



ESSENTIALS OF CANCER EXERCISE®

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A stylized human figure in light blue, with arms raised and a circular head, positioned on the left side of the page. The figure is partially overlaid by a large teal shape that contains the text.

1. WHAT IS CANCER?

The term “cancer” refers to a group of diseases in which abnormal (malignant) cells divide and form additional abnormal cells without any order or control. It is an umbrella term for over 200 different diseases. In normal tissues, the rates of new cell growth and old cell death are kept in balance. In cancer this balance is disrupted. This disruption can result from uncontrolled cell growth or loss of a cells’ ability to undergo “apoptosis.” “Apoptosis,” or “cell suicide,” is the mechanism by which old or damaged cells normally self-destruct. The problem with these malignant cells is that they are unable to perform the functions that they were designed for – such as to replace worn-out cells or repair damaged cells – and they continue to grow and multiply without constraint. The normal cells do not respond appropriately to the body’s signals to divide only when needed and to stop when the need is fulfilled. In other words, these cells can be thought of as taking on a life of their own. The gradual increase in the number of growing cells creates a growing mass of tissue called a “tumor,” or “neoplasm.”

If the rate of cell division is relatively rapid, and no “suicide” signals are in place to trigger cell death, the tumor will grow quickly in size; if the cells divide more slowly, tumor growth will be slower. Regardless of the growth rate, tumors ultimately increase in size because new cells are being produced in greater numbers than needed. The cells can invade and destroy healthy tissue and can spread and grow in other areas of the body through two mechanisms: invasion and metastasis. Invasion refers to the direct migration and penetration by cancer cells into neighboring tissues. Metastasis refers to the ability of cancer cells to penetrate into lymphatic and blood vessels, circulate through the bloodstream, and then invade normal tissues elsewhere in the body.

DEVIATION FROM NORMAL CELL GROWTH

Cancer tissue has a distinctive appearance when viewed under a microscope. Pathologists will look for a large number of dividing cells, variation in nuclear size and shape, variation in cell size and shape, loss of normal tissue organization, and a poorly defined tumor boundary. Sometimes pathologists will detect a condition known as “hyperplasia.” This refers to tissue growth based on an excessive rate of cell division, leading to a larger than usual number of cells. Everything else in the cells’ structure seems to remain normal and potentially reversible. Hyperplasia can be a normal tissue response to an irritating stimulus, for example a callus that forms on your hand when you begin playing tennis on a regular basis.

Another non-cancerous condition is called “dysplasia.” This, too, is an abnormal type of cell proliferation characterized by loss of normal tissue arrangement and cell structure. Often times these cells will revert back to normal behavior, but occasionally, they gradually become malignant. These areas are usually closely monitored by a professional in case they need treatment. The most severe cases of dysplasia are sometimes referred to as “carcinoma in situ.” This term refers to an uncontrolled growth of cells that remains in its original location. It does, however, have the potential to develop into an invasive malignancy and, is therefore, usually removed surgically when possible. Lastly, there is invasive cancer. Unlike carcinoma in situ, this cancer has spread beyond its’ original location and has begun to infiltrate into other, previously healthy, tissue. These tumors tend to grow more quickly, spread to other organs more frequently, and be less responsive to therapy. These cancers are surgically removed when possible and often accompanied by radiation and/or chemotherapy to kill any cancerous cells that have spread outside of the tumor.

Cancers are divided into six categories with carcinomas making up 90% of all cancers. They arise in the epithelium, the membranous tissue that forms the inner lining and outer covering of organs, glands, and vessels, as well as the surface layer of the skin. Carcinomas include lung, breast, cervical, prostate, and colon cancer.

The following five categories make up the remaining 10%:

1. **Sarcomas** – bone, cartilage, fat, muscle, and blood vessels
2. **Leukemias** – blood, blood cells, and bone marrow
3. **Lymphomas (including multiple myeloma)** – lymph nodes and lymphatic system
4. **Melanomas** – skin cells that produce pigment responsible for skin color
5. **Gliomas** – brain and spinal cord

WHAT CAUSES CANCER

Although cancer affects people of all ages, the risk of developing most types of cancer increases with age. Cancer is often perceived as a disease that strikes for no apparent reason because there are many unproven theories. Scientists don’t know all of the reasons however, many have been identified. Besides heredity, which only accounts for approximately 10% of all cancer cases, scientific studies point to three main categories of factors that contribute the development of cancer: chemicals (e.g., from smoking, diet, inhalation...), radiation (e.g., x-rays, ultraviolet, radioactive chemicals...), and viruses or bacteria (e.g., Human Papillomavirus, Epstein Barr Virus, hepatitis B...)

