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The Role of Nutrition in
Breast and Colorectal Cancer Patients Undergoing Chemotherapy

By

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ABSTRACT

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Nutrition is important to sustain life. It is extremely significant for patients who are actively being treated with chemotherapy. The focus of this research is to understand how nutrition affects cancer patients. This includes the intake of beverages on breast and colorectal cancer patients. Research suggests women breast cancer patients and men colorectal cancer patients can overcome or lessen side effects from cancer treatment with a focus on nutrition. These side effects are most apparent when cancer patients are undergoing chemotherapy treatment.

Unfortunately, there has been limited research on nutritional support for breast and colorectal cancer patients. Therefore this study includes qualitative data to expand the research. It includes interviews with an oncologist and a registered dietitian to help examine the level of awareness that healthcare professionals incorporate into treatment plans for their patients pertaining to the role of nutrition. The interviews are presented in chapters two and three. These chapters consist of main subcategories which correlate to chapter one, which reviews the existing scholarship on the topic. The subcategories are as follows: training, side effects, weight, and diet.

The last chapter explores the lack of resources for cancer patients regarding nutritional support while undergoing treatment. A collaborative effort among oncologists and registered dietitians would create optimal treatment plans for breast and colorectal patients. Patients have the right to rely on their providers to direct them to the best care!

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1.1 Introduction to Cancer in the United States

Cancer is a global disease that affects large numbers of people, especially in the United States. Cancer is included in the top ten leading causes of all death in the United States; it is ranked as the second highest cause. Cancer is a broad medical illness that can be categorized by the type and progression of the disease. “Roughly 1.9 million people will be diagnosed with cancer in 2022” (cancer.gov). “An estimated 287,850 women and 2,710 men will be diagnosed with breast cancer in a year,” which makes it the second most common cancer diagnosis in the United States for women (cancer.gov). Colorectal cancer is also among the top leading deaths in the United States, as approximately “4.4% of men (1 in 23) and 4.1% of women (1 in 25) will be diagnosed with colorectal cancer in their lifetime” (cancer.org).

Each of these cancers in the United States has a different set of symptoms and diagnoses. Breast cancer and colorectal cancer take place in different parts of the human body, which affect biological organs and systems. Both cancers have a specific list of symptoms and diagnostic tests, that are discussed in more detail further in the review. These cancers can be treated with one of the same option treatments known as chemotherapy. Chemotherapy is one of the strongest forms of treatment and patients endure numerous and sometimes difficult side effects from this powerful medication. Chemotherapy is available in various strengths and administration methods, depending on the stage and progression of a cancer diagnosis.

Through research, nutrition has been seen to have a correlation with subduing side effects from such treatments in cancer patients. Nutrition can support breast and colorectal cancer patients by providing fuel and energy. This will allow patients to feel stronger to fight against difficult side effects. Some specific food groups are the most important to the body. Providers

have recommended eating from these groups to energize and meet daily nutritional requirements to fulfill the body. These food groups are discussed further in this chapter.

Food and beverages work together to provide nutrition. They are necessary for biological life processes to perform efficiently. The choice of food and beverages can give a patient a sense of control in their life while undergoing cancer treatment. They can use the information to gain nutritional knowledge. This along with encouragement to help choose proper products can be beneficial. Nutritional knowledge can be provided from healthcare providers such as oncologists, chefs, and registered dietitians.

1.1.1 Breast Cancer Introduction

Breast cancer is a solid tumor cancer, which occurs within the breast cells and metastasizes within the three main regions of the breast: lobules, ducts, and connective tissue (cancer.org). Breast cancer mainly targets the ducts and the lobule regions and then spreads throughout the tissue. Invasive ductal carcinoma and invasive lobular carcinoma are the most common type of breast cancer (Centers for Disease Control and Prevention). Cancer can spread to other regions within the breast and can vary with progression and stage. Breast cancer can develop in all human beings. However, there are several predispositions for women that place them at a higher risk for a diagnosis of breast cancer.

1.1.2 Gender and Statistics

Breast cancer is a specific type of cancer that is most prevalent among women due to hormonal differences. Men have lower levels of estrogen and produce fewer breast cells. The breast cells that do exist within the male body consist of fat, not “formed glands”

(Breastcancer.org). Male breasts also do not take as long to develop. In a woman's life, the breast changes and develops throughout their menstrual cycle and pregnancy. Women's breasts form glands which occur during five developmental stages (hopkinsmedicine.org). These cells and glands are more susceptible to illness later in life, resulting in the age of 50 and over, being prone to breast cancer. "About 2 out of 3 invasive breast cancers are found in women 55 or older" (Breastcancer.org). The demographic for women of the age of 50 is slightly lower for different racial groups. Black women tend to be diagnosed with breast cancer at a younger age and statistically have a higher death rate. In comparison, Asian women have the lowest death rate for breast cancer (cancer.org). Fortunately, for women diagnosed with breast cancer, there is a 90% survival rate (cancer.gov).

There are certain risk factors that are more susceptible to breast cancer. The top factor is being a female. The other factors are increasing age, obesity, family medical history, radiation history, and inherited genes that increase cancer risk (mayoclinic.org). It is especially important to know one's family medical history as breast cancer can be hereditary. If your mother or grandmother was diagnosed with breast cancer in their lifetime, this automatically increases one's risk (WHO.int). There are also some specific gene mutations that have been studied and determined to increase the risk for breast cancer. These genes are "BRCA1, BRCA2, and PALB-2" (WHO.int). These inherited genes do not predict with certainty that one will get breast cancer but it raises the risk by approximately "5 to 10 percent" (mayoclinic.org). Risk factors should be regarded when providing health histories to doctors and, equally important, are noting any changes that may occur in one's body. Changes can indicate a symptom of breast cancer.

1.1.3 Symptoms and Tests

Symptoms that breast cancer patients experience range from slight irritation in the breast region to nipple discharge and lumps (CDC). Symptoms can be physical changes in the skin around the breast region, redness, nipple inverted or unusual, and changes in the shape of the breast (mayoclinic.org). A symptom such as irritation can be difficult to diagnose based on this one symptom because of irritation on one's pain tolerance. However, lumps and discharge are easier symptoms to self-diagnose.

A woman should see a gynecologist once a year or if they are experiencing any symptoms that correlate with breast cancer. Typically a woman should begin following an Obstetrics and Gynecology physician during the transition into womanhood when the breasts are fully developed. When a patient consults a doctor about symptoms they are experiencing, diagnostic tests and physical examinations are performed to help the physician determine an accurate diagnosis. The physician has four main ways to detect breast cancer. They are ultrasound, diagnostic mammogram, breast magnetic resonance imaging, and biopsy (CDC). The ultrasound emits sound waves to create images. The "ultrasound may be used to determine whether a new breast lump is a solid mass or a fluid-filled cyst" (mayoclinic.org). A diagnostic mammogram exposes the patient to radiation in order to take x-ray images of the breasts. The test is run through a machine that uploads the taken photos from the patient to the computer. The physician can run through the images scanning for any abnormalities of lumps or clusters (CDC). Breast magnetic resonance imaging features the MRI machine, in which the patient must lie down in the machine. Before the start of the test, a patient is injected with dye. The dye works with a magnet and the radio waves emitted from the machine. While this is occurring, the machine is scanning the "interior" of the breast for abnormalities (mayoclinic.org). The last test

that a healthcare provider can perform is a biopsy. The physician takes a small sample of the breast region using a “specialized needle device guided by X-ray or another imaging test to extract” the tissue (mayoclinic.org). These procedures can be conducted when one is experiencing any symptoms.

