FLEX CEUs

Oncology: Role of Physical Therapy

Introduction

Each year, approximately 2 million people in the United States receive a cancer diagnosis of some sort. This course investigates the convergence of oncology and physical therapy, preparing healthcare professionals with the expertise and abilities to improve the well-being and life quality of those undergoing cancer treatment. Participants will explore the physiological repercussions of cancer and its therapies, acquiring evidence-based techniques to tackle issues like pain management, fatigue, and mobility hurdles. The curriculum encompasses aspects such as quality of life, both short and long-term treatment, the psychosocial implications of cancer, complications arising from cancer treatment, and the procedures involved in obtaining an oncology board certification. Through a comprehensive approach, this course empowers practitioners to formulate customized rehabilitation plans, creating cooperation between oncologists, cancer patients, social support of cancer patients, and physical therapists. Emphasizing patient-centric care, participants will acquire insights into effective communication and support strategies for individuals navigating the intricate path of cancer treatment.

Background Information

It is crucial to lay the foundation for understanding the profound impact that cancer and its treatments have on individuals' physiological well-being for physical therapists and assistants to provide patient-centered evaluation and treatment. With the unfortunate rise in cancer diagnoses across the United States, the integration of oncology and physical therapy becomes increasingly vital to optimize quality of life and recovery. In this section, we will delve into the prevalence and incidence of cancer, types of cancer, and cancer treatments. Following a comprehensive understanding of the background information,

physical therapists and assistants will be well-equipped to navigate the complexities of providing effective care for their patients undergoing cancer treatment and side effects.

Types of Cancer

Cancer is a complex group of diseases characterized by the uncontrolled growth and spread of abnormal cells. There are many different types of cancer, each with its own characteristics, risk factors, and treatment approaches. This section will outline various types of cancer and risk factors.

Breast Cancer [1]

Breast cancer is a type of cancer that originates in the cells of the breast, typically in the ducts or lobules. Breast cancer is characterized by the uncontrolled proliferation of abnormal cells within the breast tissue. These cells may form a malignant tumor, which can invade surrounding tissues and, in advanced stages, may spread to other parts of the body through the bloodstream or lymphatic system.

Types of Breast Cancer [1]

The two main histological types are in situ (non-invasive) and invasive (infiltrating) carcinoma. Additionally, within invasive carcinoma, there are several subtypes based on the appearance of the cancer cells and the structures involved. In situ carcinoma types are ductal carcinoma and lobular carcinoma. Ductal carcinoma in situ (DCIS) occurs when abnormal cells are found in the lining of a breast duct but have not invaded nearby tissues. This is considered a non-invasive stage of breast cancer that if left untreated, can become invasive and spread to other tissues. Lobular carcinoma in situ (LCIS) occurs when abnormal cells are found in the lobules of the breast, without invasion into nearby tissues. LCIS itself does not

pose an immediate threat, but it is associated with an increased risk of developing invasive breast cancer.

Invasive carcinoma types include invasive ductal carcinoma, invasive lobular carcinoma, inflammatory breast cancer, triple-negative breast cancer, HER2-positive breast cancer, mucinous carcinoma, and tubular carcinoma. With invasive ductal carcinoma (IDC), cancer cells invade nearby tissues and can spread to other parts of the body. This is the most common type of invasive breast cancer. Cells may form tubular structures or have a more irregular appearance. Treatment and prognosis depend on the stage and characteristics of the tumor. Invasive lobular carcinoma (ILC) occurs when cancer cells invade the lobules and may or may not spread to surrounding tissues. Cells often lack adhesion molecules, making them less likely to form a distinct mass. This type may be more challenging to detect on imaging, and treatment approaches may differ from IDC. Inflammatory breast cancer is a rare and aggressive type of cancer that presents with redness, swelling, and warmth (resembling inflammation), and may not form a distinct tumor mass. It tends to have a poorer prognosis due to its aggressive nature. Triple-negative breast cancer (TNBC) lacks estrogen receptor (ER), progesterone receptor (PR), and HER2 expression and is a high-grade cancer that tends to be aggressive. There are limited targeted therapy options, and chemotherapy is a primary treatment. HER2-positive breast cancer develops due to overexpression of the HER2/neu gene. Tumors may be more aggressive but targeted therapies are also effective. Mucinous carcinoma is characterized by tumor cells that are surrounded by mucus. This is a less aggressive cancer with a better prognosis than others. Tubular carcinoma occurs when tumor cells form small tube-like structures. It is often low-grade and associated with a favorable prognosis.

Staging of Breast Cancer [2]

The staging of breast cancer is a systematic way of describing the extent of the disease based on the size of the primary tumor, whether the cancer has spread to lymph nodes, and whether it has metastasized to other parts of the body. The most commonly used staging system is the TNM system, developed by the American Joint Committee on Cancer (AJCC) and the Union for International Cancer Control (UICC). This is explained in a future section generalized to other forms of cancer.

Symptoms of Breast Cancer [3]

Breast cancer symptoms can vary, and some people with breast cancer may not experience noticeable symptoms in the early stages. Regular breast self-exams and routine screenings, such as mammograms, play a crucial role in early detection. A new lump or mass in the breast or underarm that may feel firm, with irregular edges is a large sign. Changes in the breast size, shape or appearance, swelling, redness, and warmth are also signs. Dimpling and puckering, resembling an orange peel, inversion of the nipple, scaling and flaking in the nipple, and nipple discharge are signs as well. Unexplained and persistent pain and discomfort are also abnormal signs. In addition, axillary lymph node changes may be signs. Advanced disease signs are bone pain, neurological signs, shortness of breath, and jaundice if the cancer has metastasized.

Breast Cancer Risk Factors [4,5]

Breast cancer is a multifactorial disease influenced by a combination of genetic, hormonal, environmental, and lifestyle factors. While the exact cause of breast cancer is often complex and not fully understood, numerous risk factors have been identified through research. It's important to note that having one or more risk factors doesn't guarantee the development of breast cancer, and many individuals with breast cancer have no identifiable risk factors. This section outlines the most common risk factors for developing any type of breast cancer.

Age

Breast cancer risk increases with age. The most common age group to develop breast cancer is over 50 years old.

Gender

Females develop breast cancer more frequently than males, although males can develop it as well. However, males have a significantly lower incidence of breast cancer and represent just 0.01% of cases in the United States.

Family History and Genetics

Having first-degree relatives (mother, sister, or daughter) with breast cancer increases the risk of developing breast cancer by double. Having a second-degree relative (aunt, cousin, or grandmother) with breast cancer does not significantly increase one's risk for breast cancer. It does increase the risk if multiple second-degree relatives have breast cancer, however.

Inherited mutations in specific genes, such as BRCA1 and BRCA2, are associated with a higher risk of breast cancer because these genes play critical roles in maintaining the integrity of the cell's DNA. The BRCA1 and BRCA2 genes, in particular, are tumor suppressor genes, and their normal function is to help prevent the development of cancer by regulating cell growth and repair. The risk of developing breast cancer with mutations in the BRCA1 or BRCA2 genes is 50-85%. Without these mutations, the risk for the average person is 12%.

Personal History of Breast Cancer or Non-Cancerous Breast Diseases

The previous diagnosis of breast cancer or certain benign breast conditions (e.g., atypical hyperplasia) is a risk factor for developing the same or a new type of breast cancer.

Reproductive and Hormonal Factors

Early menstruation, starting menstruation at a young age (before the age of 12), is a risk factor for breast cancer. In addition, late menopause, or continuing to menstruate at an older age (age older than 55 years) is a risk factor. In addition, late age at first full-term pregnancy, or having the first full-term pregnancy after the age of 30, is a risk factor. Lastly, never having been pregnant is also associated with a higher risk of developing breast cancer. Prolonged exposure to estrogen and progesterone without the protective effects of pregnancy can increase breast cancer risk. This is the case with all of these scenarios.

Having hormone replacement therapy (HRT) is also associated with an increased risk of breast cancer. This is especially true with the long-term use of combined estrogen and progesterone hormone replacement therapy during menopause.

Breast Density [6]

Women with dense breast tissue may have a higher risk as it can make it more challenging to detect tumors on mammograms. Dense breast tissue has little adipose tissue and higher amounts of glandular and fibrous connective tissue. Around ten percent of women have what is known as extremely dense breast tissue, where there is predominantly glandular and fibrous connective tissue in the breasts. Around half of women over 40 years old have dense breast tissue found on a mammogram. Women with a lower body mass index, using hormone therapy are more likely to have high breast density.

Lifestyle Factors

Alcohol consumption, especially regular and excessive alcohol consumption, is a risk factor for breast and other cancers. In addition, the lack of regular physical activity is a risk factor. Obesity, especially after menopause, can increase one's risk for the development of breast and other cancers. These factors may contribute to an increased risk of breast cancer, possibly through hormonal and other

mechanisms. Diets high in processed foods, low in whole foods (fruits, vegetables, unprocessed meats, etc.), and diets high in saturated fats are all risk factors for cancer.

In addition, environmental exposures to certain conditions can increase cancer risk. The exposure to certain chemicals, such as in factory work, can increase the predisposition of breast cancer. Also, working shift work and disrupting the body's circadian rhythm can increase the risk due to hormonal mechanisms. Smoking is a risk factor as well, although not as high as with other cancers.

The risk for developing breast cancer is multifactorial and typically results from a combination of factors. There is continual research on what significance certain factors have to result in breast cancer.

Lung Cancer

Lung cancer is a complex disease characterized by the uncontrolled growth of abnormal cells in the lung tissues. It is the result of genetic mutations that lead to the disruption of normal cellular processes, allowing cells to divide and multiply uncontrollably.

Types of Lung Cancer [7]

Lung cancer is broadly classified into two main types based on histological features: non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). These classifications have further subtypes, each with distinct characteristics.

Non-Small Cell Lung Cancer

Non-Small Cell Lung Cancer (NSCLC) is the most common type of lung cancer, accounting for approximately 85% of all lung cancer cases. NSCLC encompasses several histological subtypes, each with distinct characteristics. Understanding

NSCLC in detail involves exploring its subtypes, molecular features, staging, and treatment modalities.

Adenocarcinomas arise from glandular cells and are most often found in the outer regions of the lungs. They are more common in non-smokers and females. Squamous cell carcinoma (SCC) develops from squamous epithelial cells, usually in the central airways. This type of lung cancer has a strong association with smoking. Large cell carcinoma are large, undifferentiated cells lacking the features of adenocarcinoma or SCC. This cancer type is aggressive and grows quickly. Adenosquamous carcinomas contain both glandular and squamous components and are associated with a poor prognosis.

Small Cell Lung Cancer

Small Cell Lung Cancer (SCLC) is a type of lung cancer that is characterized by the rapid growth of small-sized cells. It accounts for approximately 15% of all lung cancers and is known for its aggressive behavior, rapid growth, and early dissemination. SCLC is strongly associated with cigarette smoking, and it tends to respond well to chemotherapy, at least initially. SCLC is often classified as a neuroendocrine tumor due to its origin in the neuroendocrine cells of the lung. Tumors are often centrally located in the lung, near the bronchi.

Staging of Lung Cancer

The most commonly used staging system for lung cancer is the TNM system (Tumor, Node, Metastasis), which provides detailed information about the primary tumor, lymph node involvement, and the presence of distant metastasis. Information on this is further in this section.

Symptoms of Lung Cancer [8]

Several symptoms may point to lung cancer, as part of a larger clinical picture. In the early stages, lung cancer may not cause noticeable symptoms, and symptoms

may become more apparent as the disease progresses. First of all, a persistent cough that worsens over time, and coughing up blood are signs of lung cancer. Shortness of breath and chest pain that worsens with deep breathing and coughing are also signs. Like other cancer types, unexplained weight loss, persistent fatigue, and a decrease in appetite are also symptoms. Wheezing, hoarseness, and recurrent infections can also be signs. Advanced signs of metastasis include bone pain, headaches, seizures, and swallowing difficulty.

Risk Factors of Lung Cancer [9]

Lung cancer risk factors can be categorized into various types, including behavioral, environmental, occupational, and genetic factors. This section will detail each to help healthcare providers best explain modifiable and nonmodifiable risk factors to patients.

Behavioral

Cigarette smoking is the leading cause of lung cancer. It introduces numerous carcinogens, such as tar and nicotine, which can cause DNA damage and lead to the development of cancerous cells. Inhaling smoke from others' tobacco products increases the risk of lung cancer, especially for non-smokers, children, and individuals with prolonged exposure. Use of other tobacco products, such as cigars, pipes, and smokeless tobacco, also increases the risk of lung cancer. Quitting smoking can significantly reduce the risk of lung cancer over time. However, the risk remains elevated compared to non-smokers, even after quitting.