Chemicals and radiation that are capable of causing cancer are known as “carcinogens.” Carcinogens initiate a series of genetic alterations or mutations and encourage cell proliferation. This usually doesn’t happen overnight. Sometimes several decades can pass between exposure to a carcinogen and the onset of cancer. Since exposure to carcinogens is responsible for triggering most cancers, we can reduce our risk by taking steps to avoid such agents whenever possible. The use of tobacco products has been implicated in one out of every three cancer deaths. In spite of the Surgeon General’s repeated warnings, as well as the fact that smoking is the largest single cause of death from cancer, the tobacco industry continues to thrive. Avoiding tobacco products, cigarettes, cigars, and chewing tobacco, is the single most effective lifestyle decision you can make in an effort to prevent cancer.



Although it is usually not life-threatening, skin cancer caused by exposure to sunlight is the most frequently observed type of cancer. Most of us don't take skin cancer very seriously because it is often easy to cure. Melanoma, a more serious form of skin cancer also associated with sun exposure, is potentially lethal. Once again, we choose to ignore the repeated and ever-present warnings to stay out of the sun and continue to bask in the sun's glory for hours on end. Risk of skin cancer can be greatly reduced by wearing clothing to shield the skin from ultraviolet radiation, wearing protective sunscreen, or by avoiding direct sun exposure altogether.

Actions can also be taken to avoid exposure to some of the viruses that are associated with cancers. The most common of which is the human papillomavirus (HPV), which is involved in the transmission of cervical cancer. "Safe sex," including limiting exposure to multiple sex partners, is the best way to prevent this virus which is sexually transmitted. Many carcinogens have become "occupational" hazards to those who come in contact with them on a regular basis. These include arsenic, asbestos, benzene, chromium, leather dust, naphthylamine, radon, soots, tars, oils, vinyl chloride, and wood dust. Workers who are exposed to these chemicals have a higher incidence of cancer. Although a person's chance of developing cancer at some point in his/her lifetime is almost twice as great today as it was fifty years ago, cancer is still not considered an epidemic. The increase in identifiable cancer cases is due largely in part to increased life span because cancer is more prevalent among older people.

Obesity (being extremely overweight) raises the risk of type II diabetes, high blood pressure, heart disease, and cancer. There are approximately 40,000 cancer diagnoses in the U.S. each year are caused by obesity. In addition, being overweight and obesity cause 15% to 20% of all cancer-related deaths each year. Several studies have explored why being overweight or obese may increase cancer risk and growth. People who are obese have more fat tissue, which can produce hormones, such as insulin or estrogen, and may cause cancer cells to grow. How much a person weighs throughout various points in his or her life may also affect the risk for cancer.

Research has shown that the following are modestly associated with an increased risk:

- High birth weight
- Weight gain during adulthood
- Gaining and losing weight repeatedly

Cancer cells come in all different shapes and sizes and are classified by their aggressiveness and from the tissue where they originate. Cancer cells that essentially resemble their non-cancerous counterparts and can still perform some of their normal functions are described as *well differentiated*. On the flip side, the cells that are identified by their disorganized structure and their ability to divide rapidly and chaotically are known as *poorly differentiated cells*. A tumor that remains confined to its' original, or *primary* location, is referred to as *localized*. There are two ways that a cancer can spread; it can grow straight through the primary organ and directly into adjacent tissue (referred to as a *local extension or regional disease*), or in *metastatic cancer*, a colony of malignant cells can break away and ride the circulatory system to nearby lymph nodes or a distant organ where it forms a *secondary cancer*. Sometimes, despite batteries of tests, a metastatic tumor is diagnosed, but no primary tumor is found. When this happens, the cancer is declared a *cancer of unknown primary origin*.

GENETICS

Over 200 hereditary cancer susceptibility syndromes have been identified, although heredity only accounts for about 5-10% of all cancers, in those cases the cancer is caused by an abnormal gene that is being passed along from generation to generation. This takes place when an abnormal gene that can lead to cancer is inherited. Genes are pieces of *DNA*. They contain the instructions on how to make the proteins the body needs to function, when to destroy damaged cells, and how to keep your body's cellular composition in balance. They control everything that makes you YOU and they can also affect your risk of getting cancer. When there is an abnormal change in a gene it's called gene mutation. The 2 types of mutations are inherited and acquired (somatic).

- An inherited gene mutation is one that is transmitted through genes that have been passed from parents to their offspring
- Acquired (somatic) mutations are changes in DNA that develop throughout a person's lifetime

We are born with two copies of most genes – one from our mom and one from our dad. When we inherit an abnormal copy of a gene, our cells already start out with one mutation. If the other copy of the gene stops working (because of an acquired mutation, for example), the gene can stop functioning altogether. When the gene that stops working is a *cancer susceptibility gene*, cancer may develop. Some cancer susceptibility genes function as *tumor suppressor genes* (normal genes that slow down cell division, repair DNA mistakes, or tell cells when to die – a process known as *apoptosis* or programmed cell death). When tumor suppressor genes don't work properly, cells can grow out of control, which can lead to cancer. Many family cancer syndromes are caused by inherited defects of tumor suppressor genes. Cancers that are caused by inherited genes tend to occur earlier in life than those that are acquired.