1.1.4 Chemotherapy treatment/ side effects

Once breast cancer has been detected and confirmed by diagnostic tests; the patient and doctor must advise a treatment plan. It is important to determine an appropriate and optimal treatment plan. There are several ways to attack cancer: local treatments, systemic treatments, and treatments by stage. As these options are effective, the treatment plan should account for what the patient wants, what the caretakers want, and what the best medical care options are for the patient. Chemotherapy is one of the most common and recommended treatments for a progressed or aggressive state of cancer. Most breast cancer patients undergo chemotherapy treatment, instead of surgery. Surgery is more invasive and considered a second treatment option (mayoclinic.org). Doctors advise the patient to undergo chemotherapy treatments to decrease the size of the tumor in the breast or decrease lymph nodes or any other abnormalities that are malignant (mayoclinic.org).

Chemotherapy is cytotoxic, meaning it kills cancer cells (macmillan.org.uk). Cytotoxic chemotherapy is given through an IV (intravenous) and distributed into the bloodstream. Breast cancer patients have a central line placed which allows them to receive the chemotherapy via an infusion. The central line is normally placed on the opposite side of where the cancer is located (cancer.org). However, if a woman has breast cancer in both breasts, the central line runs on the side with the “fewest lymph nodes removed or involved with cancer” (cancer.org).

Cytotoxic chemotherapy aims at obstructing the cell's process of growing and dividing. The goal of the drug is to kill the cancer cells before more can metastasize and develop. However, chemotherapy is such a strong drug that healthy cells can also be affected in the process. The healthy cells can usually recover but the cancer cells die. Since the number of blood cells are reduced, specifically the white blood cells, this can lead to a higher risk of infection. The white blood cells work as a defensive system against any foreign invaders (macmillan.org.uk). The white blood cells operate within the immune system and move to detect any invaders and fight against them (macmillan.org.uk). Since chemotherapy reduces the white blood cells, patients are more likely to get an infection or a virus (macmillan.org.uk). An additional virus or illness exposed to a person with cancer while undergoing chemotherapy can severely harm their body. It is important for caretakers, family members, and visitors to take preventative measures near chemotherapy patients and for the patient to be aware of who they are exposed to.

Chemotherapy treatments are typically 3-6 months in duration and are monitored by a healthcare team. The treatments themselves are strenuous to the body. Treatment can have side effects that are taxing on both the physical and mental body (mayoclinic.org). Cancer treatments can cause long-term and short-term problems, such as “dysphagia, xerostomia, or malabsorption, that can make eating difficult and that can impair nutritional status, leading to persistent weight loss, muscle wasting, and nutrient deficiencies” (Brown, 2001, 157). “Weight loss was identified in 40% of patients with breast cancer” (Rivadeneira, 1998, 69-80). Other side effects range from appetite loss, constipation, diarrhea, gas, bloating, fatigue, nausea, swallowing problems, and taste changes. These side effects can be suppressed and or managed with nutritional support and care.

1.1.5 Nutritional Support is important

When breast cancer is detected early, the patient may be able to take preventative measures to overcome the side effects of chemotherapy. Preventative measures such as consuming certain foods and beverages may ease the uncomfortable side effects from chemotherapy. Consuming specific foods and beverages are preventive practices that are beneficial for patients struggling with intaking adequate amounts of nutrients to maintain a healthy weight. A healthy weight which is determined if the patient is still able to function and continue treatment. Since treatments take a toll on the body and often cancer patients seek help pertaining to this (Brown, 2003, 268-291). “The time of cancer diagnosis has been identified as a ‘teachable moment’ when a high proportion of cancer survivors are open to learning more about nutrition and cancer” (Czymmek, 2012, 89). This crucial time frame provides the patient an opportunity to learn and be more receptive towards the importance of nutrition. Nutrition plays a significant component in maintaining bodily functions during chemotherapy treatment. Food is the body’s fuel or energy source which allows it to operate efficiently. The human body can store fat which can be quickly consumed for energy. Energy is required to maintain life processes. When a cancer cell attacks healthy cells in a body, the affected cells lose the ability to metabolize efficiently. This can result in a change in body weight seen as the main side effect of chemotherapy (Demark-Wahnefried, 1993, 1418-1429). The change can be a gain or loss of body weight. Many women patients are affected by the fluctuation in their weight and seek advice from healthcare providers for nutritional support.

A specific study that highlights weight gain in breast cancer patients was conducted. Breast cancer patients receiving chemotherapy had their diets evaluated. Many patients gained weight undergoing chemotherapy treatments because of hormonal imbalances and alterations.

This study compared a beverage diet to a supplemented diet. It was a randomized experiment that studied two groups. Group I, the experimental group, was administered a “free choice diet supplemented with nutritional support in the form of a liquid diet supplement” (Elkort, 1981, 386). Group II, the control group, “received only a normal self-selected diet. Dietary intakes were calculated for the total carbohydrate, fat, and protein consumed and the percentage of calories derived from carbohydrate, protein, and fat was calculated” (Elkort, 1981, 386). The study had inherent errors because it was difficult to maintain among the high-risk participants. During the study, several patients passed away resulting in unclear or incomplete data. However, nutritional boundaries and criteria were established before the study where, “both groups fell within normal limits at the start of the study except for body weight and triceps skinfold thickness; both of which were elevated above the normal range” (Elkort, 1981, 387). The study indicated that as body weight increased iron levels decreased.

The study did not offer enough information to make a thorough assessment regarding beverages and supplemental diets. It did suggest that patients and providers need a better understanding of how to administer “nutritional support programs only in situations” of special circumstances (Elkort, 1981, 385). From the study, providers only addressed patients if there was a clear problem. However, a provider should focus on all patient problems. Providers' knowledge of nutritional value for patients undergoing chemotherapy has evolved over years. It is important for a patient to consult or consider a specialist such as a nutritionist when receiving chemotherapy treatments.

1.1.6 Provider's Recommendations

In the past, providers encouraged and instructed their patients to reduce their calorie intake. It was believed that one could kill cancer cells through starvation mode. Patients were advised to do so because it was believed this minimized nutrients that the cancer cells needed to thrive (Naveed, 2014, 391-398). The theory of starving cancer was tested on mice with fasting and short-term starvation. “Short-term starvation or fasting differentially kills cancer cells but not the normal cells in response to chemotherapy drugs. Fasting for three to five days is not acceptable by most patients, in this case, alternate day fasting... may provide similar results” (Naveed, 2014, 391-398). There is a difference between short-term and long-term fasting. The belief that long-term fasting is effective has not been proven scientifically. Low-calorie or no-calorie days have not been studied or researched adequately enough to confirm such a modality kills breast cancer cells.

Today, oncologists, registered dietitians, and other healthcare professionals recommend eating, even if one does not have an appetite or does not want to eat due to fear of gaining weight. Recommendations such as “adding butter or oils to foods” can have a tremendous impact (No Appetite? how to Get Nutrition during Cancer Treatment, 2022). Butter and other healthy fats are encouraged to be eaten; peanuts, beans, cheese, avocado, and other seeds/nuts. Most of the energy our bodies require to function properly are derived from carbohydrates and fats. This is the reason healthcare professionals claim carbohydrates and fats are healthy and necessary. Fat consumed in a diet can be beneficial because it allows the body to decompose and distribute it to other areas that are in need of building and repairing, such as organs and other significant vitals.

Registered dietitians at the Helen F. Graham Cancer Center at Christiana Care are implementing and recommending a new device to patients. The MedGem device built by Microlife USA Incorporation can determine a person’s metabolism rate. It measures the rate of

metabolism from a breath test. “Metabolic measurement is a key factor for calculating how many calories the body burns for energy each day. MedGem is a portable, hand-held device that the patient breathes into for about 10 to 15 minutes. To lose or gain weight, a person would need to adjust the caloric intake and/or physical activity level” (Czymmek, 2012, 91).