Environmental and Occupational Risk Factors

Radon is a radioactive gas that can enter homes from the ground and increase the risk of lung cancer when inhaled. Radon is the second leading cause of lung cancer after smoking. Exposure to indoor pollutants such as asbestos, formaldehyde, and certain household chemicals may elevate the risk of lung cancer, particularly in

occupational settings. Exposure to various workplace carcinogens, including arsenic, chromium, nickel, and diesel exhaust, can contribute to an increased risk of lung cancer. This is common in jobs like automotive shops, factory work, and more.

Family Risk Factors and Genetics

Having a first-degree relative (parent, sibling, child) with lung cancer increases an individual's risk, suggesting a potential genetic component. This risk is about one-and-a-half times more than having no first-degree relative with lung cancer, adjusted for behavioral risk factors like smoking. Inherited genetic mutations, such as those in the EGFR or TP53 genes, may contribute to an increased susceptibility to lung cancer, though these are less common than environmental factors. The EGFR (Epidermal Growth Factor Receptor) gene is a cell surface receptor that plays a crucial role in cell growth, proliferation, and survival. Mutations in the EGFR gene can lead to the overactivation of the receptor and the continuous stimulation of cell growth and division. EGFR mutations are commonly found in non-small cell lung cancer (NSCLC), particularly in adenocarcinomas. The TP53 gene is a tumor suppressor gene that plays a crucial role in preventing the development of cancer. TP53 mutations are among the most common genetic alterations in various cancers, including lung cancer. Mutations in TP53 can lead to the loss of its tumor-suppressive functions, allowing damaged cells to survive and proliferate uncontrollably.

Understanding these risk factors is crucial for preventive efforts, early detection, and personalized interventions. It's essential to note that lung cancer can occur in individuals without these risk factors, and not everyone with risk factors will develop the disease.

Colorectal Cancer

Colorectal cancer, also known as bowel or colon cancer, is a type of cancer that starts in the colon or rectum. It usually develops from precancerous polyps (abnormal growths) in the lining of the colon or rectum. Colorectal cancer is one of the most common cancers globally, and its prognosis and treatment outcomes often depend on the stage at which it is diagnosed.

Types of Colorectal Cancer [10]

Adenocarcinomas are the most common type of colorectal cancers, comprising around 95 percent of cases. It originates from the glandular cells lining the inner wall of the colon or rectum. Adenocarcinoma can be further classified into subtypes, such as tubular adenocarcinoma, mucinous adenocarcinoma, and signet ring cell carcinoma. Carcinoid tumors are rare neuroendocrine tumors that can develop in the gastrointestinal tract, including the colon. Carcinoid tumors in the colon are often slow-growing and may not cause noticeable symptoms until they reach an advanced stage. Gastrointestinal Stromal Tumors (GISTs) are uncommon tumors that can occur in the gastrointestinal tract, including the colon. GISTs can vary in their behavior, from benign to malignant. Most are found in the stomach or small intestine, but they can occur in the colon as well.

Staging of Colorectal Cancer

The most commonly used staging system for colorectal cancer is the TNM system (Tumor, Node, Metastasis), which provides detailed information about the primary tumor, lymph node involvement, and the presence of distant metastasis. Information on this is further in this section.

Symptoms of Colorectal Cancer

Colorectal cancer symptoms can vary depending on the location of the tumor, the stage of the cancer, and individual factors. In the early stages, colorectal cancer

may not cause noticeable symptoms, which is why regular screenings are important for early detection. With progression, there are several symptoms that physical therapists may screen for in patients. Symptoms of colon cancer can be characteristic of other gastrointestinal conditions, and a full clinical picture should be taken into account.

Early symptoms include changes in bowel habits (diarrhea or constipation, changes in stool consistency, feeling of incomplete bowel emptying), blood in the stool, abdominal discomfort, and unexplained weight loss. Blood may appear bright red, dark, or black and tarry.

Advanced symptoms include fatigue, anemia, abdominal pain, bowel obstruction, nausea, vomiting, changes in bowel habits, incomplete emptying, and rectal bleeding.

Risk Factors for Colon Cancer [11]

Several risk factors can increase the likelihood of developing colorectal cancer. It's important to note that having one or more risk factors does not guarantee the development of colorectal cancer, and some individuals with no apparent risk factors may still develop the disease.

Age

The risk of colorectal cancer increases with age. The majority of cases occur in individuals over the age of 50.

Family History and Inheritance

A family history of colorectal cancer or adenomatous polyps increases the risk. The risk is higher if the affected relative is a first-degree relative (parent, sibling, or child).

Certain genetic conditions can significantly increase the risk of colorectal cancer. These conditions are associated with inherited mutations in specific genes that play a role in the development and regulation of cells in the colon and rectum. Examples are Familial Adenomatous Polyposis (FAP) and Lynch Syndrome. FAP is caused by a mutation in the adenomatous polyposis coli gene and leads to the development of numerous adenomatous polyps in the colon and rectum. This typically begins benign but can progress to cancer. Lynch syndrome is caused by mutations in DNA mismatch repair genes, including MLH1, MSH2, MSH6, PMS2, and others. It increases the risk of colorectal cancer and other cancers, such as endometrial, ovarian, and stomach cancers. Individuals with Lynch syndrome often develop colorectal cancer at a younger age.

Prostate Cancer [12]

Prostate cancer originates in the epithelial cells of the prostate gland. The majority of cases are adenocarcinomas, characterized by glandular differentiation. In advanced cases, neuroendocrine differentiation may occur. Pathological evaluation involves assessing the Gleason score, a grading system that reflects the degree of glandular differentiation and tumor aggressiveness.

Types of Prostate Cancer

Adenocarcinomas are the most common type of prostate cancer. They originate from the glandular cells of the prostate. Subtypes are acinar adenocarcinoma, which form with glandular patterns, ductal adenocarcinoma, which are characterized by large, cribriform glandular structures, and cribriform pattern, which are associated with higher Gleason scores and more aggressive behavior. Neuroendocrine differentiation is a rare variant with more aggressive disease. Sarcomatous carcinoma is a rare variant characterized by spindle-shaped cells and is also more aggressive than adenocarcinomas.

Staging of Prostate Cancer

The staging of prostate cancer is typically by the TNM system and what is known as a Gleason score. The Gleason score is a critical component in the grading and staging of prostate cancer. It provides valuable information about the aggressiveness and potential behavior of cancer cells. The Gleason score is named after Dr. Donald Gleason, who developed this grading system. The Gleason score ranges from 6 to 10, with higher scores indicating more aggressive cancer. The score is derived from the sum of two Gleason grades, each ranging from 1 to 5. The two grades represent the primary and secondary patterns observed in the tumor. Lower grades (1 and 2) represent well-differentiated, less aggressive tumor patterns. Higher grades (4 and 5) indicate poorly differentiated, more aggressive patterns. The primary pattern (first number) is the most predominant pattern observed in the tumor. The secondary pattern (second number) is the next most common pattern. For example, a Gleason Score of 6 (3+3) represents moderate differentiation with a primary pattern of Grade 3 and a secondary pattern of Grade 3.

Prostate-specific antigen (PSA) is a protein produced by the prostate gland, and measuring PSA levels in the blood is a common test used in the screening, diagnosis, and monitoring of prostate cancer. PSA levels can be elevated for various reasons, including cancerous conditions and non-cancerous conditions like benign prostatic hyperplasia (BPH) and prostatitis. A PSA level below 4.0 nanograms per milliliter (ng/mL) is often considered normal. However, there is no strict cutoff, and what is considered a normal level can vary. PSA levels between 4.0 and 10.0 ng/mL are generally considered to be in the "gray zone," and further evaluation is needed. PSA levels above 10.0 ng/mL are often associated with an increased likelihood of prostate cancer.

Symptoms of Prostate Cancer

Prostate cancer in its early stages often does not cause noticeable symptoms. As the disease progresses, some individuals may experience symptoms. It's important to note that these symptoms can also be associated with non-cancerous conditions like benign prostatic hyperplasia (BPH) or prostatitis.

Urinary changes like frequent urination, straining during urination, a weak or interrupted urine flow, and urgency are signs of prostate cancer. Incomplete bladder emptying is also a sign. Pelvic pain and bone pain are signs of moderate to advanced disease. Blood in urine (hematuria) and/or blood in semen is a sign. Erectile dysfunction is also a sign of prostate cancer, among a larger clinical picture.

Risk Factors of Prostate Cancer [13]

Increasing age is a major risk factor. Androgens, particularly testosterone, play a role in carcinogenesis. Genetic alterations play a role in prostate cancer development. Mutations in tumor suppressor genes, oncogenes, and DNA repair genes are implicated. The androgen receptor (AR) pathway is crucial, and resistance to androgen deprivation therapy may result from AR mutations or alterations. African American men have a higher incidence and mortality rate. One in six Black men will develop prostate cancer in a lifetime. This number is one in eight in White men. High-fat diets, red meat consumption, and low intake of fruits and vegetables may influence risk. Variances in incidence based on geographical regions and exposure to certain environmental agents.

Ovarian Cancer [14,15]

Ovarian cancer is a type of cancer that originates in the ovaries. It is often called the "silent killer" because symptoms are not specific and tend to appear in later stages when the cancer has already spread beyond the ovaries. Ovarian cancer is

the 11th most common cancer among women but is the 5th most common cause of cancer death among women. This is due to the challenge of early detection.

Types of Ovarian Cancer

Ovarian cancer can be categorized into several types based on the specific cell types from which the cancer originates. Epithelial ovarian cancer (EOC) is the most common type of ovarian cancer, accounting for about 90% of all ovarian cancer cases. It arises from the epithelial cells that cover the surface of the ovary. EOC is a challenging disease to detect early because symptoms may be subtle, and there are often no specific screening tests for routine use. Germ cell tumors (GCTs) are a type of ovarian cancer that originates from the germ cells, which are the cells that develop into eggs. While most ovarian cancers are epithelial, germ cell tumors account for a small percentage, approximately 5-10%, of ovarian cancers. Germ cell tumors are often found in younger women and are generally more responsive to treatment. Sex cord-stromal tumors are a rare type of ovarian cancer that develops from the cells that support the eggs and the connective tissues of the ovaries. These tumors account for about 5% of all ovarian cancers and are often diagnosed at an earlier stage.

Staging [16]

Ovarian cancer staging is typically determined by the FIGO (International Federation of Gynecology and Obstetrics) system. The rating system is described below.

Stage I: Cancer is limited to one or both ovaries.

Stage II: Cancer has spread to other pelvic organs.

Stage III: Cancer has spread to the abdomen or nearby lymph nodes.

Stage IV: Cancer has spread to distant organs.

Symptoms

Abdominal pain, bloating, changes in bowel movements, frequent urination, and/or persistent discomfort in the pelvic or abdominal area are symptoms of ovarian cancer. The loss of appetite, feeling full quickly after eating a small amount, unexplained weight loss, persistent fatigue, and changes or irregularities in the menstrual cycle are all symptoms as well.

Risk Factors

Ovarian cancer risk increases with age, and it is most commonly diagnosed in women over 60. A family history of ovarian, breast, or colorectal cancer increases the risk. Mutations in BRCA1, BRCA2, and other genes are associated with an increased risk. A medical history of previous cancers, especially breast or colorectal cancers, may increase the risk. Nulliparity (never having given birth) and early onset of menstruation or late menopause may contribute. The long-term use of estrogen-only hormone replacement therapy may also increase the risk. Women with endometriosis have a higher risk. Endometriosis is a common condition where tissue similar to the lining of the uterus, known as the endometrium, starts to grow outside the uterus. This tissue can be found on the ovaries, fallopian tubes, the outer surface of the uterus, the pelvic peritoneum (lining of the abdominal cavity), and other organs in the pelvic region. Lastly, obesity is linked to an increased risk of ovarian cancer.

Pancreatic Cancer [17,18]

Pancreatic cancer refers to the abnormal and uncontrolled growth of cells in the pancreas. The pancreas has two main functions: producing digestive enzymes to aid in digestion and secreting hormones like insulin to regulate blood glucose levels. Pancreatic cancer is notorious for its aggressive nature and often presents challenges in early detection.

Types of Pancreatic Cancer

Pancreatic cancer can be divided into two main types: exocrine and endocrine pancreatic cancer. Exocrine pancreatic cancer is far more common than endocrine, accounting for around 90 percent of cases. Pancreatic ductal adenocarcinoma (PDAC) is the most common type of exocrine pancreatic cancer. It arises from the cells lining the pancreatic duct and is highly aggressive with a diagnosis typically at an advanced stage. Acinar cell carcinoma is less common than PDAC, originates from cells that produce pancreatic enzymes, and has a better prognosis than PDAC. Pancreatoblastomas are extremely rare and most often occur in children. Pancreatic neuroendocrine tumors (PNETs) are a type of endocrine pancreatic cancer that originate from pancreatic islet cells, include both tumors that produce hormones and do not, and are less aggressive than exocrine cancers.

Staging

Staging for pancreatic cancer uses the TNM system and the grading system below.

Stage I: Tumor confined to the pancreas.