When many people in one family have cancer, the assumption is that it is inherited however, it is more likely that it is due to chance or exposure to a common toxin. Less often, these cancers may be caused by an inherited gene mutation causing a family cancer syndrome.

The following list (provided by the American Cancer Society) is cancers that are more likely to occur from an inherited gene:

- Many cases of an uncommon or rare type of cancer
- Cancers occurring at younger ages than usual
- More than one type of cancer in a single person (like a woman with both breast and ovarian cancer)
- Cancers occurring in both of a pair of organs (both eyes, both kidneys, both breasts)
- More than one childhood cancer in a set of siblings (like sarcoma in both a brother and a sister)
- Cancer occurring in the sex not usually affected (like breast cancer in a man)

Cancer in a parent, brother, or sister, is more cause for concern than cancer in a more distant relative. Even if a gene mutation is present, the chance of you getting it gets lower with more distant relatives. Having two relatives with cancer is more concerning if the people are related to each other. For example, if both relatives are your father's sisters it carries more weight than if one was your father's sister and the other was your mother's sister.

Having several different kinds of cancer among family members is not as concerning as many family members having the same type of cancer. There are, however, some family cancer syndromes, in which a few types of cancer seem to go hand-in-hand (breast cancer and ovarian cancer run together in families with hereditary breast and ovarian cancer syndrome, colon and endometrial cancers tend to go together in a syndrome called hereditary non-polyposis colorectal cancer – Lynch syndrome).

The age at which someone is diagnosed is also important. For example, colon cancer is rare in people under thirty. Having two or more cases in close relatives under thirty years of age could be a sign of an inherited cancer syndrome. On the other hand, breast cancer is very common in menopausal women, so if both your mother and her sister were found to have breast cancer when they were in their 50s, it is less likely to be due to an inherited gene change.

CANCER SIGNS & SYMPTOMS

Cancer signs and symptoms vary depending on many factors. These include, but are not limited to, the cancer type stage, size and location. The early stages of cancer may not produce any noticeable symptoms. Unfortunately, this can result in a less favorable prognosis when diagnosis is made. Typically, symptoms are more obvious in the more advanced stages of the disease.

Some general symptoms of cancer include:

- Unexplained weight loss or gain
- Fever
- Fatigue
- Pain
- Appetite changes
- Nausea and/or vomiting
- Skin changes (dimpling, redness, swelling, crusting-over, bruising, etc.)

It is important to seek medical advice as soon as any of these symptoms become obvious. Many share characteristics of non-cancerous conditions, but it's better to be proactive and find out for certain. I also recommend getting a second opinion, whether the doctor says it is malignant (cancerous), or benign (non-cancerous).

The following are specific symptoms typically associated with certain cancer types:

Skin - some common symptoms of skin cancer include: change in a mole's size, shape, and color in the form of asymmetry, border/color irregularities or diameter (larger than 1/4 inch), itchiness, pain, and/or oozing around the affected area.

Hematologic - hematologic cancers include leukemia, non-Hodgkin lymphoma, Hodgkin lymphoma, or multiple myeloma. Some common symptoms include: flu-like symptoms, fever, chills, joint/bone pain, anemia, night sweats, lymph node swelling, itching, persistent cough, shortness of breath, abdominal discomfort, headaches, easy bruising or bleeding, and/or frequent infections. Head and neck - some common symptoms of head and neck cancers include: persistent pain, difficulty swallowing, voice changes, mouth sores, dry mouth, changes in appearance, and/or taste changes.

Lung - some common symptoms of lung cancer include: a cough that doesn't go away, pain in the chest area, shortness of breath, hoarseness, wheezing, coughing up blood, blood in phlegm or mucus, neck or facial swelling, and/or headaches.

Digestive/Gastrointestinal - some common gastrointestinal cancer symptoms include: cramps, bloating, gas pain, changes in bowel/bladder habits, constipation, diarrhea, bloody stools, rectal bleeding, anemia, and/or jaundice.

Gynecologic - some common gynecologic cancer symptoms include: abnormal vaginal bleeding (after menopause, between periods, following sexual intercourse), pain during intercourse, pelvic/back pain, pain on urination, and/or watery, white or pinkish vaginal discharge.

Prostate - some common prostate cancer symptoms include: weak or interrupted flow of urine, need to urinate frequently (especially at night), blood in the urine, inability to urinate, or difficulty starting to urinate, urine flow that is not easily stopped, painful or burning urination with radiating pain in the back, pelvis, or hips.

An array of diagnostic tests will need to be done to accurately confirm a diagnosis of cancer and come up with an individualized treatment plan.