An instructive web page that is available to the public is ELLICSR Kitchen. The web page is targeted to cancer patients and cancer survivors. Its focus is to help this population manage a healthy lifestyle with cooked foods. The site is hosted by Wellness Chef Jeremy Capone and Registered Dietitian Stephanie Gladman (ellicsr.ca). Together the chef and the registered dietitian create meals with a focus on countering the effects one endures during cancer treatments. One recipe that these providers promote is named “Ginger and Cocoa Energy Patties.” The ingredients in this recipe are selected based on recommendations that ginger is a good source of nutrients and can help with the side effects of nausea and appetite loss. The patties in the recipe are high in calories to help compensate for the lack of appetite from cancer patients. If a cancer patient cannot eat 3 meals a day, it is suggested that they eat foods high in calories such as the “ginger and cocoa energy patties” whenever they can (ellicsr.ca).

Julie Lanford, a registered cancer dietitian has also created an informative web page for breast cancer patients (cancerdietitian.com). She uploads recipes and articles on her page to assist patients who have developed food fear. Food fear has been coined in recent times as a fear of eating certain foods that may contribute to weight gain. It also refers to a belief that digesting the wrong foods can cause cancer to multiply or grow. Society and the influence of the media have contributed to this food fear as well as what is considered an ideal body weight standard. The ideal body weight standard is unattainable and unrealistic for the average person. Many

women are self-conscious about their appearance during their cancer journey, which can affect them mentally.

Julie Lanford addresses food fear by creating tasty recipes that are nutritionally beneficial for cancer patients with the hope they help patients consume quality calories. Her recipes are intended to decrease food adversities that cancer patients may experience. She uploads instructional blogs pertaining to specific diets. The goal is to help cancer patients who are struggling with food textures, tastes, inadequate nutrient uptake, and the inability to chew or swallow, to be able to select a recipe that can be beneficial. One controversial food group regarding breast cancer are soybeans. Within the scientific community, there is controversy regarding the benefits, if any, of consuming soybeans. Julie Lanford states that “people have heard soy is bad for breast cancer, especially the type of breast cancer that grows in response to hormones. The truth is that no studies have proven phytoestrogens cause cancer to grow; so far it is a theory.” She advises her clients to eat soybeans in moderation and to avoid soy powders because the powders are manufactured and not authentic soy.

One source that contradicts Julie Lanford’s recommendations on eating soybeans, believes soybeans are harmful. This source states breast cancer survivors should not consume soybeans. “Some professionals express concerns that soy foods may be harmful to certain individuals” (Maskarinec, 2005, 1524-1528). Soy contains isoflavones, which are plant estrogens (Kucuk, 2017, 1901-1903). Research has discovered that high levels of estrogen increase the risk of breast cancer (Kucuk, 2017, 1901-1903). The recommendation regarding consuming soybeans is not as important as other nutritional recommendations and it should be noted that the recommendation is from an older source affecting future discoveries. The majority of cancer journals and medical professionals agree that one’s diet “should emphasize vegetables and fruits,

low amounts of saturated fats, soy foods in moderation, and moderate or no alcohol” consumption (Brown, 2001, 153-181).

Web pages and online sources have made it more accessible for patients to develop a better understanding of nutrition. The patient can remotely message a registered dietitian such as Julie Lanford or Wellness Chef Jeremy Capone and Registered Dietitian Stephanie Gladman. Patients can also review blogs and articles from previous posts, and stay up to date with maintaining a healthy lifestyle. Patients can consult with dietitians or nutritionists who are experienced in treating cancer patients. They can provide information, recipes, and suggestions on how to receive the highest amount of nutritious food; specifically fruits, vegetables, fiber, and most importantly protein.

1.1.7 Protein

Protein is one of the core food groups. It is very important to get an adequate amount of protein. The total amount of protein is always listed in bold print included with nutrition facts on food and beverage products. Protein is a significant food group for cancer patients. Cancer patients can be malnourished because of their diagnosis and treatment and require large amounts of protein consumption. Proteins are contrived by amino acids. The amino acids have the ability to receive energy and aid in repairing hormones. There are about 20 amino acids that have been identified as essential for growth and development, the others are not necessary (Hoffman, 2004, 118-130). Protein “intake is essential during all stages of cancer treatment, recovery, and long-term survival. The best choices to meet protein needs are foods that are low in saturated fat. An intake of 10% of calories from protein will generally meet the protein needs of adult cancer survivors” (Brown, 2003, 274).

Protein is essential because it contributes to reducing hunger. Protein contains a peptide YY, which has the effect on a patient to feel full for a long duration of time (Batterham, 2006, 223-233). A patient can eat less food with a higher percentage of protein. The average person should “consume 15–30 grams of protein at each meal” (mayoclinic.org). A healthy person’s total percentage of protein in their daily intake should be approximately 10% to 35% percent. The average amount of protein a woman should consume is dependent upon body weight. However, since cancer patients are undergoing different treatments, they may be required to consume more protein to keep their energy levels elevated. The recommendation to eat more protein may be difficult for these patients.

If a patient struggles to eat protein in food or fails to meet the average standard; supplements can be beneficial (Brown, 2001, 153-181; Bloch, 2000, 122-127). High-graded supplements can provide a high amount of protein (Brown, 2001, 153-181). These supplements are recommended to cancer patients who may struggle with this issue (Bloch, 2000,124). Some patients get their protein intake from ingesting protein beverages such as the classic protein shake (ellicsr.ca). This option can be suitable for those patients that have difficulty swallowing or chewing. Many companies that produce such shakes offer several choices of flavor. There are also cancer patients who have no difficulty absorbing protein through adequate consumption of meat.

Although protein is highly recommended for breast cancer and its survivors; studies have also shown that plant-based diets are highly effective at fighting cancer, slowing the progression of the disease, or maintaining remission of the disease. One study “asked nearly 70,000 volunteers about their diets, then tracked them over time; they found lower cancer rates among people who didn't eat meat at all” (How Plant-Based Food Helps Fight Cancer, 2022). It has been

shown scientifically that plant-based foods may reduce cancer. Some research has found “plants produce many phytochemicals (literally, plant chemicals) which may protect cells from damage. Phytochemicals have many beneficial effects, including anti-inflammatory... and they boost fiber consumption. Young women who ate the highest amount of fiber-rich diets were 25% less likely to get breast cancer later in life” (How Plant-Based Food Helps Fight Cancer, 2022). This knowledge does not suggest that cancer patients and survivors should remove meat from their diets, but it should serve as a reminder in being mindful of the amount of meat they consume.

Meat is a protein that is generally processed (Brognano, 2022). Consuming high amounts of processed foods increases the chemical compounds circulating in the human body. Many processed types of meat and products contain chemical additives or synthetic chemicals such as preservatives (Brognano, 2022). These additives, chemicals, and preservatives are found to contain nitrates (Bendix, 2022). Science has discovered that nitrates might raise cancer risk (Bendix, 2022). These chemicals circulating in the bloodstream after consuming processed foods can alter the cancer status negatively or detrimentally. Other sources of protein can come from eggs, dairy products, nuts, seeds, and legumes. These sources are generally not as processed and can provide a high amount of protein.

Consuming nutritious food is just as important as drinking beverages. It is not only vital for a patient to understand the mechanism that food can have on side effects from cancer treatment but equally important to understand how consuming a beverage plays a role in receiving good nutrition. Typically when a person consumes food, there is also a beverage.