Stage II: Localized spread to nearby tissues and organs.

Stage III: Extensive local invasion and involvement of nearby lymph nodes.

Stage IV: Distant metastasis, often to the liver or lungs.

Symptoms

Pancreatic cancer often does not cause noticeable symptoms in its early stages. As the cancer progresses, symptoms may become more apparent. It's important to note that the symptoms of pancreatic cancer can be nonspecific and may resemble those of other, less severe conditions.

Dull, aching abdominal pain, often in the upper abdomen or mid back, which worsens after eating is a sign of pancreatic cancer. Jaundice, or yellowing of the skin or eyes, can occur due to the buildup of bilirubin from obstruction of bile ducts from the tumor. Dark urine and pale-colored stools may also be a result of the obstruction. Unexplained and unintentional weight loss, poor appetite, consistent fatigue, nausea, vomiting, and changes in bowel habits are all considered symptoms. An onset of diabetes with no obvious etiology can occur due to the differences in insulin production.

Risk Factors

The risk of pancreatic cancer increases with age, with the majority of cases diagnosed in individuals over 60. Cigarette smoking is a significant risk factor. Inherited genetic mutations (for example BRCA2) or familial pancreatic cancer syndromes are a risk factor. Chronic pancreatitis, or long-term inflammation of the pancreas is a risk factor, along with long-standing diabetes and obesity. Being overweight or obese increases the risk. Occupational exposure to chemicals such as hard metals, pesticides, diesel engine exhaust, and asbestos can increase the risk of pancreatic cancer. In addition, African Americans have on average a 70 percent higher risk of developing pancreatic cancer than other racial groups.

Skin Cancer [19,20]

Skin cancer is the abnormal growth of skin cells, primarily caused by exposure to ultraviolet (UV) radiation from the sun or artificial sources like tanning beds. It is the most common type of cancer globally.

Types of Skin Cancer

Basal Cell Carcinoma (BCC) is the most common type of skin cancer, originates in the basal cells of the epidermis and is typically non-aggressive. It often appears as a pearly or waxy bump, or a flat, flesh-colored or brown scar-like lesion. Squamous

Cell Carcinoma (SCC) arises in the squamous cells of the epidermis and can be more aggressive than BCC. It typically presents as a red, scaly patch, or a firm rapidly growing nodule. Melanoma originates in melanocytes, is less common but more aggressive than BCC and SCC, and is characterized by changes in the color, size, or shape of existing moles, or the appearance of new, unusual-looking moles. Merkel cell carcinoma is rare, aggressive, originates in the epidermis, and appears as firm, shiny nodules in sun-exposed areas of the skin.

Staging

The staging of skin cancer follows the TNM system as other cancers.

Symptoms

The most common symptoms of skin cancer are changes in the skin. This includes changes in moles, marked by irregular borders and changes in color, size, or shape. New skin growths, like bumps, nodules, or sores that do not heal are signs. In addition, itching, tenderness, and pain in a previously normal area of the skin are symptoms of skin cancer. Bleeding and oozing from a skin lesion that was not from trauma to the skin is a sign as well.

Risk Factors

The most common risk factor is UV radiation exposure from either sun exposure or artificial UV light, such as tanning bed use. Having lighter skin types is a risk factor as well as the presence of numerous moles. A genetic predisposition, family history, and a personal history of previous skin cancer is a risk for developing any type of skin cancer. Lastly, a compromised immune system is a risk factor.

Hematologic Cancer [21,22]

Hematologic cancers, also known as blood cancers, affect the blood, bone marrow, lymph nodes, and other parts of the lymphatic system. These cancers

originate in the cells of the hematopoietic system, which is responsible for the production of blood cells. There are three main types of hematologic cancers: leukemia, lymphoma, and myeloma.

Types of Hematologic Cancer

Leukemia is a cancer that starts in the bone marrow and affects the blood and blood-forming tissues. It is characterized by the rapid production of abnormal white blood cells. There are four main types of leukemia, which are classified based on the type of blood cell affected and the rate of disease progression. Acute Lymphoblastic Leukemia (ALL) starts in the bone marrow and affects the blood and blood-forming tissues. It is characterized by the rapid production of immature white blood cells, called lymphoblasts. It most commonly affects children between 2 and 5 years old. Chronic Lymphocytic Leukemia (CLL) is a slow-growing leukemia that primarily involves the blood and bone marrow. CLL is characterized by the accumulation of mature but abnormal lymphocytes, particularly B cells, which are a type of lymphocyte responsible for producing antibodies. It affects older adults predominantly, with the highest incidence around 70 years old. Acute Myeloid Leukemia (AML) is a type of cancer that affects the bone marrow and blood. It is characterized by the rapid growth of abnormal myeloid cells, which are immature white blood cells that normally develop into red blood cells, white blood cells, and platelets. It can occur at any age but is most common in older adults. Chronic Myeloid Leukemia (CML) is a type of leukemia that originates in the bone marrow and affects the blood and blood-forming tissues. It is characterized by the overproduction of mature and immature granulocytes (a type of white blood cell) and is associated with a specific genetic abnormality known as the Philadelphia chromosome. It most commonly occurs in people aged 60 years and older. Leukemia is staged and classified as either acute or chronic, and further subtyped based on the specific cell type affected.

Lymphomas are cancers that affect the lymphatic system, a part of the immune system. They are divided into two main types: Hodgkin lymphoma and non-Hodgkin lymphoma. Hodgkin Lymphoma (HL) is characterized by the presence of Reed-Sternberg cells. There are different subtypes of Hodgkin lymphoma, such as nodular sclerosis, mixed cellularity, lymphocyte-rich, and lymphocyte-depleted. Non-Hodgkin Lymphoma (NHL) is a diverse group of lymphomas that do not contain Reed-Sternberg cells. There are many subtypes of NHL, including diffuse large B-cell lymphoma, follicular lymphoma, mantle cell lymphoma, and Burkitt lymphoma. Stages range from I (localized disease) to IV (widespread disease).

Multiple myeloma is a cancer that forms in plasma cells, a type of white blood cell found in bone marrow. Abnormal plasma cells multiply and produce abnormal antibodies, leading to problems like bone damage and anemia. Myeloma is often staged using the International Staging System (ISS), which takes into account factors such as serum beta-2 microglobulin levels and serum albumin levels. Stages range from I to III.

Symptoms

The symptoms of hematologic cancers can vary depending on the specific type of cancer and its stage. However, there are some general symptoms that may be indicative of hematologic cancers such as leukemia, lymphoma, or myeloma.

General symptoms of hematologic cancer include persistent and unexplained fatigue or weakness, recurrent or persistent fevers without an apparent cause, and significant and unexplained weight loss over a short period.

Symptoms specific to leukemia include frequent infections, bruising easily, prolonged bleeding, frequent nosebleeds, pale skin, shortness of breath, and weakness due to anemia.

Symptoms specific to lymphoma include enlarged lymph nodes often in the neck, armpit, or groin, night sweats, and persistent unexplained itching all over the body.

Symptoms specific to myeloma include bone pain, fractures, fatigue and weakness, and kidney problems like excess thirst, frequent urination, and swelling.

Symptoms of Chronic Myeloid Leukemia are an enlarged spleen or liver, a feeling of fullness even after eating a small amount, and abdominal discomfort.

Risk Factors

The development of hematologic cancers is often complex, and the exact causes are not always well understood. However, certain risk factors may increase the likelihood of developing hematologic cancers, including leukemia, lymphoma, and myeloma. The most common risk factors are explained below.

The risk of hematologic cancers generally increases with age, with many cases diagnosed in older adults. A family history of hematologic cancers may increase the risk. Some genetic syndromes are also associated with a higher likelihood of developing these cancers. Some types of hematologic cancers may have a gender predisposition. For example, certain types of lymphomas are more common in males. Individuals who have undergone certain types of chemotherapy or radiation therapy for previous cancers may have an increased risk of developing secondary hematologic cancers. Exposure to benzene, a chemical found in some industrial settings and tobacco smoke, is associated with an increased risk of leukemia. Some studies suggest a link between exposure to certain agricultural chemicals and the development of hematologic cancers. High levels of ionizing radiation, such as those experienced during radiation therapy or nuclear accidents, may increase the risk of developing hematologic cancers. Individuals with certain immune system disorders, such as autoimmune diseases or HIV/AIDS,

may have an elevated risk of hematologic cancers. The Epstein-Barr Virus (EBV) has been linked to an increased risk of Hodgkin lymphoma and certain types of non-Hodgkin lymphoma. Infection of the Human T-cell Leukemia Virus-1 (HTLV-1) is associated with an increased risk of adult T-cell leukemia/lymphoma. A medical history of certain chronic blood disorders, such as myelodysplastic syndromes (MDS), may progress to acute leukemia. Some studies suggest a possible link between obesity and an increased risk of developing certain hematologic cancers. Some individuals with certain pre-existing conditions, such as Down syndrome, are at an increased risk of developing leukemia.

Brain and Central Nervous System Cancers [23]

Brain and central nervous system (CNS) cancers are a diverse group of tumors that can occur in the brain, spinal cord, and other parts of the central nervous system. These cancers can be primary, originating in the brain or spinal cord tissue, or secondary (metastatic), originating in another part of the body and spreading to the CNS.

Types of Brain/CNS Cancer

Glioblastoma Multiforme (GBM) is the most common and aggressive type of primary brain tumor in adults. It originates in glial cells, specifically astrocytes, and tends to grow rapidly. Astrocytomas arise from astrocytes, a type of glial cell. They can vary in grade from low to high, with higher grades indicating a more aggressive tumor. Oligodendrogliomas originate from oligodendrocytes, these tumors are less common and typically slower-growing than astrocytomas. Meningiomas are tumors that develop in the meninges and are usually slow-growing and are often benign. Medulloblastomas are primarily found in the cerebellum, and are fast-growing tumors that often occur in children. They are considered embryonal tumors. Schwannomas arise from Schwann cells and often affect the nerves of the vestibular (balance) and auditory nerves. Vestibular

schwannomas, for example, can lead to hearing loss and imbalance. Pituitary tumors develop in the pituitary gland, which plays a crucial role in hormone regulation. Depending on their characteristics, they may be classified as functional (producing hormones) or non-functional. Several other uncommon tumors, such as ependymomas, craniopharyngiomas, and chordomas, which are found in the ventricles, near the pituitary gland, and along the spine, respectively, are also forms of central nervous system cancer that healthcare providers may encounter.

Staging

TNM staging used for many solid tumors, is less commonly applied to brain and CNS tumors. Brain tumors are classified based on the type of cells from which they originate. For example, gliomas arise from glial cells, and meningiomas originate from the meninges. Tumors are graded based on their appearance under a microscope and how quickly they are likely to grow. The grading system is generally from Grade I to Grade IV:

Grade I: Slow-growing and less likely to spread.

Grade II: Gradually growing and may become more aggressive over time.

Grade III: Malignant and likely to grow more quickly.

Grade IV: Highly aggressive and tends to spread rapidly.

Symptoms

The symptoms of brain or central nervous system (CNS) cancer can vary widely depending on the type of tumor, its location, size, and the rate of growth. General symptoms include headaches, nausea and vomiting, and visual changes like double vision, blurred vision, seeing flashing lights or unusual shapes, and/or the loss of peripheral vision. Neurological symptoms include seizures, weakness or numbness in the extremities, coordination difficulties, memory loss, concentration

problems, mood swings, irritability, and personality changes. For tumors that increase intracranial pressure (ICP) on the brain, symptoms can be papilledema (swelling of the optic nerve), projectile vomiting, and changes in consciousness.

Risk Factors

The exact cause of most brain and central nervous system (CNS) cancers is not well understood, and the majority of cases occur sporadically without an identified cause. However, certain risk factors may be associated with an increased likelihood of developing brain and CNS cancers.

The risk of brain and CNS cancers increases with age. Certain types of tumors, such as gliomas, are more common in adults, while others, like medulloblastomas, are more frequently diagnosed in children. Some types of brain tumors may have a slight gender predisposition. For example, meningiomas are more common in women. Individuals with a family history of certain genetic syndromes, such as neurofibromatosis type 1 and type 2, Li-Fraumeni syndrome, or Turcot syndrome, may have an increased risk. Rare hereditary conditions, such as von Hippel-Lindau (VHL) disease and Gorlin syndrome, are associated with an elevated risk of brain tumors. Exposure to ionizing radiation and certain chemicals (pesticides, industrial chemicals) are potential risk factors. Severe or repeated head injuries, such as those occurring in accidents or contact sports, have been suggested as potential risk factors. Long-term and frequent seizures, especially in conditions like epilepsy, may be associated with an increased risk.

Bone Cancers [24,25]

Bone cancers, medically referred to as primary bone tumors, originate in the bone tissue. They can be benign or malignant. Malignant bone tumors are further categorized into primary bone cancers, which originate in the bone itself, and

secondary bone cancers, which spread to the bones from other organs (metastatic cancers).

