the study.

**Data analysis:**

All survey answers were recorded via SPSS software (version 24). The level of significance was defined as $P \leq 0.05$. Analysis included comparing initial and final survey results for each participant in each category of nutritional knowledge, behaviors, and habits. Descriptive statistics were utilized for Likert Scale questions on both initial and final surveys assessing participant lifestyle, behavior pattern, and self-efficacy responses. Means were compared between initial and final attitudes of participants and values of significance ($P \leq 0.05$) were recorded. Paired T tests were utilized to examine nutritional knowledge questions and note
values of significance ($P \leq 0.05$) between participant initial and final survey responses. Finally, frequencies were determined for questions asked on the exit survey regarding whether or not the information taught was helpful, and if participants planned to implement the information and make dietary changes. Averages from these initial and final Likert Scale questions were recorded.

**Results**

**Sample, Recruitment, & Retention:**

Twenty-one cancer survivors participated in the study, 86% of whom were female (N=18) and approximately 10% of whom were male (N=2) (one participant did not specify gender). The average age of participants was 56.8+/-9.9 years. Individuals who did not participate in the study were not cancer survivors and therefore not eligible. Participants enrolled in the class because they hoped to learn about nutrition (95%, N=19), lose weight (33.3%, N=6), learn cooking skills (28.6%, N=5), or were referred by their doctor (19%, N=4). Only 57% of participants reported having met with an RD prior to the class.

**Dietary Patterns & Behaviors:**

Participants reported a significant increase in daily vegetable intake from 1.73 (N=20) to 2.63 (N=16) servings per day ($p \leq 0.05$). Although not statistically significant, a decrease in meat intake was also reported from 2.00 servings (N=20) to 1.75 servings per day (N=16). Additionally, reported fruit intake increased from 1.80 (N=20) to 2.28 (N=16) servings daily and reported grain intake decreased from 2.26 (N=19) to 2.13 (N=16) servings daily (see Appendix, Figure 2). When asked if participants eat on the go, 13% (N=3) of participants agreed initially, with only 4.3% (N=1) agreeing in the final survey. While ~44% (N=10) reported eating while
multitasking initially, only ~26% (N=6) reported this in the final survey. The percentage of participants correctly answering a knowledge question regarding complementary proteins increased from ~56% (N=11) to ~81% (N=13) when participants who skipped this question were removed from the data. However, overall nutrition knowledge did not significantly increase.

**Meal Preparation:**

Although no significant difference was detected between total initial and final nutrition knowledge scores, participants’ confidence scores preparing meals improved significantly (p≤0.05) from 0.89 (N=19) to 1.56 (N=16). There was an increase in participants who reported enjoying preparing healthy meals from an average of 0.75 to 1.13 in the final survey. Participants reported they strongly agreed they would make dietary changes after participating in the class (1.67 average +/-0.49), they will implement what they learned in the class into their lifestyle (1.73 average +/-0.46), and they found the information taught to be helpful (1.93 average +/-0.26).

**Discussion and Conclusion**

**Principal Findings:**

This study supported research findings that state over 50% of cancer survivors feel it is important to receive some form of nutrition therapy, which is demonstrated in the majority of participants reporting they took the class to learn more about nutrition (see Appendix, Figure 1). This may also be reflected in the results reporting improved confidence levels and comfort levels in regard to nutrition and cooking. The sample of participants appeared to be somewhat motivated and curious about nutrition at baseline according to these results and the fact that most participants signed up for the class voluntarily. Furthermore, over half of the sample reported
having had some form of nutrition education or counseling from an RD since cancer diagnosis (57%, N=12). According to the literature, this percentage may be above the average population of cancer survivors who meet with an RD after diagnosis. However, it is important to note that despite the majority of the sample having had previous exposure to counseling from an RD, knowledge tested on the survey about the role of an RD did not significantly improve over the course.

The average number of knowledge questions that participants answered correctly did not significantly change from initial to final surveys. The lack of improvement in average nutritional knowledge scores could be attributed to inconsistent participant attendance throughout the six-week course. Some participants did not attend every class due to scheduling conflicts, cancer treatment, or other extenuating circumstances. Poor attendance may certainly have affected one’s overall improvement in nutrition knowledge, as he or she would have missed some topics covered in class and incorporated in the survey. Another possible contributor to insignificant knowledge improvements was survey questions that did not focus on topics discussed in-depth during the course. The nutrition knowledge questions were created based upon the AICR curriculum covered in the culinary medicine class. However, specific areas of focus included in the survey may not have been equally focused on throughout the class. These variables could change based on a class’s interests and questions, leading the education to focus on topics at different levels of detail. Finally, the nutrition education portion took place at the end of the class, following the hands-on cooking portion. During this time, participants sat together at round tables and sampled each of the meals they had previously prepared. Tasting the meals took place simultaneously during the RDs’ educational lesson. Eating during the education could have served as a distraction to participants, impacting their attention. In addition, the classes are
customarily three hours long, so participants may have been tired. All of these variables could result in suboptimal focus and processing of educational material.