1.1.8 Beverages

Consuming beverages can affect one's breast cancer state. A beverage can be just as important as the food a cancer patient or survivor absorbs. Cancer patients should also focus on their drink of choice. A well-known fact is that water is beneficial to good health. Drinking adequate amounts of water helps transport crucial nutrients and oxygen to cells. It also helps the body get rid of waste products and decreases the workload on the liver and kidneys (Cancer Treatment Centers of America, 2020; Comprehensive Cancer Centers, 2017). Therefore it is beneficial for a cancer patient to continue drinking proper amounts of water during treatment. There are other prominent drinks that are also considered to be beneficial. These drinks are typically seltzers, mineral water, and energy drinks. This study will not go into further detail because of the lack of scientific data to support their health status. Other beverages are viewed as detrimental and unhealthy choices in a typical diet which include soda, alcohol, and sweetened teas.

Alcohol contains a high level of ethanol. When ethanol is digested, the liver metabolizes it and transforms the ethanol into a toxic carcinogen. Most carcinogens interfere with a cell's DNA (G. Pösch, 2004, 155–165). This causes mutations in the cells. Toxic carcinogens circulating throughout the bloodstream can erupt cancer (G. Pösch, 2004, 155–165). A steady consumption of alcohol causes damage to the liver, kidneys, and brain. The damage to these vital organs may place a person with a weaker immune system that is already weak from chemotherapy at a higher risk for increased medical complications.

Alcohol consumed during treatment can affect other organs and make breast cancer patients more vulnerable to other illnesses and increase cancer treatment complications. It can also increase the transmission of cancer, or death (Room, 2005, 519-530). Patients are strongly encouraged to limit alcohol and avoid it in general (7 Ways to Reduce the Risk of Breast Cancer,

2022). Another beverage that many Americans consume is soda. Similar to alcohol, soda can have a negative impact on cancer patients who are weak and compromised.

A study was conducted to determine the association between soda consumption and breast cancer patients' longevity. Soda in the United States represents a big portion of the sweet sugar beverage industry. It does not have much nutritional value but does have a lot of sugar and artificial flavoring (Koyratty, 2021, 945-952). A study in the early 2000s was geared toward women ages 35 to 79 years old (Koyratty, 2021, 945-952). Each subject was questioned on their consumption of sweetened beverages such as soda. The questionnaire ranged from never to as high as at least 5 times per week. The results from the study were interesting because it inferred that soda consumption increased mortality by a small percentage among breast cancer patients.

In the discussion following the study, it was highly advised to be cautious about consuming soda. “High intake of sugar-sweetened soda, in the quantities consumed by many in the United States, has been associated with weight gain and high adiposity, both of which are well-established risk factors for cancers, particularly postmenopausal breast cancer and for reduced survival after breast cancer diagnosis” (Koyratty, 2021, 945-952). Although the results are contrary to what the average American has been told; that soda itself causes cancer, it does provide data to show soda increases unhealthy risks which are elevated factors for cancer diagnoses. The study does not confirm that one should consistently drink soda. It is still highly recommended to reduce the intake of the “unnecessary added sugars” in diets since they offer little to no nutritional value (Koyratty, 2021, 945-952). As a result of the study, breast cancer patients should be aware that most beverages consumed in limited amounts or in moderation, are typically not harmful. If possible, sugary drinks should be avoided. A better substitute for sugars and artificial sugar drinks would be unsweetened tea and ginger.

Ginger and tea are promoted as preventing inflammation. It has been found that ginger contains shogals and gingerols. These compounds have anti-cancer, anti-inflammatory, and antioxidant properties (Makanjuola, 2015). Many cancer patients consume ginger tea for these health benefits. Ginger and tea can also be seen as supplementary drinks to soothe and reduce gastrointestinal problems such as nausea. Some teas are flavored and advertised as helping reduce stress levels and promote sleep. Tea sipping can aid in meditation and can produce a calming state. This is beneficial for the patient because stress can be an agitator to cancer (Nagaraja, 2013, 558-560). One does not want to be overly stressed because it can affect one's health by triggering biological processes to overwork. An agitator to cancer may inhibit chemotherapy from operating effectively and preventing cell apoptosis (Nagaraja, 2013, 558-560). Tea and ginger are beverages that can assist patients by relaxing and controlling their stress levels.

Breast cancer patients must be extremely mindful when choosing food and beverage options for nutrition, especially if they are enduring pain or other side effects from treatment. It is important to navigate healthy choices. Reaching out to a medical provider may help, along with following a registered dietitian. Many dietitians share information on websites that can be helpful when meal prepping. Similarly to breast cancer patients, colorectal patients also experience similar challenges. These challenges include consuming food from important food groups and drinking quality nutrient-rich beverages.

1.2 Colorectal Cancer Introduction

Colorectal cancer metastasizes in the colon or rectal region of the body. Four different sections make up the colon: ascending colon, transverse colon, descending colon, and sigmoid

colon. Each section of the colon consists of its property within the digestive system. The digestive system is vital for one's body to access nutrients and minerals. Colorectal cancer inhibits the digestive system from working properly. The cancer blocks waste and fluid transportation because it grows and takes up room in the colon wall, which can spread into blood vessels (cancer.org). Common colorectal cancers are called adenocarcinomas. "These cancers start in cells that make mucus to lubricate the inside of the colon and rectum" (cancer.org). A main issue regarding colorectal cancer is that many Americans do not get screened yearly. Failure to get screened leads to a high death rate.

1.2.2 Gender and Statistics

Colorectal cancer is one of the top five most common types of cancers found in men in the United States (cancer.gov). This cancer is more prominent in men than women. The demographic age for colorectal cancer is around 65 to 74 years old. Colorectal cancer is considered one of the more serious cancers because of the death rate. The death rate for colorectal cancer is considerably high as patients are diagnosed at an older age. Men are more often diagnosed and face a higher risk for colorectal cancer because there is a correlation between men and obesity. This correlation is not as apparent in women. Men are also more likely to get diagnosed with cancer in general because of the biological disparities (Saudi Medical Journal, 2022).

Statistically, African American males are more likely to be diagnosed with colorectal cancer (cancer.gov). In addition to genetics and health history playing a role in risk, scientists and researchers have discovered a correlation between diet and colorectal cancer (cancer.org). Gastroenterologists have found that African Americans tend to consume less fiber and a higher

percentage of animal fat in their daily diets (Colorectal Surgery Associates, 2021). These lifestyle variables contribute to the higher rate of colorectal cancer in African American males (Colorectal Surgery Associates, 2021). “Few studies have tried to determine whether dietary factors influence prognosis after colorectal cancer diagnosis and their findings have varied” (Brown, 2003, 283).

1.2.3 Symptoms and Tests

Colorectal cancer symptoms can be easily detected by a change or pain in bowel movement. Symptoms can last within days or over an extended time. It is recommended to take notice of any sudden or consistent unusual bowel movements. If one is also experiencing a significant loss in weight and rectal bleeding this could indicate a problem within the colon (cancer.org). One preventative measure that a male should adhere to is going to the doctor. A male should follow a gastroenterologist once he reaches the age of 45. This doctor will recommend screenings for colon cancer every few years.

The two common screening tests are stool-based and visual examination. The stool-based test is named after what it checks, the stool, and should be done every 3 years. This test is more simplistic than a colonoscopy because it is less invasive and less costly. Visual examination can be known as a virtual colonoscopy. This examination is done every 5 years and is fairly accurate however there can be false positives (cancer.org). A colonoscopy is one of the biggest diagnostic screenings that people tend to push back. It should occur at the age of 50 and should be repeated every 10 years. In general, “less than 50% of people who should be screened for colorectal cancer are getting an appropriate screening” (cancerdietician). The colonoscopy test requires the male to consume a prepared drink which enables them to empty their intestines

and bowel from the stool. The specific drink is provided by the medical professional and is to be consumed a day before the screening. The patient is then prepared for the examination. During the examination, the doctors operate a small medical camera throughout the colon and scan the region. The camera takes visual images to detect any lumps, polyps, or unusual areas (cancer.org).