The following are some common diagnostic tests:

- A thorough review of health history
- Physical exam
- Lab tests (blood, urine, etc.)
- Biopsy
- Imaging (X-ray, PET scan, CT scan, MRI, ultrasound, etc.)
- Nuclear medicine scans – bone scans
- Endoscopy
- Genetic testing

2. RELATIVE CONTRAINDICATIONS CANCER SURGERY

Following any cancer surgery there is bound to be pain, scar tissue, and the possibility of adhesions. All of these can contribute to muscle imbalances and range of motion limitations. Therefore, it is imperative that you understand where the incision is, the direction of the incision (horizontal, vertical, diagonal, or laparoscopic), and if there was an amputation. If in fact there was an amputation, was it a muscle that was removed for use as a flap or was it a limb that will require a prosthetic device? All of these will factor into posture, ability to perform activities of daily living, whether or not there is a risk for lymphedema, and biomechanics.

The *general recommendation* is that patients are at least **6-weeks** post-op prior to beginning an exercise program. It is mandatory that you have a medical clearance from the doctor prior to your first meeting if it involves anything physical (this includes assessment protocol). There are certain procedures that *may require 2-3 months* of healing time before a patient can safely begin an exercise program. Pain, as well as fear, can limit the motivation and ability to perform certain activities. Pushing someone too hard, or too fast, can result in physical injury as well as loss of interest.

PROSTATE CANCER CONTRAINDICATIONS

Radical Prostatectomy

- Retropubic
 - Client should be able to stand “erect” with good posture prior to beginning any “crunch-type” exercises (this would exacerbate forward flexion).
 - You can begin with core exercises on an exercise ball, BOSU®, foam roller, balance discs, etc.
- Perineal
 - Client should avoid Squatting or lunging for at least 12 weeks after surgery
 - Client should begin with body weight only and only a few repetitions. Gradually add more repetitions and slowly and progressively add more weight
 - Lymph node dissection
- Because your client will be at risk for lower extremity lymphedema, you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression stockings with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

LUNG CANCER CONTRAINDICATIONS

Mediastinoscopy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lymphedema, you must begin with a warm-up and upper extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

All lung surgeries

- Be careful with placement on equipment and avoid anything that causes pain in area.
- Look for relative improvement in cardiorespiratory fitness. Are they more or less breathless with exercise? Is it improving?

Extended resection

- Where was muscle flap taken from?
- Address any muscle imbalances that may have arisen with corrective exercises

KIDNEY CANCER CONTRAINDICATIONS

Partial nephrectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises.

Radical nephrectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Expect excessive fatigue in the absence of adrenal gland
- Because your client will be at risk for lower extremity lymphedema, you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

CANCER OF THE COLON OR RECTUM CONTRAINDICATIONS

Colon resection (Colectomy)

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema, you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

LOW ANTERIOR RESECTION

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

Abdominal-perineal resection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises

BLADDER CANCER CONTRAINDICATIONS

Radical Cystectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

- If the prostate or ovaries are removed, your female client will experience menopause and your male client will experience menopause-like symptoms. Both will have a tendency to gain weight (body fat) and be at risk for osteoporosis. Weight bearing exercise will be critical; as will a healthy diet.

Urostomy

- Be sensitive to placement on equipment or having them in prone position due to external pouch.
- If they get an infection at their stoma site, it will increase their risk for lymphedema if they have had nodes removed or received radiation.

PANCREATIC CANCER CONTRAINDICATIONS

Whipple procedure

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercise
- Possibility of developing diabetes or worsening diabetes
- Peripheral neuropathy if they have/get diabetes
- Stomach may be paralyzed for 4-6 weeks after surgery and require feeding tube. May have ongoing issues with weight loss and digestive problems leading to malnourishment.

Distal pancreatectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Diabetes
- Peripheral neuropathy
- Weight loss
- Immunocompromization if spleen was removed
- Osteopenia

Total pancreatectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Diabetes
- Peripheral neuropathy
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Immunocompromization if spleen was removed

Minimally invasive surgery

- Your client will be at risk for lower extremity lymphedema if lymph nodes were removed. If so all lymphedema precautions will apply.

CERVICAL CANCER CONTRAINDICATIONS

Laparoscopic hysterectomy

- Your client will be at risk for lower extremity lymphedema if lymph nodes were removed. If so all lymphedema precautions will apply.
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

Total & radical hysterectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises

- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

Laparoscopic-assisted radical vaginal hysterectomy

- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

Radical trachelectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

Pelvic exenteration

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis
- Be sensitive to placement on equipment, or having them in prone position due to external pouch
- If they get an infection at their stoma site, it will increase their risk for lymphedema if they have had nodes removed or received radiation.
- If skin or muscle grafts are used for reconstructive procedures, address any muscle imbalances that may have arisen with corrective exercises

Sentinel lymph node biopsy

- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

UTERINE CANCER CONTRAINDICATIONS

Laparoscopic hysterectomy

- Your client will be at risk for lower extremity lymphedema if lymph nodes were removed. If so all lymphedema precautions will apply.
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