Types of Bone Cancer

Osteosarcoma most commonly occurs in the long bones, such as the arms and legs. It predominantly affects adolescents and young adults and is characterized by the production of immature bone by cancer cells. Chondrosarcoma develops in the cartilage, most often in the pelvis, upper leg, and shoulder, and is more common in adults. Ewing sarcoma arises from primitive nerve tissue and can involve both bone and soft tissue, is typically found in long bones, the pelvis, and ribs, and affects mostly young adults and children. Fibrosarcoma arises in the connective tissue of the bone and is most common in adults.

Symptoms

The most common symptoms of bone cancers include persistent, localized bone pain especially at night and with activity, swelling or a lump near the affected bone, fractures in the bone, limited range of motion in nearby joints, and general fatigue and weakness.

Risk Factors

Bone cancer occurs at higher rates for different ages per type of cancer. Bone cancer can occur at any age, but certain types, such as osteosarcoma and Ewing sarcoma, are more common in children and young adults. Some types of bone cancer, such as osteosarcoma, tend to occur more frequently in males. Certain genetic conditions like Li-Fraumeni syndrome, Paget's Disease, and retinoblastoma predispose individuals to bone cancer. Prior bone marrow transplants also increase the risk of bone cancer, along with chemical and radiation exposure.

Thyroid Cancer [26]

Thyroid cancer arises in the cells of the thyroid gland, which produces hormones that regulate metabolism, like thyroxine, and triiodothyronine. Thyroid cancer is generally treatable, and the prognosis is often favorable, especially when diagnosed early.

Types of Thyroid Cancer

Papillary thyroid carcinoma is the most common type of thyroid cancer, is often slow-growing, tends to affect people in their 30s and 40s, and it presents as a single nodule in one lobe of the thyroid. Follicular thyroid carcinoma accounts for a smaller percentage of cases, tends to occur in older adults, and typically presents as a nodule and may invade blood vessels. Medullary thyroid carcinoma originates from the thyroid's C cells and may be associated with multiple endocrine neoplasia (MEN) syndromes, which are a rare group of genetic disorders that affect endocrine function. Anaplastic thyroid carcinoma is a rare and aggressive form of thyroid cancer that is rapidly growing and may invade nearby structures, making prognosis poor.

Symptoms

Symptoms of thyroid cancer include thyroid nodules, voice changes such as hoarseness, difficulty swallowing, persistent coughing, and pain in the anterior neck.

Risk Factors

Thyroid cancer is more common in females, in people with a family history of thyroid cancer, in those with a prior history of thyroid nodules, with radiation exposure, and who have iodine deficiency.

Head and Neck Cancer [27]

Head and neck cancer refers to a group of cancers that originate in various structures such as the oral cavity, pharynx, larynx, nasal cavity, paranasal sinuses, and salivary glands. These cancers can develop in the mucosal surfaces, the lining of the mouth, nose, and throat, as well as in the structures responsible for speech, swallowing, and other vital functions.

Types of Head and Neck Cancer

Head and neck cancer can be classified into several types based on the location and effect of the cancer. Oral cavity cancer includes cancers of the lips, gums, tongue, cheek lining, and hard palate. Pharyngeal cancer is cancer of the pharynx which may be within the nasopharynx, oropharynx, or hypopharynx. Laryngeal cancer affects the larynx and vocal cords. Nasal cavity and paranasal sinus cancer develops in the nasal cavity or the sinuses surrounding the nose. Salivary gland cancer originates in the salivary glands and is a rare type of cancer.

Symptoms

The symptoms of head and neck cancer can vary depending on the location of the cancer and its stage. Early-stage head and neck cancers may not cause noticeable symptoms, while more advanced stages can present with a range of signs. Symptoms of head and neck cancer besides unintentional weight loss, persistent fatigue, and loss of appetite are below.

A persistent sore throat, dysphagia, voice changes, persistent cough, ear pain, a lump or mass in the throat or neck, chronic congestion, jaw pain, bleeding from the nose, mouth, or throat, skin changes, and persistent bad breath are all symptoms of head and neck cancer.

Risk Factors

Tobacco smoking and excessive alcohol consumption are major risk factors, as well as exposure to prior radiation therapy and workplace carcinogens, such as asbestos, wood dust, and certain chemicals. Human Papillomavirus (HPV) infection is a risk factor for oropharyngeal cancers. Men are more likely to develop head and neck cancer than women. The risk of head and neck cancer increases with age, with most cases diagnosed in individuals over 50. Lastly, a lack of proper dental care and poor oral hygiene may contribute.

Each cancer type has a clinical presentation that physical therapists and assistants should be aware of for both screening and intervention purposes. This section explains the most common cancer types to help serve as a foundation for understanding patients with cancer who are seeking physical therapy.

Statistics – Prevalence and Incidence [28]

The overall percentage of risk for developing cancer in men is 22 percent and in women is 18 percent throughout a lifetime. Worldwide, eighteen million new cases of cancer were diagnosed in 2018. Eleven percent of new cancer cases are lung cancer and breast cancer, separately. Seven percent of cancer cases worldwide are prostate cancer. Cancer, behind heart disease, is the second most common cause of death worldwide.

In those 14 years old and younger, hematologic and brain cancer are most common. Leukemias represent 37 percent of cancer cases in this age group. Brain and nervous system cancers represent 16 percent of cases and lymphomas represent 13 percent of cases.

In those from 15 to 49 years old, breast cancer is most common, representing 13 percent of total cases. Liver cancer is second most prevalent, at 12 percent of cases. Lung cancer represents 9 percent of cases worldwide in this age group.

In the group 50 to 59 years old, lung cancer represents 18 percent of cases, liver cancer accounts for 11 percent of cases, and breast cancer accounts for 9 percent of cases.

In those 60 years and older, lung cancer accounts for 21 percent of cases, colorectal, liver, and stomach cancer account for 9 percent of cases each.

Cancer Staging [29]

The TNM staging system is a widely used method for describing the extent and spread of cancer within the body. The TNM system stands for Tumor, Node, and Metastasis, and it is an important tool in cancer staging, aiding in treatment planning and prognosis assessment. Each of the three components of TNM provides specific information about cancer.

Tumor (T) Stage

The letter "T" indicates the stage of cancer. TX means that a primary tumor cannot be assessed and there is no information on it. T0 means that there is no evidence of a primary tumor. Tis (Carcinoma in Situ) is the staging for non-invasive tumors. Tis (DCIS) signifies a ductal carcinoma in situ. Tis (LCIS) signifies a lobular carcinoma in situ. T1, T2, T3, T4 indicate an increasing size of the primary tumor. T1 is used for tumor(s) that are less than or equal to 2 cm in greatest dimension. T2 is used to classify tumors that are greater than 2 cm but less than 5 cm. T3 is used to classify tumors that are greater than 5 cm. T4 is used to classify a tumor of any size with direct extension to the chest wall or skin.

Node (N) Stage

NX means that regional lymph nodes cannot be assessed. N0 is used to signify that there is no regional lymph node metastasis. N1, N2, N3 are used to signify

increasing involvement of regional lymph nodes. N1 means that there has been metastasis to 1-3 axillary lymph nodes or internal mammary nodes. N2 means there is metastasis to 4-9 axillary lymph nodes or clinically evident internal mammary nodes. N3 means there has been metastasis to 10 or more axillary lymph nodes, or infraclavicular or supraclavicular lymph nodes.

Metastasis (M) Stage

MX means that the presence of distant metastasis cannot be assessed. M0 signifies there is no distant metastasis. M1 signifies that distant metastasis is present.

Overall Stages of Cancer

Stage 0: Tis, N0, M0 signify a carcinoma in situ.

Stage I: T1, N0, M0 all signify early-stage invasive cancer.

Stage IIA: T0 or T1 or T2, N1, M0 all signify there is a small tumor with limited lymph node involvement.

Stage IIB: T2 or T3, N0 or N1, M0 signify the presence of a larger tumor size or additional lymph node involvement.

Stage IIIA: T0 to T3, N2, M0 signify a larger tumor with more extensive lymph node involvement.

Stage IIIB: T4, Any N, M0 signify locally advanced cancer with invasion of chest wall or skin.

Stage IIIC: Any T, N3, M0 signifies extensive lymph node involvement.

Stage IV: Any T, Any N, M1 signifies there is the presence of distant metastasis.

Some cancers have different staging and classification systems, which are included in a prior section describing different types of cancer.

Prognosis [28]

Overall, cancer contributes to a significant amount of mortality worldwide. Heart disease is the leading mortality cause in the world and cancer of all types is second. Cancer causes just under 9 million deaths each year in the world. The prognosis for cancer diagnosis of all types depends on several factors. The most crucial factor is the staging of the cancer and whether or not it has metastasized. Whether cancer has spread to nearby lymph nodes is a crucial factor, as this indicates a more advanced stage. Generally, younger and healthier individuals will have a better prognosis than older and those with multiple medical comorbidities. The availability of certain treatments, including surgery, chemotherapy, radiation therapy, immunotherapy, and targeted therapy impact prognosis. In addition, access to quality healthcare including specialized cancer centers, and clinical trials can influence prognosis.

Prostate and thyroid cancers have the best prognosis due to a higher likelihood of early detection. They have a 5-year survival of close to 100%. Esophagus, liver, and pancreatic cancers have the worst prognosis, which is less than 20% at 5 years. Only 7 percent of those diagnosed with pancreatic cancer survive for 5 years. Thirteen percent of those with brain cancer survive to 5 years. Those with skin melanoma survive to 5 years 92 percent of the time and those with testicular cancer survive 97 percent of the time.

Section 1 Key Words

TNM Grading System – A widely used staging system for cancer that provides a standardized way to describe the extent of a cancer's spread including

descriptions of the tumor's size and extent of invasion (T), whether cancer has spread to nearby lymph nodes (N), and whether or not a cancer has metastasized to other parts of the body (M)

Invasive Ductal Carcinoma (IDC) – The most common type of breast cancer accounting for up to 80 percent of cases, originates in the ducts and infiltrates nearby breast tissue

Non-Small Cell Lung Cancer (NSCLC) – A type of lung cancer that accounts for approximately 85% of all lung cancer cases and includes subtypes of adenocarcinoma, squamous cell carcinoma, and large cell carcinoma

Adenocarcinoma Prostate Cancer – Accounts for 90 percent of prostate cancer cases and is a slow growing cancer that originates in the glandular cells of the prostate

Section 1 Summary

This section overviewed types of cancer, statistics regarding cancer diagnosis, prognosis based on types of cancer, and cancer treatments. It provides basic knowledge for physical therapists and assistants in order to effectively manage the rehabilitation aspect of care for patients affected by cancer.

The Effects of Cancer and Treatment

There are several types of cancer that physical therapists and assistants may come across, each with varying stages, treatments, and side effects. This section will explore the effects of treatment holistically to help providers understand the possible burden that the disease causes, beyond physical side effects only. It will touch on how cancer affects quality of life, emotional effects, socioeconomic, and more.

Cancer Treatment Types and Effects [30]

The course of cancer treatment and its side effects are important for physical therapists and assistants to know how to best support recovery and function during and after treatment. This section will detail various cancer treatments based on cancer types and the side effects that affect the daily lives of those with cancer.

Surgery [31]

Surgery involves the physical removal of the tumor or cancerous tissue from the body. It is often the initial step in cancer treatment and aims to remove as much of the tumor as possible. Surgery outcomes vary per cancer type and leave side effects based on the type and invasiveness of surgical tumor removal. Common types of surgery for tumor removal are lumpectomy, mastectomy, lobectomy, colectomy, proctectomy, and others detailed below.

Lumpectomy, also known as breast-conserving surgery or partial mastectomy, involves the removal of the tumor along with a surrounding margin of normal breast tissue. The goal is to preserve as much of the breast as possible. Side effects are pain or discomfort at the surgical site, which is typically managed with pain medications, swelling, change in breast appearance, and scar formation at the incision site.

Mastectomy involves the surgical removal of the entire breast. There are different types of mastectomy, including total mastectomy, modified radical mastectomy, and radical mastectomy, each involving varying degrees of breast tissue removal. Side effects include post-surgical pain, managed with pain medications, arm and shoulder mobility restrictions, emotional effects such as changes in body image and self-esteem, and lymphedema (swelling in the arm due to the disruption of lymph vessels from surgery).

Lobectomy involves the removal of an entire lobe of the lung. It is often performed to treat lung cancer, and the choice of lobe depends on the tumor location. Side effects include pain at the incision site, breathing difficulties, such as temporary shortness of breath, and decreased lung capacity due to the removal of lung tissue.

Colectomy involves the surgical removal of all or part of the colon. It is performed to treat conditions such as colorectal cancer, and other conditions such as inflammatory bowel disease and diverticulitis. Side effects include changes in bowel habits and function, abdominal pain, and infection.