These diagnostic tests confirm the presence of cancer. The next step after one has been diagnosed with cancer is to discuss with your health care provider the treatment plan. The treatment plan is unique for every patient as there are many variables that go into creating such a plan. The progression and state of the cancer are two key components that are evaluated by the oncologist. There are seven standard treatment plans for colorectal cancer patients (cancer.gov). The treatments are listed as the following: surgery, radiofrequency ablation, cryosurgery, radiation therapy, targeted therapy, immunotherapy, and chemotherapy (cancer.gov). Surgery is performed if the doctor can remove the cancer. This occurs by cutting into the colon. However, this is a difficult operation. It is less complicated if the cancer is located in one area and is caught at an early stage. Otherwise, the operation may result in partial surgery. Radiofrequency ablation is a probe that releases “electrodes to kill cancer cells” (cancer.gov). Cryosurgery is another form of surgery that requires freezing the section of operation. Radiation therapy uses radiation to kill the cancer cells and targeted therapy uses drugs to capture specific cancer cells (cancer.gov). Immunotherapy is another treatment option that is different from the others; it requires use of the patient's immune system (cancer.gov). Chemotherapy is the most used form of cancer treatment regardless if it is the first option. Chemotherapy tends to be used after surgery to eradicate the cancer and stop its spread (cancer. gov).

1.2.4 Chemotherapy treatment/ side effects

The most common systematic treatment is chemotherapy. For colorectal cancer, chemotherapy can be administered through a vein or directly into an artery. The chemotherapy drugs that colorectal patients receive vary. They are prescribed according to the case presented. The main chemotherapy drugs listed on the cancer.org website are 5-Fluorouracil, Capecitabine, Irinotecan, Oxaliplatin, Trifluridine, and Tipiracil (cancer.org). All of these drugs administered to a patient are regulated in specifically timed cycles. A typical chemotherapy timed cycle is 2 to 3 weeks. Depending on the severity of the cancer and its stage, chemotherapy ranges from 3 to 6 months (cancer.org).

Chemotherapy has many side effects, “hair loss, mouth sores, loss of appetite or weight loss, nausea and vomiting, diarrhea, nail changes, skin changes” (cancer.org; Bozzetti, 2022, 1316-1319). These are universal side effects for chemotherapy; however, a patient may experience one of these side effects or more than one. Some side effects can be more painful than others, diarrhea would be one of the more painful side effects since this cancer is located in the colon region. Although there are side effects for a given dosage of chemotherapy, they do not have to keep the patient in discomfort. Most of these side effects can be subdued with nutritional support, protein, and beverages.

1.2.5 Nutritional Support is important

Nutritional support is of critical importance for colorectal cancer. Colorectal cancer affects the digestive system and resides within the realm of the colon. Since most cancer patients undergo chemotherapy as a treatment against colorectal cancer, it can “change the nutritional needs and alter the survivor’s intake and the body’s digestion, absorption, and use of food”

(Brown, 2003, 270). It is important to make use of nutrient-dense foods or juices. In the past, juice diets have been seen as effective for increasing nutrients when also taken with consuming food. It is recommended that a liquid diet should not be adhered strictly, unless a person is unable to chew or digest whole foods. Colorectal patients should “comply with the ACS recommendation regarding consumption of at least five servings of whole fruits and vegetables daily for cancer prevention by the practice of juicing” (Brown, 2001, 160).

Diet has been studied in colorectal cancer patients to improve overall health. However, one article stresses the idea that more research should go into asking the following questions: “what aspects of diet are most important, whether the effect of diet varies across stages of disease or treatment, and whether diet after diagnosis has an effect independent of prediagnostic diet” (Van Blarigan, 2015, 1825-1834).

1.2.6 Provider's Recommendations

The Mediterranean diet is recommended for colorectal cancer patients as providing the most nutritional support and reducing the recurrence of cancer (Farinetti, 2017). A Mediterranean diet consists of mostly fruits, vegetables, fish, and low levels of red meat (Farinetti, 2017). Olive oil, which is a liquid fat, is often incorporated into Mediterranean diets. Olive oil is a reducing agent for cancer because it “influences polyamine metabolism in cells leading to a reduction in cancerogenesis progression” (Farinetti, 2017). Olive oil contains Oleocanthal, a VOO phenolic (Parkinson, 2014, 12323-12334). This has been discovered to be beneficial to cancer because it “targets against many chronic inflammatory disease states” (Parkinson, 2014, 12323-12334). Another benefit of the Mediterranean diet is the consumption of tomatoes. Tomatoes consist of a high “content of carotenoids, primarily β -carotene and

lycopene” (Farinetti, 2017) These are the scientific words that define the color and pigments of the tomato, which are characteristics attributed to being a good source of nutrition. Numerous sources agree with the limitation of red meat. The cancer dietitian website states that one should eat at least 30 grams of fiber per day and no more than 18 ounces of red meat (cancerdietician).

Red meat consumption has been analyzed by many scientists and registered dietitians because it is one of the American consumer goods. The Nurses’ Health of US study has shown a correlation between red meats such as pork, beef, and lamb with colon cancer. Dietitians are recommending patients be cautious when deciding what meats to eat (Aykan, 2015, 288). If a patient is consuming red meat for protein, there are other options to consider, regarding protein.

One dish that embodies the dietitian and cancer web page recommendations is a recipe named caramelized French Onion & Lentil Soup (ellicsr.ca). This soup contains 11 key ingredients such as olive oil, lentils, and chicken. It is a recommended dish for colorectal cancer patients because the soup eases indigestion and painful bowel movements. Lentils are a nutritious source of fiber and “promote colon health and prevent colorectal cancer cells from growing and dividing” (ellicsr.ca). This soup illustrates the standard in which a Mediterranean diet is incorporated. A Mediterranean diet promotes high fiber and little too low amounts of red meat consumption.

1.2.7 Protein

Colorectal cancer is an illness that significantly requires nutritional support. Adequate nutrition is vital in colorectal cancer because such cancer affects the digestive system. Colorectal cancer survivors are advised to eat healthily, meaning a plate full of fruits, vegetables, and mainly protein (cancer.org). A study conducted in 2015 highlighted the amount of red meat and

processed meat that individuals consume. The study reported epidemiological data correlating a meat diet and colorectal cancer (Baena, 2015, 258-264). Red meat consumption is associated with increasing levels of carcinogens. Consuming red meat creates greater resistance to insulin which then produces bile acids. Bile acids are catalysts for carcinogenesis (Baena, 2015, 258-264). Red meat also contains high levels of “heme iron which behaves as a nitrosylation agent forming NOc, and increases cell proliferation in gut mucosa through the lipid-peroxidation pathway” (Baena, 2015, 260). Red meat is harmful to cancer patients because of the production of bile acids. These cell reactions affect the metabolism of a patient which can trigger the action of carcinogenesis (Baena, 2015, 258-264).

Protein is one of the biggest units that affect growth and hunger. It contains ghrelin, which is a stomach-derived hormone (Batterham, 2006, 223-233). This hormone increases one’s appetite which may be beneficial for a patient experiencing a lack of appetite. Protein can also prevent long-term weight gain, which can help patients if they gained weight from chemotherapy (Batterham, 2006, 223-233). Along with protein, there are beverages that contain various minerals and vitamins that can improve side effects from cancer treatments. However, patients should be aware that many beverages contain little or no nutritional value.