Total & radical hysterectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

Laparoscopic-assisted radical vaginal hysterectomy

- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor

- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

Radical trachelectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

Pelvic exenteration

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

- Be sensitive to placement on equipment, or having them in prone position due to external pouch
- If they get an infection at their stoma site, it will increase their risk for lymphedema if they have had nodes removed or received radiation.
- If skin or muscle grafts are used for reconstructive procedures, address any muscle imbalances that may have arisen with corrective exercises

Sentinel lymph node biopsy

- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

Tumor debulking

- If lymph nodes are removed, follow all lymphedema precautions and recommendations
- If spleen is removed, client will be immunocompromised
- If pancreas is removed, client will have diabetes
- Peripheral neuropathy if they have/get diabetes
- Digestive problems if stomach is removed

Panniculectomy

- Client should be able to stand “erect” with good posture prior to beginning any “crunch-type” exercises (this would exacerbate forward flexion).
- You can begin with core exercises on an exercise ball, BOSU®, foam roller, balance discs, etc.

OVARIAN CANCER CONTRAINDICATIONS

Laparotomy

- If lymph nodes are removed, follow all lymphedema precautions and recommendations

Tumor debulking

- If lymph nodes are removed, follow all lymphedema precautions and recommendations
- If spleen is removed, client will be immunocompromised
- If pancreas is removed, client will have diabetes
- Peripheral neuropathy if they have/get diabetes
- Digestive problems if stomach is removed

Total hysterectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- Your client will be in menopause if ovaries were removed – risk for osteoporosis

BLADDER CANCER CONTRAINDICATIONS

Subtotal and total gastrectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- If spleen is removed, client will be immunocompromised
- If pancreas is removed, client will have diabetes
- Peripheral neuropathy if they have/get diabetes
- Dumping syndrome - with most or all of the stomach missing, the food spills into the intestine too rapidly. In late dumping syndrome the small intestine is forced to absorb larger amounts of food than normal, driving up the concentration of sugar in the circulation. The pancreas produce excess insulin to regulate the blood glucose level. Clients may feel weak or tired several hours after eating from a drop in blood sugar. They may also have a headache, sweating, anxiety, and/or tremors. Early dumping syndrome can take place several minutes after eating. Blood pressure increases, but blood flow to the intestine decreases, Symptoms include an irregular or rapid heartbeat, dizziness, shortness of breath, flushed skin, vomiting, abdominal cramps, and diarrhea. The smaller the remaining stomach, the worse the symptoms. The symptoms usually subside within 3-12 months, but in some clients the condition may become chronic. Clients can control their symptoms by eating frequent, smaller meals, low in carbohydrates. Fluids should be consumed between meals rather than accompanying them.

Lymph node dissection

- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise

LIVER CANCER CONTRAINDICATIONS

Partial hepatectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- If part of the diaphragm is removed, client will need to focus on breathing techniques and pacing themselves during exercise.

Total hepatectomy and liver transplant

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Immunocompromization as a result of immunosuppressive drugs

Clients commonly experience side effects from the drugs used to treat or prevent rejection:

Cortisone-like drugs produce some fluid retention and puffiness of the face, risk of worsening diabetes and osteoporosis, sleep problems, mood changes, acne, dry skin, thinning skin, bruising, slow wound healing, increased sweating, headache, dizziness, nausea, and stomach pain.

Prograf and Cyclosporine (an immunosuppressant) produce some tendency to develop high blood pressure, kidney and liver problems, diabetes, periodontal disease, tremors or shaking, headache or body pain, diarrhea, constipation, vomiting, numbness, and the growth of body hair.

FK-506 (an immunosuppressant) may cause infection, heart and lung damage, headaches, diarrhea, increased tension, nausea, blurred vision, diabetes, itching, liver and kidney dysfunction, loss of appetite, insomnia, confusion, weakness, depression, cramps, neuropathy, seizures, and tremors.

BRAIN CANCER CONTRAINDICATIONS

Craniotomy

- Your client may present with acute or chronic coordination problems. Make sure that they are in a safe environment free of tripping hazards. Avoid exercises that put them at risk for falling. Have them work on balance exercises with you there to spot them, or something stable for them to hold on to. If they have been prescribed a helmet, they **MUST** wear it to exercise.
- Your client may have difficulty speaking and thinking. Be patient. Encourage them to take their time when they communicate with you. Take extra time and care in explaining how to perform exercises. Even if they were Olympic Athletes previously, they may be starting from ground zero.
- If your client has a seizure while exercising:
Protect the person from injury
 - Keep him or her from falling if you can or try to guide the person gently to the floor, then call 911.
 - Try to move furniture or other objects that might injure the person during the seizure.
 - Once you have them safely on the ground, try to position the person on his or her side so that fluid can leak out of the mouth. Be careful not to apply too much pressure to the person's body.
 - Do not force anything, including your fingers, into the person's mouth.
 - Do not try to hold down the person. This can cause injury, such as a dislocated shoulder.