Proctectomy involves the surgical removal of all or part of the rectum. It is performed to treat conditions such as rectal cancer, inflammatory bowel disease, or severe rectal prolapse. Side effects include changes in bowel habits, sexual dysfunction, infection risk, and incision site pain.

Hysterectomy involves the removal of the uterus, cervix, and surrounding tissues, typically as a treatment for cervical cancer. Lymph node removal may also be performed to reduce the chance of cancer spread.

The Whipple procedure (Pancreaticoduodenectomy) includes the removal of the head of the pancreas, part of the small intestine, gallbladder, and nearby lymph nodes. While the Whipple procedure can be life-saving, it is associated with several potential side effects and complications. These include incision site and abdominal pain, digestion and absorption of nutrient changes, weight loss, diabetes or glucose intolerance due to pancreas removal, delayed gastric emptying (gastroparesis), bile duct complications, infection, bleeding, gastrointestinal obstruction, and wound complications.

Brain cancer surgery involves the removal of abnormal or cancerous growths within the brain. The primary goal of surgery is to excise as much of the tumor as

possible while minimizing damage to healthy brain tissue. Surgery types include craniotomy, biopsy, and endoscopic surgery. The most common type of brain cancer surgery is a craniotomy, which involves making an incision in the scalp and removing a piece of the skull (bone flap) to access the brain, providing an access point to the tumor for removal or biopsy. Endoscopic surgery involves the use of a thin, lighted tube with a camera (endoscope) to access and remove tumors through small incisions or natural openings. Side effects of brain surgery and tumor removal include headaches, nausea and vomiting, infection, seizures, bleeding, and changes in cognition such as temporary changes in memory and concentration.

Radiation Therapy [32]

Radiation therapy, also known as radiotherapy, is a common treatment modality for cancer. It uses high doses of radiation to target and destroy cancer cells or inhibit their ability to grow. Radiation therapy can be delivered externally or internally, depending on the type and location of the cancer.

Types of radiation therapy include external beam radiation and internal radiation. External beam radiation is typically administered daily over several weeks and beams of radiation are generated outside the body and directed precisely at the tumor. Internal radiation is also known as brachytherapy, can be a one-time treatment or a series of treatments, and radioactive material is placed inside or very close to the tumor. Radiation treatment produces ions in the targeted tissue, which damages the DNA of cancer cells and interferes with the ability of the cells to divide and grow. Short term side effects of radiation therapy are skin redness, itching, and dryness, fatigue, hair loss, nausea and vomiting, appetite changes, and cognition changes from brain radiation. Long-term side effects may include late tissue damage from the radiation site and secondary cancers from radiation exposure.

Chemotherapy [33]

Chemotherapy is a systemic treatment for cancer that uses drugs to destroy or inhibit the growth of cancer cells. These drugs can be administered orally or intravenously and circulate throughout the body to reach cancer cells both locally and at distant sites. Chemotherapy may be used as the primary treatment, in combination with other modalities, or to shrink tumors before surgery or radiation therapy. This section will explain the main types of chemotherapy, the mechanism, common cancers each is used to treat, and side effects.

Alkylating Agents

These agents interfere with the DNA structure of cells, which prevents cancerous cells from dividing. Examples are cisplatin and cyclophosphamide. It is a treatment for leukemia, lymphoma, multiple myeloma, sarcoma, brain cancer, and cancers of the lung, breast, and ovary. Side effects include bone marrow suppression, nausea and vomiting, hair loss, irritation of the mucous membranes in the mouth and throat, kidney and bladder damage, infertility, secondary cancers, and neurotoxicity (leading to peripheral neuropathy or other neurological symptoms).

Antimetabolites

Antimetabolites mimic substances needed for DNA and RNA synthesis, disrupting cancer cell growth. Examples are methotrexate, capecitabine, and 5-fluorouracil. These are used to treat leukemia and cancer of the breast, ovary, and intestinal tract. Side effects include nausea and vomiting, bone marrow suppression, mucositis, diarrhea, skin changes, hepatotoxicity, pulmonary toxicity, flu-like symptoms, and neurotoxicity.

Antitumor Antibiotics

Antitumor antibiotics bind to DNA, preventing cell division, and is used to treat many types of cancer, including leukemia, lymphoma, soft tissue sarcoma, osteosarcoma, and breast, bladder, ovarian, and lung cancers. Examples are dactinomycin, bleomycin, daunorubicin, and doxorubicin. High doses may cause heart damage. Other side effects align with other chemotherapy side effects including hair loss, bone marrow suppression, increased infection risk, mucositis, hepatotoxicity, secondary cancers, and skin changes.

Topoisomerase Inhibitors

Topoisomerase inhibitors interfere with enzymes that are needed for DNA replication of cancer cells. Examples are etoposide and irinotecan. Side effects are similar to other chemotherapeutic drugs. These agents are used to treat leukemia, lung, ovarian, and gastrointestinal cancer. This agent predisposes one to acute myeloid leukemia within a few years.

Mitotic Inhibitors

Mitotic inhibitors disrupt mitosis by affecting microtubules, meaning cancerous cells can no longer replicate and produce new cells. Examples are docetaxel, paclitaxel, and vinblastine. These are used to treat myeloma, lymphoma, leukemia, and breast or lung cancer. Side effects are similar to other chemotherapeutic agents, besides an increased likelihood to cause painful nerve damage.

Hormone Therapy [34]

Hormone therapy, also known as endocrine therapy, is a cancer treatment that involves manipulating the levels of hormones in the body or blocking their effects to slow down or stop the growth of hormone-sensitive tumors. Hormone therapy

is commonly used in the treatment of breast, prostate, and certain gynecological cancers. The types of hormone therapy vary depending on the type of cancer and its hormone receptor status. Below are the two most common hormone therapy treatments.

Breast Cancer Hormone Therapy

Breast cancer hormone therapy, also known as endocrine therapy, is a type of treatment that targets the hormones estrogen and progesterone, which can stimulate the growth of certain types of breast cancer. This therapy is specifically used for breast cancers that are hormone receptor-positive, meaning they have receptors for estrogen (ER-positive) and/or progesterone (PR-positive). Types of breast cancer hormone therapy include Selective Estrogen Receptor Modulators (SERMs), Aromatase Inhibitors, Gonadotropin-Releasing Hormone Agonists, and Selective Estrogen Receptor Degraders (SERDs). The mechanisms of these agents are to block estrogen and progesterone themselves, or the precursors to hormone formation. They may be prescribed for years to continue being effective. Side effects include menopausal symptoms like hot flashes, night sweats, and vaginal dryness, increased risk of osteopenia/osteoporosis, mood swings, libido changes, weight gain, and cardiovascular issues with long term use.

Prostate Cancer Hormone Therapy

Prostate cancer hormone therapy, also known as androgen deprivation therapy (ADT), is a treatment strategy designed to block or reduce the levels of male hormones (androgens), particularly testosterone. Since prostate cancer cells often depend on androgens for growth, reducing their availability can slow down or shrink the tumor. Types include luteinizing hormone-releasing hormone (LHRH) agonists, luteinizing hormone-releasing (LHRH) antagonists, and anti-androgens. The mechanism of these agents are to suppress testosterone, inhibit the release of luteinizing hormone, and to block the action of androgens by binding to

androgen receptors on prostate cancer cells. Side effects include androgen deprivation symptoms (hot flashes, fatigue, decreased libido, muscle weakness), bone density loss, metabolic changes like weight gain and insulin resistance, cardiovascular complications like heart disease and elevated blood pressure, joint pain, loss of muscle mass, and decreased bone density.

Targeted Therapy [35]

Targeted therapy is a type of cancer treatment that specifically targets molecules involved in the growth and survival of cancer cells. Unlike traditional chemotherapy, which affects rapidly dividing normal and cancer cells, targeted therapy aims to interfere with specific proteins or signaling pathways that play a crucial role in the growth and spread of cancer cells. This approach allows for more precise and less harmful treatment. Types of targeted therapy include monoclonal antibodies (target specific proteins on cancer cells), tyrosine kinase inhibitors (block tyrosine kinase enzymes that are involved in the division of cells), and hormone receptor blockers. Examples of targeted therapies include trastuzumab, which targets HER2-positive breast cancer cells and imatinib which is used to treat chronic myeloid leukemia. The advantage of targeted therapy is fewer side effects due to targeting the specific molecules involved in cancer growth. It is a personalized treatment that does not work for all types of cancer and is sometimes used as an adjunct to chemotherapy and immunotherapy.

Immunotherapy [36]

Immunotherapy is a type of cancer treatment that harnesses the body's own immune system to recognize, attack, and eliminate cancer cells. Immunotherapy aims to enhance or stimulate the immune response to target and destroy cancer cells. Types of immunotherapy include checkpoint inhibitors (inhibit immune responses allowing the immune system to fight off cancer), CAR T-cell therapy,

monoclonal antibodies, cytokines, and cancer vaccines. CAR T-cell therapy involves genetically modifying a patient's T-cells to express chimeric antigen receptors (CARs) which target specific proteins on the surface of cancer cells. Monoclonal antibodies are engineered to target specific cancer cell proteins, marking them to be destroyed by the immune system. Cytokines are proteins that regulate immune responses and interferons and interleukins are utilized in cancer immunotherapy. Cancer vaccines stimulate the immune system to attack cancer cells and can be preventative or therapeutic. Side effects of these therapies are immune-related adverse events, which can include fatigue, skin rash, diarrhea, and inflammation of the lungs or other organs. The effectiveness of immunotherapy depends on the cancer type and patient characteristics.

Bone Marrow or Stem Cell Transplant [37]

These transplants involve the infusion of healthy blood-forming cells (either bone marrow or stem cells) into a patient after high-dose chemotherapy or radiation. The goal is to replace damaged or cancerous cells with healthy ones. Types of transplants include autologous, allogenic, or syngeneic transplants. Autologous utilizes a patient's own cells which are collected prior to a high-dose treatment and infused back afterwards, and is used in lymphoma, multiple myeloma, and certain solid tumors. Allogenic transplants utilize a donor's cells to replace the patient's diseased cells and is used in leukemia and lymphoma. Side effects may include graft-versus-host disease (GVHD), where the donor cells recognize the patient's tissues as foreign and attack them, organ damage, fatigue, infection, low blood count, nausea and vomiting, infertility, and secondary cancer.

Palliative Care and Hospice Care [38]

Palliative care is a specialized medical approach aimed at providing relief from the symptoms and stress associated with serious illness, including cancer. The goal of

palliative care is to improve the quality of life for both the patient and their family. It is not limited to end-of-life care and can be integrated at any stage of a serious illness, alongside curative or life-prolonging treatments. Palliative care takes a holistic approach working to manage symptoms such as pain, fatigue, nausea, and shortness of breath, to provide emotional support, to facilitate communication, and to provide spiritual care for patients and families. The palliative care team includes physicians, nurses, social workers, chaplains, and other specialists who work collaboratively to address the diverse needs of the patient. Palliative care can be introduced at the time of diagnosis and continued throughout the course of illness, alongside active treatment. In advanced stages of cancer, when the focus shifts from curative to comfort-oriented care, palliative care may transition into hospice care. The primary focus of hospice care is on enhancing the quality of life for patients and their families by managing symptoms, addressing emotional and spiritual needs, and providing compassionate end-of-life care. Hospice care is typically considered when curative treatments are no longer effective or desired, and the focus shifts to providing comfort and quality of life. Hospice care may occur in one's home or in an inpatient hospice facility. Part of hospice care is support for the patient and family with decision-making, advanced directives, and grief and bereavement support.

Clinical Trials [39]

Clinical trials for cancer treatment are research studies conducted to evaluate the safety and effectiveness of new interventions, including drugs, therapies, or procedures, with the goal of advancing medical knowledge and improving patient outcomes. These trials are essential for developing new and innovative approaches to cancer prevention, diagnosis, and treatment. Clinical trials typically progress through several phases, each designed to answer specific research questions and gather different types of information. Phase I involves initial testing

in a small group of patients to assess the safety, dosage, and potential side effects of a new treatment. Phase II expands the study to a larger group of patients to further evaluate safety and begin assessing the treatment's effectiveness. Phase III involves a larger number of patients to compare the new treatment to standard treatments, gather more information on effectiveness and side effects, and establish its role in clinical practice. Phase IV is conducted after a treatment is approved and on the market, these trials monitor its long-term safety and effectiveness in larger, more diverse patient populations. Treatment trials evaluate new drugs, therapies, or combinations of treatments. Prevention trials investigate ways to prevent cancer in individuals at increased risk. Screening trials assess new methods for detecting cancer in its early stages. Supportive care trials focus on improving the quality of life for cancer patients by managing symptoms and side effects. Patients undergoing cancer treatment may qualify for clinical trials which may help outcomes depending on the type of trial and their specific cancer.

Quality of Life [40]

Quality of life extends far beyond the physical aspects of the disease, encompassing emotional, social, and psychological dimensions. This impact may occur through direct mechanisms from cancer treatment or indirect mechanisms from coping and external factors to the cancer diagnosis itself.