1.2.8 Beverages

Alcohol consumption is advised to be ingested in a limited or modified amount for colorectal cancer patients. Men are strictly told to follow the guidelines of drinking minimal amounts of alcohol to prevent cancer recurrence. Other beverages such as tea and coffee have not been typically limited. Data and scientific findings on these beverages related to colorectal cancer for men have been found to be insignificant. Unlike alcohol which has been linked to a

higher risk of cancer, tea, and coffee drinking are not associated with cancer (A.R.Vieira, 2017, 1788-1802).

Coffee is a common choice of drink for many Americans. The corporate company, Dunkin Donuts' slogan is “America runs on Dunkin”. In recent times, there has been an increase in studies on the effect of coffee and its chemical properties on the human body. Reports have shown that black coffee has a positive effect on cancer (cancer.org). A pure form of coffee contains antioxidants that react against cancer. However, if coffee is consumed with heavy cream and sugar, could have an adverse effect on one. In other words, there were benefits “found in people who drank 4 to 6 cups of black coffee” (cancer.org).

Tea has two categories; the pure form and the herbal form (cancerdietican.com). Camellia sinensis plant is the pure form (cancerdietican.com). Herbal teas are made with tea leaves that are flavored. These teas are found in the grocery store. Both substances either directly from the plant or from tea leaves contain beneficial qualities. Tea has a high concentration of antioxidants which are the source of “polyphenols and flavonoids” (cancerdietican.com). Studies have suggested that polyphenols kill cancer cells and disrupt the progression of tumors (Kopustinskiene, 2020, 457; Yang 2010, 429-439). Flavonoids interfere with the cancer cell’s cycle and inhibit duplication (Kopustinskiene, 2020, 457; Yang, 2010, 429-439). These are significant findings for cancer patients. Pure forms of tea are safe and should be implemented in colorectal cancer patients’ diets.

Colorectal cancer patients have several options for obtaining support related to nutrition. It is extremely beneficial for these patients to receive information about how to consume optimal amounts of adequate nutrition. The recommendations and studies that registered dietitians support in articles with high ratings and conclusive results supported by oncologists. There

should be little difficulty in navigating these informative web pages. Colorectal patients and their caretakers should become more knowledgeable about preparing and maintaining diets rich in nutritious food and beverages, whether that be incorporating Mediterranean foods or indulging in more herbal teas.

1.3 Chapter Overview

It can be beneficial for breast and colorectal cancer patients to become knowledgeable and more aware of the resources available to them. Medical professionals should encourage their patients to look for nutritional support specific to their cancer, as demonstrated in this chapter. Breast and colorectal cancers have both similarities and differences with nutritional requirements. Recommendations are based on the organ that cancer cells inhabit and from chemotherapy treatments.

Since chemotherapy is the main form of treatment for breast and colorectal cancer patients, patients should be aware of the side effects from the treatment. Unfortunately, side effects will exist. However, there are many methods in which a patient may tolerate such ill effects including; nausea, vomiting, weight gain, weight loss, and diarrhea.

The following section will expand this research with interviews from an oncologist and dietitian. The interviews will help explore the relationship between the two differing healthcare fields and will examine if any shared information between the two providers is established or evident. It is fundamental for patients and healthcare professionals to discuss reasons for any lack of reciprocal professional relationships between oncology and nutrition. Is it the training and education that is not inclusive to such healthcare professionals? Is it a lack of shared communication between both disciplines? Do such healthcare fields operate purely

autonomously and not collaboratively? Do they disregard another discipline's benefit for the patient? There should be a focus on the role that nutrition can play for breast and colorectal cancer patients undergoing cancer treatment.

Chapter 2: Methods

The study focuses on examining the role of nutritional support in breast and colorectal cancer patients. To further understand this study, Melinda Goldner, Professor of Sociology and Chair Department of Sociology, and Jillian Bove, a Union College student, developed a research proposal that was presented to Union College Human Subjects Review Committee Chair Joshua Hart and the Office for Human Research Protections. The study was granted approval on December 9, 2022. This approved proposal analyzed and compared oncologists to registered dietitians with questions relating to the healthcare field. However, collecting this data from a large sample size was difficult as many healthcare professionals were busy, and receiving contact back from them was extremely limited. Datas collected below are based on a small sample size but with an ample amount of information. Ideally, to continue with expanding research into this matter, a larger sample size would be beneficial.

2.1 Description of methodology

The methodology for this study gathered and collected qualitative data. This study conducted interviews with an oncologist and a registered dietitian. The interviews were voluntary and our interviewees were able to skip any questions and discontinue their participation, without penalty, at any time. There was no deception of any kind and all information was kept confidential. In a short 10 to 15 minute interview the interviewees were asked to answer 4 questions (see Appendix A and B for the Interview Guides). These questions had multiple parts to broaden a wider range of descriptions or detail. These questions ranged from open to multiple parts, and evaluation questions. Interviews took place virtually and in person. If the interviewee had extra time the interview was extended by a few minutes.

2.2 Sampling Population

Participants recruited for this study were found through educational background, experience, and professional degrees or accreditation. The participants were an oncologist, and a registered dietitian, and/or nutritionist. The sample region was from the Northeast. Fortunately, a virtual interview with an oncologist and an in-person interview with a registered dietitian was conducted. Finding participants for the study was the most challenging obstacle because of individual professional time constraints and maintaining professional confidentiality. In terms of professional confidentiality, this implies it was difficult to reach or gain access to an oncologist's and registered dietitians emails or phone numbers. Many times office secretaries, receptionists or staff members did not have the ability to give such contact information.

2.3 Data Analysis

The interviews were considered to be the research instrument in this study. The two interviews and transcriptions (See Appendix A and B for the interview guide for the questions) were organized, analyzed, and contrasted alongside each other. The analysis consisted of scanning for keywords, synonyms, and common themes. The two interviews and the questions inquired were categorized into four groups. Groups listed as the following: training, side effects pertaining to eating, weight, and specific food and or diet. The interviewees had similarities in their responses.

Chapter 3: Results

This chapter discusses the interviews that were conducted in terms of the following categories (Training, Side Effects, Weight, and Diet). These categories are critical when reflecting on past chapters. The results listed are sorted chronologically into categories. These results were obtained from the sample size the study received. This section will also incorporate recommendations from the Nutrition in Cancer Care (cancer.gov) web page. Those recommendations provide a clear connection between cancer patients and nutrition.

3.1 Training

Training to become a certified oncologist or dietitian varies in terms of education and clinical requirements. The interview examined if the oncologist and dietitian received any additional training other than their respective field of study through their professions. The oncologist stated that they did not receive any nutritional training for their work in oncology. In response to whether the profession of oncology adequately addresses nutritional support during cancer treatment, the oncologist did recognize the importance of nutrition stating that “when I trained 40 years ago I'd say no; today it is very important.”

When referring patients to another provider to discuss nutrition the oncologist replied that it only really happens if “they can or if I see they are losing weight and/or gaining weight.” Several nutritionists are members of the practice; however, they are not typically used unless requested. “Those that request nutritional consultations are mostly patients who are very fit, practice yoga, and care a lot about their diets in general.” It was noted that within the oncologist's practice, they saw “mostly white Anglo-Saxons who have similar concerns with one another but in general, they don't really change their diet.”