TESTICULAR CANCER CONTRAINDICATIONS

Radical inguinal orchiectomy

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises

Retroperitoneal lymph node dissection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- In the absence of testosterone, your client will have a difficult time building lean muscle mass, may experience breast tenderness or growth, weight gain, and will be at a higher risk for osteoporosis.

SMALL INTESTINE CANCER CONTRAINDICATIONS

Small bowel resection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lower extremity lymphedema (risk doubles with radiation), you must begin with a warm-up and lower extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.
- Recommend that client discuss compression garments with their doctor
- If they have already been prescribed, they **MUST** wear them to exercise
- In the absence of testosterone, your client will have a difficult time building lean muscle mass, may experience breast tenderness or growth, weight gain, and will be at a higher risk for osteoporosis.

Whipple procedure

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercise
- Possibility of developing diabetes or worsening diabetes
- Peripheral neuropathy if they have/get diabetes
- Stomach may be paralyzed for 4-6 weeks after surgery and require feeding tube. May have ongoing issues with weight loss and digestive problems leading to malnourishment.

LIP & ORAL CAVITY CANCER CONTRAINDICATIONS

Glossectomy, hemiglossectomy, mandibulectomy, and maxillectomy

- Difficulty swallowing and chewing; often limited to liquids.
- Malnourishment

Segmental mandibulectomy

- Was there a bone graft? Where was it taken from?
- Address any muscle imbalances that may have arisen with corrective exercise

Neck Dissection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises
- Because your client will be at risk for lymphedema in the face and neck (risk doubles with radiation), you must begin with a warm-up and upper extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.

Radical neck dissection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises; shoulder movement is likely to be impaired.
- Reduced strength in neck and head movements
- Because your client will be at risk for lymphedema in the face and neck (risk doubles with radiation), you must begin with a warm-up and upper extremity lymph drainage exercises
- Start and progress slowly when adding repetitions and resistance. Too much, too fast, can cause lymphedema.

Reconstructive surgery

- Was there a bone or muscle graft? Where was it taken from?
- Address any muscle imbalances that may have arisen with corrective exercise

Tracheotomy/tracheostomy

- Avoid activities that run the risk of getting water in airway

THYROID CANCER CONTRAINDICATIONS

- Lobectomy, isthmusectomy, and near total thyroidectomy
- If lymph nodes are removed, follow all lymphedema precautions and recommendations
- Total thyroidectomy
- If lymph nodes are removed, follow all lymphedema precautions and recommendations
- Client will have an increased risk of osteoporosis
- Client is likely to struggle with weight gain and fatigue

ESOPHAGEAL CANCER CONTRAINDICATIONS

Esophagectomy

- If lymph nodes are removed, follow all lymphedema precautions and recommendations
- If part of the stomach is removed, digestive issues and possible malnourishment

Open esophagectomy

- *Transthoracic esophagectomy* /incision in the chest and abdomen and *transhiatal esophagectomy*/incision in the abdomen and neck
- Address any muscle imbalances that may have arisen with corrective exercises

Mediastinoscopy or thoracoscopy

- If lymph nodes are removed, follow all lymphedema precautions and recommendations

LARYNGEAL CANCER CONTRAINDICATIONS

Partial / supraglottic laryngectomy

- Avoid activities that run the risk of getting water in airway

Total laryngectomy

- Avoid activities that run the risk of getting water in airway

Radical neck dissection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises; shoulder movement is likely to be impaired.
- Reduced strength in neck and head movements
- Because your client will be at risk for lymphedema in the face and neck (risk doubles with

THROAT CANCER CONTRAINDICATIONS

Pharyngectomy

- Because your client will be at risk for lymphedema in the face and neck (risk doubles with radiation), you must begin with a warm-up and upper extremity lymph drainage exercises

Laryngopharyngectomy

- Because your client will be at risk for lymphedema in the face and neck (risk doubles with radiation), you must begin with a warm-up and upper extremity lymph drainage exercises
- See contraindications for reconstructive surgery below

Partial laryngopharyngectomy

- Avoid activities that run the risk of getting water in airway

Radical neck dissection

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises; shoulder movement is likely to be impaired.
- Reduced strength in neck and head movements
- Because your client will be at risk for lymphedema in the face and neck (risk doubles with radiation), you must begin with a warm-up and upper extremity lymph drainage exercises

Throat reconstructive surgery

- Was there a muscle graft? Where was it taken from?
- Address any muscle imbalances that may have arisen with corrective exercise