Cancer and its treatments can influence neurotransmitter levels in the brain, impacting mood regulation. For example, chemotherapy may affect serotonin and dopamine levels. Certain cancers, such as those affecting the endocrine system, can lead to hormonal imbalances, contributing to mood disturbances. How individuals perceive and interpret their cancer diagnosis and prognosis can significantly impact emotional responses. Positive or negative cognitive appraisals influence emotional well-being. The effectiveness of coping strategies, such as

problem-solving or emotional regulation techniques, plays a role in emotional outcomes. The existential aspects of a cancer diagnosis, including questions about life purpose and meaning, can contribute to emotional distress. Pre-existing personality traits and coping styles can influence how individuals respond emotionally to a cancer diagnosis. The concept of resilience plays a role in determining how well individuals adapt to and cope with the emotional challenges posed by cancer. Alterations in physical appearance due to surgery, chemotherapy, or radiation may impact self-esteem and body image, influencing emotional well-being.

The presence or absence of supportive social networks can influence emotional well-being. Strong social support is generally associated with better emotional outcomes. The economic burden of cancer, including treatment costs and potential loss of income, can be a source of stress and anxiety. Tailored interventions, including psycho-oncological support, counseling, and behavioral therapies, can contribute to addressing emotional distress and promoting emotional well-being during and after cancer treatment.

Pain [41]

Pain in cancer patients can vary widely based on the type of cancer, its stage, and individual factors. This section will explain in brief detail examples of different types of cancer related pain that individuals may experience based on the type of cancer.

Breast Cancer

Individuals with breast cancer may experience pain in the breast or chest area from tumor growth, especially in advanced stages. Following surgery, such as a mastectomy or lumpectomy, patients may experience surgical site pain. Nerve

damage from surgery or treatments like chemotherapy can lead to neuropathic pain, characterized by tingling or burning sensations, typically in extremities.

Lung Cancer

Lung tumors can cause localized chest pain, often exacerbated by breathing or coughing. Involvement of the pleura can lead to pleuritic pain, intensified during breathing. Metastasis to bones, common in lung cancer, can cause severe bone pain.

Leukemia and Lymphoma

Leukemia may cause bone pain due to the increased production of abnormal blood cells. Swollen lymph nodes in lymphomas can be painful as well.

Pancreatic Cancer

Pancreatic tumors can cause severe abdominal pain. Pain may radiate to the back due to the proximity of the pancreas to the spine.

It is important to note that cancer pain can be complex, involving not only nociceptive pain but also neuropathic pain and psychosocial factors. Pain management in cancer often requires a multidisciplinary approach, including medications, interventional procedures, and supportive care. Individualized assessment and treatment plans are crucial to address the specific nature of pain in each cancer patient.

Fatigue [42]

Cancer-related fatigue is a common and distressing symptom experienced by many individuals undergoing cancer treatment or living with cancer. It is characterized by a persistent and overwhelming sense of tiredness that is not

relieved by rest and is disproportionate to the level of activity. Cancer-related fatigue can significantly impact a person's quality of life and daily functioning, in the ways listed in this section.

Cancer-related fatigue is a side effect of chemotherapy, radiation therapy, and certain medications due to these treatments affecting normal cells as well as cancer cells. Anemia is also a major cause of fatigue in cancer patients due to a decrease in red blood cells and therefore reduced oxygen-carrying capacity. Stress, anxiety, and depression commonly associated with a cancer diagnosis can contribute to fatigue. Cancer-related symptoms, treatment side effects, and emotional factors can disrupt sleep, exacerbating fatigue.

Cancer-related fatigue is often chronic, lasting for an extended period and may persist beyond the completion of cancer treatment. Fatigue can vary in intensity throughout the day, with some individuals experiencing more severe fatigue in the afternoon or evening.

Physical activity has evidence supporting reducing the incidence of cancer-related fatigue in cancer patients. In addition, psychosocial support, medications, adequate nutrition, and pacing activities throughout the day can all help combat cancer-related fatigue.

Anxiety and Depression [43]

Anxiety and depression are prevalent psychological symptoms experienced by many cancer patients, often arising from the complex interplay of biological, psychological, and social factors. On a neurobiological basis, anxiety cancer patients may be associated with alterations in neurotransmitters, particularly increased activity in systems involving norepinephrine, serotonin, and gamma-aminobutyric acid (GABA). Chronic stress, common in cancer, can lead to dysregulation of the HPA axis, resulting in heightened cortisol levels and

contributing to anxiety. Individuals with cancer may experience uncertainty, fear, avoidance behaviors, excessive worry, irritability, restlessness, and difficulty concentrating, all contributing to anxiety.

On a neurobiological basis, depression is often associated with a deficiency in monoamine neurotransmitters, including serotonin, norepinephrine, and dopamine. Chronic stress and inflammation in cancer can impact neuroplasticity, contributing to changes in brain structure and function associated with depression. People with cancer diagnoses may experience depressed mood, changes in appetite and sleep, loss of energy, and feelings of hopelessness and poor self-worth, leading to the clinical diagnosis of depression.

Mental health challenges are a reality among cancer patients. Anxiety and depression should be screened for by physical therapists and assistants and intervened on by mental health professionals as appropriate.

Lymphedema [44]

Lymphedema is a condition characterized by the accumulation of lymphatic fluid, leading to swelling, usually in the arms or legs. This condition occurs when the lymphatic system, responsible for draining excess fluid from tissues and maintaining immune function, is impaired. With cancer, this typically occurs from surgery to remove tumors or radiation therapy, when lymph nodes are removed or damaged. Lymphedema typically becomes a problem within three months to nearly 20 years after the initial cancer treatment.

Physical therapists and assistants should be able to recognize the symptoms of lymphedema in order to intervene on it. The hallmark symptom is persistent swelling, often beginning distally in the affected limb and progressing proximally. Individuals with lymphedema may experience a sensation of heaviness, tightness, or discomfort in the affected area. Swelling and fibrosis can limit joint mobility,

leading to a decreased range of motion. In addition, the compromised lymphatic system increases the risk of infections, such as cellulitis, in the affected limb. Lymphedema is diagnosed by a clinical assessment, lymphoscintigraphy (imaging to visualize lymphatic flow), and bioimpedance spectroscopy (extracellular measurements).

Stages of Lymphedema

Stage 0 (Latency) occurs when there is a subclinical accumulation of fluid without visible swelling.

Stage I (Mild) occurs when there is visible swelling that resolves with elevation, often referred to as pitting edema.

Stage II (Moderate) occurs when there is swelling that does not resolve with elevation, with the potential for tissue fibrosis.

Stage III (Severe) occurs when there are irreversible tissue changes, with significant swelling, fibrosis, and potential development of secondary complications.

Treatment of lymphedema will be covered in a future section. It involves complete decongestive therapy, pneumatic compression devices, and sometimes surgery such as lymph node transfers.

Peripheral Neuropathy [45]

Peripheral neuropathy refers to damage or dysfunction of the peripheral nerves, typically in the hands and feet. Peripheral neuropathy is a common side effect of certain cancer treatments, particularly chemotherapy and sometimes radiation therapy. Many chemotherapy drugs cause DNA damage by interfering with the rapidly dividing cells, including cancer cells. Unfortunately, this also affects

normal, healthy cells, including nerve cells. The drugs may cause axonal degeneration, which disrupts the communication between nerves and leads to neuropathy. Some chemotherapy drugs, such as taxanes and vinca alkaloids, interfere with microtubules, which are structures essential for cell division. Disruption of microtubules can affect nerve cell function and peripheral neuropathy.

All healthcare professionals should be aware of the symptoms of peripheral neuropathy. First, individuals will experience a sensation of "pins and needles" or numbness, usually starting in the toes and fingers. Some individuals describe a burning pain or shooting pain in affected areas. Light touch or pressure may cause discomfort. In severe cases, coordination and balance may be affected, leading to an increased fall risk.

There are three main types of peripheral neuropathy including sensory, motor, and autonomic neuropathy. Sensory neuropathy affects the sensory nerves, leading to symptoms like tingling, numbness, and pain. Motor neuropathy affects the motor nerves, leading to weakness, muscle cramps, and difficulty moving. Autonomic neuropathy affects the nerves that control involuntary bodily functions, leading to issues like blood pressure changes, digestive problems, and difficulty regulating body temperature.

Risk factors for neuropathy are high doses of chemotherapy, long durations of chemotherapy, and those with pre-existing conditions that increase the risk of peripheral neuropathy (such as diabetes mellitus). Many patients with peripheral neuropathy will be prescribed medications such as pain relievers and antidepressants to reduce neuropathy symptoms. In addition, oncologists can adjust chemotherapy doses to reduce the side effect of neuropathy.

Gastrointestinal Complications [30]

Gastrointestinal (GI) complications are common side effects of cancer treatment, particularly chemotherapy, radiation therapy, and certain targeted therapies. These complications can significantly impact a patient's quality of life and may require specific management.

Those undergoing cancer treatment, whether chemotherapy or radiation, may experience nausea, vomiting, mucositis, diarrhea, constipation, and gastrointestinal bleeding. These side effects vary per type of treatment, the duration of treatment, and individual factors. Patients may be prescribed prophylactic medications to mitigate gastrointestinal complications before the occur.

Chemo Brain [46]

"Chemo brain," also known as chemotherapy-related cognitive impairment or cancer-related cognitive dysfunction, refers to a cognitive decline or impairment in memory, attention, and other mental functions that some cancer patients experience during or after cancer treatment.

Chemo brain can affect various cognitive functions, including memory, concentration, information processing speed, and multitasking abilities. Symptoms may develop during cancer treatment (chemotherapy, radiation therapy) or after its completion. Patients often describe difficulty with memory recall, mental fog, and challenges in concentrating on tasks. Cognitive testing may reveal measurable changes in cognitive performance.

Chemo brain is theorized to be caused by a few factors. Some chemotherapy drugs can cross the blood-brain barrier, potentially leading to direct neurotoxic effects on the brain. Chemotherapy may cause damage to neurons and affect the

structure and function of the brain. Cancer and its treatment can trigger an inflammatory response, and cytokines released during inflammation may impact cognitive function. Changes in estrogen levels, often induced by cancer treatments, may contribute to cognitive changes, especially in hormone-sensitive areas of the brain. Some individuals experience temporary cognitive changes that improve after treatment, while others may have persistent issues. Severity can vary from mild cognitive symptoms that do not significantly impact daily life to more severe impairments affecting work, social interactions, and quality of life.

To manage chemo brain, patients may improve with cognitive rehabilitation in speech or occupational therapy and be prescribed certain medications.

Scar Tissue [47]

Scar tissue formation, also known as fibrosis, is a common complication of cancer treatment, particularly radiation therapy and certain surgical procedures. Management of scar tissue involves prevention (advanced radiation and surgical techniques), physical therapy, and topical treatments.

Radiation-Induced Fibrosis

Radiation therapy damages not only cancer cells but also normal tissues in the treatment area. This damage triggers an inflammatory response, leading to the release of cytokines and growth factors. Fibroblasts, which are cells responsible for producing collagen (the main component of scar tissue), become activated and start proliferating. Excessive collagen deposition occurs, leading to the formation of fibrous tissue.

Surgical Scarring

Surgical scarring occurs as a process of wound healing from the trauma of surgery. Immediately after surgery, there is an inflammatory phase where immune cells remove damaged tissue and debris. In the proliferative phase of healing, fibroblasts migrate to the wound site and produce collagen, promoting the formation of scar tissue. Over time, the scar tissue undergoes remodeling to strengthen and contract the wound, called the maturation phase. Excessive collagen production results in raised, red scars that remain within the boundaries of the original wound, called hypertrophic scars. Abnormal wound healing leads to the formation of thick, raised scars that extend beyond the original wound site, called keloids. Excessive scar tissue can lead to the tightening or shortening of tissues, restricting movement and function. This is called a contracture, which can affect joint mobility.

Section 2 Key Words

Alkylating Agents – A class of chemotherapy drugs that interfere with the DNA structure of rapidly dividing cells, including cancer cells

Palliative Care – A specialized medical approach focused on providing relief from the symptoms and stress of a serious illness, with the goal of improving the quality of life for both the patient and their family

Lymphedema – A chronic condition characterized by the accumulation of excess lymphatic fluid in the tissues, leading to swelling, typically in the arms or legs

Chemo-Brain – Also called chemotherapy-induced cognitive impairment or cancer-related cognitive dysfunction and refers to a set of cognitive changes or difficulties in memory, concentration, and other cognitive functions during or after cancer treatment

Section 2 Summary

Physical therapists and assistants frequently encounter diverse types of cancer, each presenting distinct stages, treatments, and associated side effects. This section provided a holistic exploration of the effects of cancer treatment, aiming to broaden the understanding of the potential challenges posed by the disease. It detailed a comprehensive impact of cancer, encompassing aspects such as quality of life, emotional well-being, socioeconomic considerations, and more. By embracing this comprehensive perspective, healthcare providers can better understand the burdens experienced by individuals undergoing cancer treatment, ultimately enhancing their ability to deliver effective and empathetic care.