In contrast to the oncologist's training and referrals, the registered dietitian received limited training in oncology. The registered dietitian explained that during training, one must complete a dietetic internship as a requirement to become a registered dietitian. The dietetic internship includes sections consisting of community, clinical, and oncology. The oncology section explores nutrition of cancer patients. Several cancer patients presented in the dietetic internship had an acute form of cancer. The dietitian expressed that there was no direct or formal training on the subject of cancer. It did come up in some material within textbooks; and “I saw some cancer patients but no crazy formal training.”

3.2 Side effects

Chemotherapy is the main form of treatment that both the dietitian and oncologist specifically stated and either prescribed or addressed in their practice. In both interviews, the interviewees mentioned that chemotherapy was the most common treatment that is seen in their fields. The oncologist noted “nausea, diarrhea, loss in electrolytes, taking in food but not keeping the food in, which results in losing too much weight” are the side effects typically seen. In addition, “conventional chemotherapy can cause nausea and diarrhea, and immunotherapy is not as common a treatment, but causes nausea. Plus the immune system undergoing chemotherapy goes after the digestive system. What comes in and what comes out (references the intake of food not being able to be broken down and used as a source of energy).”

The dietitian stated “chemotherapy can really change one’s body, especially with appetite decrease and weight loss. Muscles fade.” The loss of muscles is not as talked about because it is not recognized as the most important factor. The dietitian suggested that muscles are important

when it comes to assisting the body in order to maintain breathing and movement. It can be beneficial to have some muscle when undergoing strong medication.

3.3 Weight

The previous understanding from chapter one is that breast and colorectal cancer patients gain weight while undergoing chemotherapy (Elkort, 1981, 387). This understanding was contrasted with the interviews. The oncologist focused on the fact that they tend to see overweight patients. The average person is overweight and should be on a diet because some weight loss is important, according to the oncologist.

However, most patients lose weight undergoing chemotherapy. The oncologist stated that theoretically, carbs can “stimulate insulin production” and lead to a shift in “weight.” This is a concern when a patient is drastically losing weight, which can affect their magnesium level as well. Weight loss is dangerous because it can slow down treatment and stop it all together. The oncologist would like the patient to maintain their weight so that treatment can continue uninterrupted. The faster a patient can start treatment, the better the long-term results.

The dietitian specifically claimed that most cancer patients discussed in the dietetic internship were breast and colorectal cancer patients. From a nutritional standpoint, recommendations will be the same for all other types of cancers. These recommendations are “focusing on what comes into play while undergoing chemotherapy.” The best way to nourish cancer patients according to the dietitian, “is to consider how to assist the patient if there is a lack of appetite. For a lot of patients, they tend to lose the joy of food.” Therefore the dietitian must work with them on how they can add calories quickly into their diet. Changing the standard from 3 meals a day, to ingesting high-caloric foods multiple times a day is what dietitians strive for.

The dietitian had a similar view about cancer patients and weight. “I have seen a handful of cancer patients and we are taught the typical problem is that cancer patients cannot maintain their weight. It is weight loss rather than weight gain.” There are expectations that patients can gain weight by consuming fast food and other carbs. However, the dietitian focused mostly on weight loss.

The dietitian discussed coffee and since coffee is a stimulant; the most concerning factor regarding coffee and cancer patients is the effect of caffeine. “Caffeine has negative effects such as sleep and if one consumes a lot of coffee they may fill their appetite in volume.” If one fills up in volume they tend not to have room for solid foods. Solid foods are what the registered dietitian recommends. “There is a thin line because I would not want my patient to drink too much coffee in case of this.”

3.4 Diet

An oncologist aims to assist a patient if they are communicating they are unsure about what diet to follow or what they should eat. This is most apparent in the “yoga type of people, it is a small cross-section of patients,” according to the oncologist. The oncologist highly recommends a low-carb Mediterranean diet to patients that haven't been feeling well or are unhealthy.

The dietitian stated that a patient may use protein as a way to give patients a good source of nutrients with high calories. “Mediterranean diet is generally known as the number one diet. I don't want to think about it as a diet because it doesn't limit how much of the types of food you should eat and it doesn't limit calories in any way. I think of the Mediterranean diet as a lifestyle.” This aligns with the cancer.gov dietary guidelines because it suggests that “cancer

patients may try special diets to make their treatment work better, prevent side effects from treatment, or to treat cancer itself.” The diets that are listed are vegetarian, vegan, macrobiotic, and ketogenic diets.

The vegetarian diet is a diet that contains and is limited to fruits, vegetables, nuts, and plant-based foods (mayoclinic). There is no meat in this diet and it is one of the most restrictive diets. In comparison to the vegetarian diet, the macrobiotic diet includes “whole grains, local fresh veggies, sea veggies, and beans. Other foods include seasonal fruits, nuts, seeds, and white fish two to three times per week. You cannot eat meat, dairy, most other animal products, certain fruits and veggies, and some common drinks,” such as avocado, eggplant, fennel, green peppers, commercial beers, and decaffeinated coffee (Winchester Hospital). The macrobiotic diet is broken down into percentages: “50% to 60% whole grains, 25% to 30% veggies, 5% to 10% soups, and 5% to 10% beans and sea veggies” (Winchester Hospital). The ketogenic diet is “all about eating the right foods in the right proportions. When you get it right, it'll trigger your body to start burning stored fat” (Mayo Clinic). Primarily the ketogenic diet is similar to the macrobiotic diet consisting of vegetables, greek yogurt, oils, eggs, fish, nuts, and seeds (mayo clinic).

Along with a distinct diet, the dietitian recommends cancer patients to be mindful of what foods they choose to consume. It has been assumed that a little red wine and chocolate are good. The dietitian believes that these foods “may have some health benefits but it is difficult to prove.” One should focus on “is there a lot of ingredients, what are the ingredients, and is it worth it? Does it contain a high dosage of sugar?”

The registered dietitian used the broad term sugar in the interview, however, it should be narrowed down as dietary sugar since not all sugar is considered unhealthy and bad. Dietary

sugar includes preservatives and added sugars which are dangerous to cancer. Sugar is dangerous to cancer because it is a source of nutrients. Nutrients travel throughout the body to cells. Cancer is a specific type of tumor and “certain tumors may respond directly to dietary sugar (colorectal and endometrial cancers) and fat (prostate cancer) or indirectly to the obese state (breast cancer)” (Goncalves, pp. 255-273). One study notes that “dietary sugar stimulates insulin release and may predispose to insulin resistance (Daly et al. 1997). The resulting chronic hyperinsulinemia may stimulate tumorigenesis because insulin is a known mitogen of breast tumor cell growth in vitro” (Goncalves, pp. 255-273). This does not only apply to breast cancer but also to colorectal cancer.

3.5 Summary of Results

“It has been estimated that about a third of the most common cancers are preventable, in part, through a nutritious diet” (Goncalves, pp. 255-273). Providers are responsible to prevent these life-long illnesses for all individuals. The study and its findings suggested; medical providers are extremely crucial to cancer patients. As they may be able to direct their patients for nutritional care which might not have been previously addressed with a patient. In general, oncologists and registered dietitians must collaborate with each other to assist a patient in need. It is the patient’s responsibility to address any concerns they have with their providers.

Chapter 4: Conclusions

After conducting interviews with the oncologist and registered dietitian, it is clear that there should be changes in establishing reciprocal communication among these healthcare providers. Particularly there should be a change in the training or education to become a registered dietitian and an oncologist. The standard clinical training that has been incorporated is a didactic internship and medical residency. The didactic internship and medical residency should establish a relationship between both healthcare disciplines (dietitian and oncology). Communicating and collaborating with each other should be reciprocal. Medical practices such as oncologists should expand their services to include registered dietitians. Referrals for such expanded services would be efficient, convenient, and easy for the patient. Patients could access resources quickly to help them in their cancer journey.