Glossectomy, hemiglossectomy, and maxillectomy

- Difficulty swallowing and chewing; often limited to liquids.
- Malnourishment

LYMPHOMA CONTRAINDICATIONS

Incisional or core biopsy, excisional biopsy, and fine needle aspiration

- Because your client will be at risk for lymphedema anywhere lymph nodes are removed (risk doubles with radiation), you must begin with a warm-up and upper/lower extremity lymph drainage exercises

BONE & SOFT TISSUE CANCER CONTRAINDICATIONS

Surgical excision, conservative surgical excision, wide surgical excision, and radical surgical excision

- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises

Limb-sparing surgery

- Because your client will be at risk for lymphedema due to the high doses of radiation, you must begin with a warm-up and upper/lower extremity lymph drainage exercises
- Was there a bone or muscle graft? Where was it taken from?
- Address any muscle imbalances that may have arisen with corrective exercise

Reconstructive surgery

- What type of reconstruction did they undergo? Follow precautions/limitations for previously listed types of reconstruction
- Where is the incision?
- Address any muscle imbalances that may have arisen with corrective exercises

SKIN CANCER CONTRAINDICATIONS

Sentinel node biopsy

- Because your client will be at risk for lymphedema anywhere lymph nodes are removed (risk doubles with radiation), you must begin with a warm-up and upper/lower extremity lymph drainage exercises

BREAST CANCER CONTRAINDICATIONS

Lumpectomy

- Because your client will be at risk for lymphedema in the affected arm (side) from radiation, you must begin with a warm-up and upper extremity lymph drainage exercises.
- Because of potential scar tissue/adhesions from radiation and surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

Partial/segmental mastectomy (quadrantectomy)

- Because your client will be at risk for lymphedema in the affected arm (side) from radiation, you must begin with a warm-up and upper extremity lymph drainage exercises. Risk increases if lymph nodes have been removed.
- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

Total/simple mastectomy

- Because of potential scar tissue/adhesions from radiation and surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.
- If lymph nodes are removed, follow all lymphedema precautions and recommendations and look for “winged scapula” and lymphatic cording. If there is noticeable cording, client needs to see physical therapist. You can coordinate with therapist to give them a home-based stretching routine.

Skin - sparing mastectomy

- Because of potential scar tissue/adhesions from radiation and surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises

Subcutaneous mastectomy

- Because of potential scar tissue/adhesions from radiation and surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

Modified radical mastectomy

- Because your client will be at risk for lymphedema in the affected arm (side) from node dissection, you must begin with a warm-up and upper extremity lymph drainage exercises. Look for “winged scapula” and lymphatic cording. If there is noticeable cording, client needs to see physical therapist. You can coordinate with therapist to give them a home-based stretching routine.
- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises. There is a greater likelihood of frozen shoulder; if client can't raise arm at least 90 degrees in flexion and abduction, they should be referred to a physical therapist.

Nipple-sparing mastectomy

- Because your client will be at risk for lymphedema in the affected arm (side) from radiation, you must begin with a warm-up and upper extremity lymph drainage exercises.
- Because of potential scar tissue/adhesions from radiation and surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.
- If lymph nodes are removed risk of lymphedema will increase. Look for “winged scapula” and axillary cording.

Radical mastectomy

- Because your client will be at risk for lymphedema in the affected arm (side) from node dissection, you must begin with a warm-up and upper extremity lymph drainage exercises. Look for “winged scapula” and lymphatic cording. If there is noticeable cording, client needs to see physical therapist. You can coordinate with therapist to give them a home-based stretching routine.
- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises. There is a greater likelihood of frozen shoulder; if client can't raise arm at least 90 degrees in flexion and abduction, they should be referred to a physical therapist.
- Inability to perform horizontal abduction

Axillary node dissection (ALND)

- Because your client will be at risk for lymphedema in the affected arm (side) from node dissection, you must begin with a warm-up and upper extremity lymph drainage exercises.
- Look for “winged scapula” and lymphatic cording. If there is noticeable cording, client needs to see physical therapist. You can coordinate with therapist to give them a home-based stretching routine.
- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises. There is a greater likelihood of frozen shoulder; if client can't raise arm at least 90 degrees in flexion and abduction, they should be referred to a physical therapist.
- Recurrent infections

Sentinel node biopsy

- Because your client will be at risk for lymphedema in the affected arm (side) from node dissection, you must begin with a warm-up and upper extremity lymph drainage exercises.
- Look for “winged scapula” and lymphatic cording. If there is noticeable cording, client needs to see physical therapist. You can coordinate with therapist to give them a home-based stretching routine.
- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

Implants / tissue expanders

- Capsular contracture - a condition in which scar tissue around the implant or expander hardens and then contracts. This can cause deformity, pain, and abnormal firmness of the breast.
- Pectoralis major may go into painful spasms - focus on gentle stretching.
- **DO NOT** perform **ANY** chest exercises while expanders are in place.
- When beginning range of motion exercises, start with limited range of motion and gradually increase as tolerated. Implants can “pop” out of pocket if normal range of motion is exceeded.
- Rupture – do not apply excessive pressure to chest with machines or placing client in prone position.