Despite the lack of improvement in nutrition knowledge, the study results show positive changes in confidence levels and dietary behaviors. On the final survey, all participants stated they “agreed” or “strongly agreed” that they felt comfortable cooking in the kitchen, confident to cook their own healthy meals, and confident reading and understanding a food label (see Appendix, Figure 3). Additionally, participants reported an increase in enjoyment of preparing healthy meals (.75 to 1.13). Almost 100% of participants reported that they intend to make dietary changes and 100% would implement what they learned in the class into their lives (see Appendix, Figure 4). These results demonstrate an apparent change in participant attitudes toward nutrition and confidence to implement healthy eating habits and meal preparation into their lives. This data also validates the impact of hands-on activities and participation in a group nutrition education. Participants reported increases in self-efficacy toward cooking and ability to prepare healthy meals alone; therefore, the hands-on food preparation portion of the class appears to improve cancer survivors’ self-efficacy and motivation. Study findings on nutrition behaviors and confidence are important because individuals must first possess motivation before putting nutrition knowledge to practice.

**Strengths and Limitations:**

Strengths of this study include that it is developed based upon the AICR curriculum, is at an appropriate health literacy level, and was consistent in duration, and maintained confidentiality. The multiple-choice, knowledge portion of the survey was developed based upon the AICR nutrition recommendations and education materials. The RDs at MCI provided the lesson plans and modules for the class, which further enhanced the development of survey
questions. These resources ensured that the participants were tested on scientifically supported and published information. Initial and final surveys were strategically crafted to include these guidelines, and the RDs at MCI reviewed them for appropriate literacy level and format design suitable to their client population. Once approved, the survey was piloted at a culinary medicine class already underway at MCI. Further edits were made according to the feedback provided by the clients taking the class and the RDs.

Other strengths included the class duration, which was held at the same time each week and involved multiple classes. Classes were once a week for three hours over six consecutive weeks. The longer class times and repetition allowed the participants to get to know each other well and form relationships with the RDs. As a result, participants gained social support, which may have helped to create a more comfortable setting to participate in class, share ideas, and prepare meals together.

Finally, researchers maintained confidentiality by coding each participant before data was collected. The RDs at MCI assigned each participant a number and removed their names from the surveys. Therefore, researchers were blind to participant identification throughout the study to eliminate bias.

Study limitations included a small sample size, frequently skipped survey questions, inconsistent attendance, and lack of anthropometric data. Unfortunately, the sample size included only 21 participants. However, it should be noted that culinary medicine classes typically average of 14 clients per class, with a maximum capacity of 18 clients. Enrollment is limited to ensure all clients can participate in hands-on food preparation and maintain adequate opportunities for one-on-one interaction with the RDs. Despite being told to answer every survey question to the best of his or her ability, some study participants still skipped questions on the
surveys. Data was skewed due to these occurrences, and some data had to be removed to accurately analyze frequencies and means. In addition to the absence of some data, the absence of individuals at various classes may have also affected changes in nutritional knowledge and overall effectiveness of the course. This variable was hard to control due to environmental factors, such as other doctor appointments, which kept people from being able to attend class every week. Participants missed important educational information if they were absent from class, which likely affected changes in nutrition knowledge. Data detailing subjects’ anthropometrics, such as height, weight, and body mass index (BMI) was also lacking. This information was not collected for this study; therefore, physical changes, as a result of the class, were not recorded or analyzed.

**Future Research:**

Future studies should ensure that survey questions match information taught in the class to provide more accurate data. Consistency could be better controlled if the creators of the survey were also responsible for teaching the education portion of the class. Furthermore, the survey items could be shortened or reworked to enhance response rate. Placement of nutrition education within the class time frame should be carefully considered. Exposition of nutrition concepts at the beginning of class before food is prepared may be beneficial for maintaining participant concentration and focus. Participants could then demonstrate and practice the nutrition information and recommendations learned from the lesson by cooking in the kitchen and eating together in a more social setting. Further research is needed to determine best practices to improve nutrition knowledge for cancer survivors in this setting. Long-term evaluation of culinary medicine classes would be beneficial to gain a larger sample size and track significant
changes in knowledge and anthropometrics. With anthropometric data, researchers could analyze any resulting physical or anatomical effects influenced by the culinary medicine course.
References:


Appendix

Figure 1:

Reasons For Class Participation

<table>
<thead>
<tr>
<th>Reason</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn More About Nutrition</td>
<td>19</td>
</tr>
<tr>
<td>Doctor Recommendation</td>
<td>4</td>
</tr>
<tr>
<td>Learn to Cook</td>
<td>5</td>
</tr>
<tr>
<td>Lose Weight</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 2:

Daily Consumption of Food Groups

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Initial</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td></td>
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</tr>
</tbody>
</table>

P ≤ 0.05
Figure 3:

![Graph showing self-efficacy of food preparation and healthy eating before and after education program.]

Figure 4:

![Graph showing behavior changes after education program.]

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