4.1 Registered Dietitian Training

Currently, to become a certified registered dietitian there are two ways in which one can accomplish this. Both of the options require having higher education. First, someone interested in becoming a registered dietitian should “earn a minimum of an accredited bachelor's degree. The coursework includes food service systems management, food and nutrition sciences, and computer science, among other subjects” (healthjob.org). This is strongly encouraged because when applying to a graduate master's program most schools have prerequisites for science classes. Some students pursue a degree in biology or chemistry to obtain those prerequisites, however, there is no required or mandated degree that one needs.

After achieving admission into a master's program one has to “complete a period of supervised practice program, like a dietetic internship at a community agency, health care facility, or food service settings” (healthjob.org). This was briefly discussed in chapters two and three in the interviews. Once a student has completed their master's program they are approved to take a national exam which is proctored by “the Commission on Dietetic Registration (the credentialing agency for the Academy of Nutrition and Dietetics)” (healthjob.org). Assuming one has passed the national exam, they will be granted a state license to practice.

4.2 Oncologist Training

An accredited oncologist has a longer educational journey than a registered dietitian. One must complete a bachelor's program and receive a bachelor's degree from an accredited school. Typically a student will take challenging science courses which include biology, chemistry, and organic chemistry. These courses are prerequisites to gain admission into a medical school which is another 4-year program. Medical school acceptance is one of the most competitive and rewarding programs. Applicants must take an entrance exam called the MCAT (Medical College Admission Test). This is a standardized test that evaluates a student's knowledge on science and background knowledge within the medical field. After submission of transcripts, test scores, and interviews one may be accepted or rejected from a medical program.

During the four years in medical school, two of those years are spent in the classroom with standardized learning from lectures and textbooks. The other two years are spent in a rotation schedule at a hospital which explores the student to various disciplines within the medical field. Disciplines such as dermatology, oncology, and pediatrics are explored. After completing four years of medical school, the student decides what type of residency and or

fellowship they would like to pursue. This decision determines the specialty the doctor will practice. As an example, if one desires to be an oncologist, then the “medical oncology fellowship training requires two years of accredited training beyond completion of a basic internal medicine residency, while dual certification in hematology and medical oncology requires three years of combined fellowship training” (American College of Physicians Leading Internal Medicine).

4.3 New Solution

The training to become an oncologist and a registered dietitian does not adequately prepare these disciplines to work adhesively together. An emphasis on collaboration and creating a reciprocal working relationship should be explored. A solution to address this would be to change and update the educational and clinical requirements in each discipline.

The educational system should teach students how to establish adequate quotas for patients during their work day. The oncologist would be able to guarantee the registered dietitian referrals for nutritional support as ongoing. Quotas are important because it quantifies the actual interactions the physician and dietitian exhibit on a daily basis. There does not necessarily need to be a specific quota for this to work, but it is important to remember that it allows for a statistic with regard to patient interactions and one cannot argue against a number. For instance, the oncologist refers 100 cancer patients to a dietitian in a work week. This would help both disciplines (oncology and dietitian) establish a collaborative relationship. On-going communication and exchange of information among both disciplines would be very beneficial to the patient as well as for the healthcare providers. The provider’s shared communication helps determine the patient's best method of treatment and care. Establishing quotas is one method that

may force oncologists and dietitians to work together. It will create an environment that is safe and “ it suggests a way of dealing with people which respects and highlights individual group members' abilities and contributions. There is a sharing of authority and acceptance of responsibility among group members for the groups' actions” (Laal, 2012, 486-490).

A study composed in Britain suggests that interprofessional collaboration is key to good healthcare outcomes. This study focuses on the standard for a registered dietitian to become knowledgeable with oncology nutrition. The study states that there are a set of “Standards of Professional Performance consisting of the following six domains of professionalism including Quality in Practice, Competence and Accountability, Provision of Services, Application of Research, Communication, and Application of Knowledge, and Utilization and Management of Resources” (Charuhas, 2018, 736-748). Within the list, it is explicitly stated that communication and utilization, and management of resources are highlighted as the six most important domains. It would also be beneficial to have multiple communication channels and conversation outlets for the providers. Healthcare professionals are busy and creating efficient methods to communicate among each other are necessary. Phone systems, computer programs, assistants, (including clerical), and using abbreviations to create notes could be other forms of communication for the providers.

The goal is to establish communication that is beneficial to the patient between both a registered dietitian and an oncologist. The communication between these disciplines should be reciprocal, which allows for an exchange of information pertaining to shared patients. The providers could also work in more diverse locations since the oncologist noted that they saw mostly “white Anglo-Saxon” patients. This added diversity would allow oncologists and

dietitians to become accustomed to different cultures and ethnicities. There is research that suggests some races are more prone to breast and colorectal cancer as mentioned in chapter one.

Among educational changes, there is limited research on nutrition, specifically food groups and beverages that help inhibit side effects most patients endure while being treated with chemotherapy for breast and colorectal cancer. Future research should consist of studying and tracking women with breast cancer and male colorectal cancer patients undergoing chemotherapy while ingesting and absorbing different foods and beverages. It would be beneficial for studies to have one group eat a specific food. As an example, one group consistently eats mostly fruits and vegetables and another group of patients, consumes large amounts of carbohydrates and very limited amounts of fruits and vegetables. Comparing and analyzing the groups and their effects from chemotherapy treatments may illustrate or indicate fewer complaints or ailments. If one group had a decrease in nausea or diarrhea as a side effect from chemotherapy treatments while eating from certain food groups or while following a special diet, this may validate the benefits of consuming such food. Any additional scientific findings regarding nutrition for oncology patients would benefit patients. There should be studies focused on institutional changes in education systems for healthcare disciplines such as oncology and dietitians. These professions can work collaboratively and can establish patient quotas among each other. Shared information regarding a patient's health and treatment outcomes can be mutually beneficial for the oncologist, dietitian, and patient. It would be intriguing to learn about various diets that may assist breast and colorectal cancer patients and the possibility of subduing chemotherapy side effects. The ultimate goal of oncology and the field of nutrition is to combine their respective knowledge and expertise. This will enhance quality healthcare and lead to greater and better outcomes for the patients they serve.

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APPENDIX: Interview Guides

A. Oncologists

- 1) Did you receive any nutritional training for your work in oncology? Please explain.
- 2) Do you discuss nutrition with your cancer patients? Why or why not?
If so:
 - a) How often do you discuss this (e.g. with what percentage of patients)? What do you discuss and why?
 - b) What types of questions or concerns do they have? Is there any demographic variation in terms of their questions or concerns (e.g., variation by gender, income, etc.)?
 - c) What nutritional problems do cancer patients struggle with during their treatment? Is there a common symptom? Is there one type of treatment that leads to more problems with eating or drinking? Please explain.
- 3) Do you refer patients to another provider to discuss nutrition? Please explain.
- 4) How important is nutritional support during cancer treatments, if at all?
 - a) Does your profession adequately address nutritional support during cancer treatment in your opinion? Please explain.

B. Dietitians and Nutritionists

- 1) Did you receive any additional training in oncology/specialty with cancer? Please explain.
- 2) Do you have any experience working with cancer patients? Please explain.
If so:
 - a) What do you discuss and why?
 - b) Are there certain cancers that you are more likely to see? If so, why?
 - c) Do you have more women or men cancer patients?
 - d) Is there any demographic variation, such as income, education, or race?
- 3) What nutritional problems do cancer patients struggle with during their treatment? Is there a common symptom? Is there one type of treatment that leads to more problems with eating or drinking? Please explain.
- 4) What are your recommendations to cancer patients? Please explain.