The Role of Physical Therapy

As with many other conditions, the goals of physical therapy in cancer care include improving mobility, function, and overall quality of life. Physical therapists and assistants should provide specific interventions based on clinical presentation and individual factors of their patients. This section will provide guidance on what interventions to prioritize per patient type.

Factors that Influence Service Delivery [48]

Several factors influence the delivery of physical therapy services for individuals with cancer. These factors can vary based on the specific needs of the patient, the type and stage of cancer, and the treatment modalities involved.

Cancer Type and Stage

Different cancers may require specific considerations in physical therapy. For example, breast cancer may involve shoulder mobility challenges, while lung

cancer may affect respiratory function. Early-stage versus advanced-stage cancers may have different rehabilitation needs and goals.

Individualized Assessment

A thorough assessment of the patient's overall physical condition, including the impact of cancer and its treatments on mobility, strength, range of motion, and functional abilities is necessary to design a tailored treatment plan. Physical therapists should also consider the patient's emotional well-being, motivation, and psychosocial support network.

Treatment Modalities

The type and combination of cancer treatments influence the choice of physical therapy interventions. For example, postoperative rehabilitation will differ for patients who have undergone surgery versus those who received chemotherapy or radiation therapy.

Symptom Management

Physical therapists should design interventions to manage cancer-related symptoms, such as pain, fatigue, and weakness, through targeted exercises, modalities, and manual therapy. This will differ in intensity and frequency depending on specific characteristics of the patient.

Interdisciplinary Collaboration

Interdisciplinary collaboration between physical therapists and the broader cancer treatment team is essential for providing comprehensive and integrated care for patients undergoing cancer treatment. This collaboration ensures that the physical therapy interventions align with the overall treatment goals, and it promotes better communication and coordination among healthcare professionals. Physical

therapists should collaborate directly with oncologists, surgeons, radiation oncologists, medical oncologists, nurses, social workers, other rehabilitation specialists, dietitians, and mental health professionals to provide multidisciplinary healthcare to patients with cancer.

Suggestions for Physical Therapy Examination [49,50]

The examination for a patient undergoing or has finished cancer treatment should give background information on how to create a safe and effective physical therapy treatment plan. It should include a subjective history, medical history, symptom assessment, functional assessment, range of motion, strength testing, posture and gait analysis, scar assessment, lymphedema assessment, balance and coordination testing, cardiopulmonary assessment, and psychosocial screening.

Medical History

Physical therapists should gather information on the type of cancer, date of diagnosis, cancer staging information, and the location of tumor(s). In addition, they should know the surgical, chemotherapy, and radiation history including dates, effectiveness, and side effects. Physical therapists should screen for other medical comorbidities through chart review and asking the patient. It is important to know whether the patient has underlying disease, such as cardiovascular or respiratory conditions, as part of determining the intensity of a treatment plan.

Symptoms and Concerns

The physical therapist should gather information on pain levels, fatigue, weakness, and the presence of side effects. Pain should be recorded based on location, intensity (using a scale like the Numeric Pain Rating Scale), quality, and aggravating/alleviating factors. Fatigue should be qualified with duration, timing,

and the impact on daily activities. The Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F) is a great tool to determine the extent of cancer related fatigue. It is a 41-question measure that includes the FACT-G along with an additional fatigue subscale. It assesses health-related quality of life across five domains: physical well-being (7 questions), family/social well-being (7 questions), emotional well-being (6 questions), functional well-being (7 questions), and specific items related to fatigue (13 questions). Responses are recorded on a 5-point Likert scale, ranging from 0 ("not at all") to 5 ("very much"), reflecting experiences over the past 7 days. Weakness and deconditioning should be measured and noted in documentation to provide a starting point. The presence of neuropathy, numbness, tingling, or weakness in extremities, is important to discuss, as well as any other side effects of cancer treatment.

Functional Assessment [50]

ADL and IADL assessment should be addressed with specific standardized assessments, such as the Katz Index of Independence in Activities of Daily Living. This is a tool that measures one's independence in bathing, dressing, toileting, transferring, continence, and feeding. Mobility assessment should be tested in several functional activities, like supine to sit, sit to stand, and stair negotiation. Providers should use a standardized tool like the Timed Up and Go test to quantify mobility.

Scar Assessment [51]

Scar assessment involves evaluating the integrity, mobility, and overall impact of surgical scars on a patient's functional well-being. Scars can result from various cancer-related surgeries, such as mastectomy, lumpectomy, or other procedures. Physical therapists should assess the location of the scar, length and width, color, and texture of the scar. They should assess the scar mobility, palpate for adhesions

and tethering (whether scar is attached to deeper tissues), assess for tenderness, and temperature of the scar to screen for infection. Taking photographs to include in documentation as well as precise measurements are crucial to note stages of the healing process as physical therapy progresses.

Lymphedema Assessment [52]

Lymphedema assessment involves a thorough evaluation of a patient's lymphatic system to identify and quantify any swelling or impairment in lymphatic drainage. Physical therapists should gather pertinent medical history information, such as details of the cancer diagnosis, treatment methods, and lymph node dissection or radiation therapy that has affected the lymphatic system. Screening symptoms is also important, and those with lymphedema will experience swelling, heaviness, tightness, and pain in the area of swelling. Physical therapists should assess the limb mobility, skin texture (noting for nodules, thickening, and fibrosis), as well as the circumference and volume of the affected limb.

Measurements of circumference of the affected limb should be taken, at specific anatomical landmarks, which should be qualified in documentation for consistency. Measuring water displacement with the affected limb submerged is a way to assess limb volume changes. Pitting edema should be assessed, by pressing on the swelling and documenting the degree of pitting based on the Pitting Edema Scale.

Pitting Edema Scale

0 - No Pitting. The skin resumes its normal contour immediately after pressure is released. There is no significant edema present.

1+ - Mild Pitting. The pit is approximately 2 mm deep and disappears rapidly. There is mild edema with minimal impact on tissue.

2+ - Moderate Pitting. There is deeper indentation, at about 4 mm. The pit remains for a longer time but returns to normal within a few seconds. This indicates moderate edema with noticeable swelling.

3+ - Deep Pitting. There is even deeper indentation, at around 6 mm. The pit remains for a longer duration, and the area looks swollen. This indicates significant edema with noticeable swelling and potential functional impairment.

4+ - Very Deep Pitting. There is very deep indentation, exceeding 6 mm. The pit remains for a prolonged time, and the swollen area appears distorted. This indicates severe edema with pronounced swelling, potential tissue damage, and functional limitations.

Balance and Coordination Testing

Cancer and its treatments can have various effects on an individual's balance and coordination, putting patients undergoing treatment at high fall and injury risk. Several tests and measures may be used in the cancer population, which will objectively assess one's coordination, balance, and fall risk.

The Romberg test assesses proprioception and detects sensory ataxia. To test, the patient stands with feet together and eyes open, then closed. Swaying or loss of balance with eyes open or closed indicates proprioceptive deficits. The Timed Up and Go and Berg Balance Scale are also good measures of fall risk and balance in patients with cancer. Coordination tests include the finger to nose and heel to shin test. If patients are unable to execute these movements, coordination is impaired.

Cardiopulmonary Assessment [53]

Cancer and its treatments can have systemic effects, affecting cardiovascular fitness and pulmonary function. After a thorough medical history review, physical therapists should know what cardiovascular and respiratory comorbidities a

patient has. Baseline vitals and vitals with activity should be taken whenever a patient has any underlying cardiovascular or respiratory comorbidities. Exercise capacity tests, like the Six-Minute Walk Test, is a way to measure functional capacity. The Borg Rating of Perceived Exertion scale should be used to assess exertion and dyspnea during exercise.

Psychosocial Screening [54]

Psychosocial screening for cancer patients involves assessing the emotional, psychological, and social aspects of a patient's well-being. It is crucial in providing patient-centered care and to determine whether a referral to a mental health professional is necessary. At a minimum, physical therapists should screen for depression and anxiety when the subjective history and coping strategies of the patient raise concern. The Beck Depression Inventory, Patient Health Questionnaire-9 (PHQ-9), and Generalized Anxiety Disorder 7-item scale (GAD-7) are good tools to screen for depression and anxiety. If patients score in the ranges where they have mild, moderate, or severe symptoms, they should be referred to a mental health professional for evaluation.

Suggestions for Physical Therapy Treatment and Intervention [55]

Physical therapy should focus on addressing mobility, strength, range of motion, and quality of life for patients undergoing or who have endured cancer treatment. Goals can vary tremendously, per stage of cancer, patient characteristics, and more. This section will detail interventions for individuals post-surgery, during chemotherapy and radiation, with lymphedema, and more so physical therapists and assistants have an idea of what to focus on during therapy.

Post-Surgical

Physical therapy can play a crucial role in the rehabilitation process for individuals who have undergone cancer surgery. It's important to note that the specific physical therapy treatment will depend on the type of cancer, the location of the surgery, and individual patient factors. Post-surgical early mobilization in acute care with following any surgical protocols will improve one's ability to discharge home versus needing an inpatient stay in a skilled nursing facility. Monitoring vital signs and response to early mobility is crucial to determine progress in rehabilitation and safety with progressive mobility.

This section will explain physical therapy after breast cancer surgery as a protocol.

Breast Cancer [56]

The focus of physical therapy after mastectomy or lumpectomy is on restoring mobility, strength, and function, addressing any postoperative complications, and promoting overall well-being.

The immediate postoperative phase is the first two weeks after surgery. Physical therapy should focus on pain management through gentle manual techniques around the surgical site, modalities such as ice or heat for pain control, and breathing exercises to prevent lung complications. In addition, edema management is imperative, including educating the patient to elevate the arm throughout the day. Gentle lymphatic drainage techniques are also appropriate. Then, patients should begin gentle shoulder range of motion exercises, such as Pendulum exercises. Gentle active and passive range of motion for the shoulder and elbow is also indicated. Physical therapists should emphasize proper posture to reduce strain on the surgical site and provide guidance on sleeping positions. Scar massage can begin within the first week post-surgical, to promote tissue flexibility. Cross friction massage where fingers are moving perpendicular to the scar for two minutes is the best way to reduce scar tissue. The therapist should

educate the patient on scar protection and monitoring for signs of complications, such as pus, pain, and increased redness.

In the intermediate phase (2-6 weeks), the focus of physical therapy is on progressive scar tissue management, active assisted and active range of motion exercises for the affected upper extremity, and gentle pectoral stretching. In addition, light resistance exercises should begin, focusing on scapular stabilization and gradually progress. Lymphatic drainage exercises, like deep breathing and upper extremity range of motion distally to proximally should be completed throughout the day. In addition, therapy should focus on functional mobility and activities of daily living training.

In the advanced phase, after 6 weeks, physical therapy should focus on progressive strength and endurance training, functional mobility and ADL training, return to work and sports, pain management and symptom control, and progress to self-management of impairments.

Physical Therapy During and After Chemotherapy [57]

Specific interventions in physical therapy for individuals undergoing chemotherapy can vary based on the individual's needs, cancer type, and treatment side effects. Physical therapy should focus on improving quality of life, mobility, strength, endurance, and energy conservation. Exercise programs should be tailored to the patient and should include aerobic and resistance exercises. Gradual and individualized exercise regimens have been shown to improve energy levels and reduce cancer-related fatigue. These exercises can include walking, stationary cycling, and light resistance training. The duration should be for 30 minutes, 3-5 times per week, and begin with a low to moderate intensity per the Borg Scale. After two to three weeks of aerobic exercise, with appropriate response in vital signs, their Borg RPE should be in the moderate range to see improvements in cancer-related fatigue and energy levels.

https://maximizepotentialtx.com/uncategorized/the-rating-of-perceived-exertion-rpe-scale/

Physical therapists should educate patients on energy conservation strategies, like breaking large tasks into smaller manageable segments. This is especially true for patients who have undergone chemotherapy for a longer duration. Physical therapists should implement balance and coordination training if a patient has impairments in these areas to combat side effects of chemotherapy. Chemotherapy drugs may affect the nervous system, leading to challenges with balance and coordination. Balance training may include static balance like tandem stance and single leg stance, dynamic weight shifts, heel to toe walking, challenging surfaces, weaving exercises, and negotiating obstacles. Coordination exercises may include cross-pattern movements like elbow-to-knee touches and marching in place.

Physical therapists should recommend assistive devices for those at fall risk based on standardized tests. This may include a walker, cane, wheelchair, and should be prescribed as a least restrictive assistive device.

Physical Therapy During and After Radiation [48]

Physical therapy during and after radiation treatment is similar to during and after chemotherapy. The predominant goal is to reduce side effects of treatment on energy levels, mitigate cancer-related fatigue, and preserve quality of life. It is crucial to screen for side effects to know at what level to progress exercises to. Cognitive side effects are common with both chemotherapy and radiation therapy,

and physical therapists should prescribe appropriate levels of cognitive challenge with exercises to avoid frustration of the patient.

Lymphedema Management – Complete Decongestive Therapy [58]

Complete Decongestive Therapy (CDT) is a comprehensive and specialized approach used in the treatment of lymphedema and consists of many components.

Manual lymphatic drainage is a technique involving gentle, rhythmic massage following the natural flow of the lymphatic system (toward lymph nodes). Compression therapy is also a component of CDT, where compression garments and compression bandaging are utilized. Compression garments are custom-fit and worn during the day to maintain the reduction in fluid. Compression bandages are multi-layer and applied to provide graduated compression, with more pressure at the distal end (farthest from the body) and decreasing pressure proximally. Exercises moving from distal to proximal, such as wrist flexion and extension, followed by elbow flexion and extension, and shoulder flexion and extension, are necessary to move lymph fluid. Aerobic exercise, such as swimming and biking, are good recommendations to patients as well. Skin care, including using natural cleansers and moisturizing will reduce skin irritation and dryness associated with lymphedema. Education on self-massage to move lymphatic fluid towards lymph nodes should also be a priority.

To begin, CDT should be performed five times per week, one session per day, and sessions last around one hour. Bandages are only removed for showering. The maintenance phase lasts for months or years and patients may wear elastic compression bandages rather than foam compression bandages, with self-manual lymphatic drainage for 20 minutes per day.

Contraindications [59]

Contraindications vary based on the extent of cancer treatment, staging, and underlying comorbidities. It is critical for therapists to screen for the following contraindications to physical therapy during cancer treatment.

Acute Illness or Infection

Individuals experiencing an acute illness may intensify during or after cancer treatment due to immunosuppression. In addition, those experiencing an infection should not have physical therapy beyond functional mobility sessions until they have recovered. Exercise and physical activity during illness can potentially exacerbate symptoms and hinder recovery.

Severe Fatigue

Severe fatigue, a common side effect of cancer and its treatments, may require modifications to the intensity and duration of physical therapy sessions. The individual's energy levels should be closely monitored, and adjustments to the exercise program may be necessary.

Low Blood Counts

Individuals with low blood counts, such as low red blood cells (anemia), low white blood cells, or low platelets, may need modifications to their exercise program to avoid excessive strain on the cardiovascular and immune systems.

Bleeding or Thrombocytopenia

Precautions should be taken for individuals with bleeding disorders or low platelet counts (thrombocytopenia). Activities that pose a risk of injury or bleeding should be avoided.

Active Radiation Therapy to the Treatment Area

Modalities and manual therapy techniques may be contraindicated directly over the area receiving active radiation treatment. The therapist should work closely with the oncology team to determine the appropriate timing and areas for physical therapy.

Presence of Bone Metastases

In cases where there are bone metastases, especially if the bones are at risk of fracture, certain weight-bearing exercises may need to be avoided to prevent injury.

Severe Pain

If an individual is experiencing severe pain that is not well-managed, the physical therapist should collaborate with the healthcare team to address pain control before initiating or modifying the exercise program.

Individual Medical History

The individual's complete medical history, including any pre-existing conditions, surgeries, or complications, should be thoroughly reviewed to ensure that the physical therapy plan is tailored to their specific needs and limitations. Vital signs should be monitored in response to exercise, especially for those with cardiovascular comorbidities. Contraindications in vital signs include drops in blood pressure or heart rate in response to exercise, hypertension, hypotension, and oxygen saturations below 90%. Exercise should be immediately discontinued if a patient is having unstable angina, arrhythmia, signs of a dissecting aneurysm, signs of a cerebrovascular accident, and signs of a pulmonary embolism.

Relative contraindications with specific reference values are below to help therapists determine appropriateness for exercise and physical therapy intervention. [59]

Relative Contra-indication Gain physician clearance	**Exercise modification**
Platelets <20 × 10^9/L	• Functional mobility exercises only • Minimise fall or impact risk • Emphasise normal breathing (avoid Valsalva manoeuvre) monitor bruising and bleeding
Haemoglobin <80 g/L	• Low to moderate intensity only
White blood cell <2·0 × 109/L:	• Avoid group exercise • Light to moderate intensity exercise only • Reinforce importance of sanitisation and hand-washing Clean all equipment before use
Neutrophils <1·5 × 109/L	• Avoid group exercise • Light to moderate intensity exercise only • Reinforce importance of sanitisation and hand-washing Clean all equipment before use
Blood glucose <5·5 mmol/L	• Recommend 5–30 g carbohydrate consumption before exercise
Resting Blood pressure Systolic blood pressure >200 mmHg or diastolic blood pressure >110 mmHg after two measurements, 5 min apart	• Monitor for signs and symptoms • Repeat blood pressure measurements frequently during session
Resting heart rate 120 bpm after two measurements, 5 min apart	• Exercise as tolerated • Monitor closely
Resting O2 saturation ≤88%	• Discontinue exercise if desaturation to this level occurs during a session • 88-94% Exercise as tolerated, monitor signs and symptoms of fatigue and exertion, repeat SpO_2
Sudden or severe pain, swelling or dysfunction	• Avoid exercise of the affected region • Doctor's clearance required to resume exercise of the affected region or if general exercise exacerbates symptoms

Board Certification in Oncology [60]

American Board of Physical Therapy Specialties (ABPTS) offers board certification in oncology for physical therapists, and the designation is called a Board-Certified Oncologic Clinical Specialist. It was first approved as a certification in 2016, and just under 200 physical therapists held the certifications as of June 2023. Board certification in oncology is a recognition of advanced clinical knowledge, skills, and experience in the field of oncologic physical therapy.

To apply, candidates must demonstrate specialty practice through a case report within the last three years of patient care and submit general requirements. These requirements are holding a physical therapist license that is not restricted in any United States state, pay an application fee, pass an examination, and either submit 2,000 hours of evidence of patient care in oncology or complete a residency.

Referrals and Support Groups [30,61,62]

Physical therapists, as part of a multidisciplinary care team, are responsible for referring patients to specialty care as necessary. This could include physicians of any specialty (cardiovascular, endocrine, nephrology, etc.), mental health professionals, dietitians, and other care team members based on the patient's individual presentation.

Physical therapist may refer and educate patients about the following support groups and national programs. Many states and communities offer local support groups as well, which physical therapists and assistants can independently research or collaborate with social work colleagues to discover these resources.

The American Cancer Society (ACS) coordinates a large network of cancer support groups across the country. Additionally, they maintain a comprehensive list of

organizations providing support groups. The toll-free number 1-800-ACS-2345 provides cancer information via specialists who are available around the clock. Another avenue is ACS's Cancer Survivors Network, an online community designed by and for cancer survivors and their loved ones. Here, cancer patients and families can engage in discussion boards and live chats. Anyone can call in through the toll-free number 1-877-333-HOPE. CancerCare extends professionally facilitated support groups through online platforms, telephone connections, and in-person meetings at CancerCare locations in New York City, Long Island, New Jersey, and Connecticut.

For specific cancer types, Cancer News provides links to sites listing support groups tailored for women with breast or gynecologic cancer, men with prostate cancer, and individuals dealing with lymphoma, multiple myeloma, or leukemia. The National Cancer Institute hosts a database called "National Organizations That Offer Cancer-related Services," connecting individuals to support groups or providing referrals to those that do. OncoChat offers online peer support for cancer survivors, family members, and friends.

Section 3 Key Words

Cross Friction Massage – Also known as transverse friction massage, is a technique where the therapist uses firm pressure and makes specific, transverse (crosswise or perpendicular) strokes to promote scar healing

Complete Decongestive Therapy – A technique designed to reduce swelling, improve lymphatic drainage, and enhance the overall quality of life for individuals affected by lymphedema

Board-Certified Oncologic Clinical Specialist - A physical therapist who has obtained advanced certification in the field of oncology rehabilitation

Section 3 Summary

The goals of physical therapy in cancer care are improving quality of life, physical functioning, and mobility. Physical therapists and assistants, as crucial members of the healthcare team, should provide effective interventions based on each patient's presentation. Their role is to support mobility, educate patients, be mindful of psychosocial aspects of care, and to address and refer patients to appropriate specialty care.

Case Study 1

Mrs. Smith is a 65-year-old female who was referred to physical therapy by her oncologist for postoperative rehabilitation and management of treatment-related symptoms. She was diagnosed with a Stage II invasive ductal carcinoma of the right breast. She underwent a right mastectomy six weeks ago, followed by four weeks of chemotherapy and two weeks of radiation therapy. Mrs. Smith has the following comorbidities: hypertension, Type 2 Diabetes Mellitus, and irritable bowel syndrome. On physical examination, the physical therapist discovers moderately limited right shoulder abduction and flexion, minimally limited thoracic mobility into extension, and low back pain with flexion and rotation, with moderate limitations in range of motion. Mrs. Smith has generalized weakness with global muscle strength being at 3+/5.

Reflection Questions

1. What are potential interventions that physical therapy should address in this case?
2. What are contraindications that physical therapy should consider during treatment?

3. Two months after physical therapy starts, Mrs. Smith is beginning to experience arm swelling, a feeling of heaviness, and discomfort in her right arm. What condition is she having symptoms of and how should physical therapy address it?

Responses

1. Physical therapy should gradually address shoulder range of motion that is limited from the mastectomy, scar tissue management, shoulder strength, and pain. It is also important to address generalized weakness and cancer-related fatigue through prescribing aerobic and strength training exercise. Mrs. Smith has impaired range of motion throughout her spine and this should be considered and intervened on as part of returning shoulder range of motion and strength to normal.

2. Contraindications based on Mrs. Smith's cancer treatment and comorbidities include anemia, uncontrolled hypertension, and hypoglycemia. It is important to screen for several side effects of cancer treatment including peripheral neuropathy, radiation site pain, cognitive impairment, lymphedema, and bone metastases.

3. These are initial symptoms of lymphedema, which is a side effect of mastectomy when lymph vessels and nodes are removed in the surgery. To address lymphedema, patient education is crucial, along with strategies to reduce the swelling and manage symptoms. Initially, progressive lymphatic drainage exercise should be completed from distal to proximal to help move lymph fluid from the extremity. Compression garments may be used to help prevent fluid from reaccumulating. If there are no improvements, the patient should be referred to a certified lymphedema therapist, who will work through complete decongestive therapy with Mrs. Smith.

Case Study 2

Mr. Johnson was referred to physical therapy by his oncologist after completing treatment for lung cancer, which is Stage III lung cancer treated with a lobectomy and six weeks of chemotherapy. The referral outlined the need for rehabilitation to address post-surgical impairments, respiratory function, and overall physical well-being. Upon the initial assessment, Mr. Johnson presented with reduced lung capacity and respiratory function, limited mobility and strength due to the recent surgery, fatigue, decreased endurance, and anxiety related to breathing and fear of deconditioning.

Reflection Questions

1. What should be the goals of physical therapy treatment in this case?
2. What are contraindications to exercise that should be considered when prescribing a treatment plan?
3. How should a physical therapist address anxiety and fear related to Mr. Johnson's cancer treatment?

Responses

1. Goals should be restoring respiratory function through aerobic exercise and breathing exercises, improving fatigue and endurance, providing psychosocial support, addressing residual pain from the surgery, and improving global strength and mobility.
2. Monitoring vitals is crucial in this case, especially respiratory rate, blood pressure, oxygen saturation, and heart rate. A resting oxygen saturation below 88% is a contraindication to exercise. Hypotension in response to

exercise, blood pressure near or above 200/110 resting or during exercise, and a resting heart rate above 120 beats per minute are contraindications to exercise. In addition, sudden or persistent angina is a sign to stop exercise and seek immediate medical services.

3. Physical therapists should screen for mental health conditions with tools like the PHQ-9 and GAD-7 to see if patients should be referred to mental health professionals. In addition to that, teaching deep breathing techniques and providing encouragement, suggesting support groups and other coping tools are useful strategies to help cope with cancer treatment.

Conclusion

In conclusion, this course explored the intersection of oncology and physical therapy, providing physical therapists and assistants with the expertise to enhance the well-being and life quality of the millions of individuals diagnosed with cancer annually in the United States. Participants gained insights into the physiological impact of cancer and its treatments, utilizing evidence-based strategies to address challenges of pain management, fatigue, and mobility issues. The comprehensive curriculum covers various aspects, including quality of life considerations, short and long-term treatment effects, psychosocial implications, complications from cancer treatment, and the process of achieving an oncology board certification. By adopting a multidisciplinary approach, the course empowers practitioners to develop personalized rehabilitation plans, fostering collaboration between oncologists and physical therapists. With a focus on patient-centric care, attendees also acquire valuable insights into effective communication and support strategies for individuals navigating the complex journey of cancer treatment.

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