Latissimus Dorsi Flap (LAT) Flap

- Capsular contracture - a condition in which scar tissue around the implant or expander hardens and then contracts. This can cause deformity, pain, and abnormal firmness of the breast.
- Pectoralis major may go into painful spasms - focus on gentle stretching.
- When beginning range of motion exercises, start with limited range of motion and gradually increase as tolerated. Implants can “pop” out of pocket if normal range of motion is exceeded.
- Rupture – do not apply excessive pressure to chest with machines or placing client in prone position.
- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.
- The Lat will “fire” anteriorly, just as it did in its’ original posterior location. Focus on scapular stabilization exercises and try and minimize compound back exercises such as a Lat pulldown. The Lat will hypertrophy/atrophy just as it would in its’ posterior location.

Trans Rectus Abdominis Myocutaneous (TRAM) Flap

- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.
- The goal for the first few weeks/months after surgery will be to get the client to be able to stand erect, without forward hip flexion.
 - Although having a unilateral TRAM (one side of the rectus abdominis) will not prohibit client from doing “crunch” type exercises, it is ill advised as it will create more of a muscular imbalance. Focus on core and balance exercises as well as oblique exercises.
 - A client with a bi-lateral TRAM (both sides of rectus abdominis) will not be able to perform forward flexion “crunch” type exercises at all.

- Forward flexion will give way to excessive lordosis, typically after the first few months, as the “tightness” anteriorly gives way to “weakness” and the low back begins to compensate.
- The Rectus will “fire” just as it did in its’ original location. The fat/skin of the flap will also gain/lose weight as it would in its original location.

DIEP and SIEA Flaps

- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.
- The goal for the first few weeks/months after surgery will be to get the client to be able to stand erect, without forward hip flexion.

GAP (Gluteal Artery Perforator) Flap

- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

TDAP (Thoracodorsal Artery Perforator) Flap

- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

TUG (Transverse Upper Gracilis) Flap

- Because of potential scar tissue/adhesions from surgery, address any muscle imbalances, and range of motion limitations, that may have arisen with corrective exercises.

MULTIPLE MYELOMA COMPLICATIONS

- Multiple myelomas' main effect is on the bones, especially the spine and rib cage. As the cancer cells grow, they stimulate the activities of other cells to eat away at the bone. Skeletal x-rays of clients often display gaping black holes called *lytic lesions*. These holes leave the bones weak and prone to fracture. The first indicators of the disease are often bone pain in the back or ribs, and broken bones. Although multiple myeloma attacks bone, it is not bone cancer because it originates in the plasma cells.
- Because multiple myeloma erodes the bone, calcium is released into the blood and builds up in large amounts causing symptoms of *hypercalcemia*; nausea, fatigue, and thirst. It is important to try and prevent fractures through weight bearing exercise. A cane or walker can be used to provide a wider base of support. Drinking plenty of fluids is also important, since it helps the kidneys to get rid of excess calcium in the blood and prevents problems that occur when calcium collects in the kidneys.
- As malignant plasma cells invade the marrow, white cells, red cells, and platelets are crowded out and can't produce their usual cells. A deficiency in red blood cells brings on symptoms of anemia; fatigue, shortness of breath, and lethargy. Too few platelets in the bloodstream are known as *thrombocytopenia* and can lead to excessive bleeding and bruising.
- In multiple myeloma, the myeloma cells crowd out the normal plasma cells, so that the antibodies to fight the infection aren't made. Infections associated with multiple myeloma include *pneumococcal pneumonia, streptococcus, staphylococcus, and shingles (herpes zoster)*. In order to prevent infections, clients should not get any vaccines or inoculations with live materials. They should consume plenty of fluids, as well as a diet high in calories and proteins, and should get plenty of rest.
- In three out of four clients, a substance called *Bence-Jones proteins* are produced by the plasma cells, clogging the narrow tubules of the kidneys and damaging the organs. Clients sometimes have impaired renal function and have to go on kidney dialysis while they're being treated for the cancer. The kidney damage may be permanent, but is often reversible with treatment, sustaining minimal damage.
- **Spinal cord compression is one of the most severe adverse effects of multiple myeloma.** Reports indicate that as many as 20% of clients develop spinal cord compression at some point during the course of their disease. *Symptoms typically include back pain, weakness or paralysis in the legs, and numbness in the lower extremities.* However, depending on the level of involvement, clients may present with upper extremity symptoms. The dysfunction may be reversible, depending on the duration of the cord compression; however, once established, the dysfunction is only rarely fully reversed.
- **Kidney Dialysis** – in *hemodialysis*, a machine called a *dialyzer* carries out the task of filtering blood three times a week. In *peritoneal dialysis*, the function is performed several times a day, but inside the person's body.
- **Plasmapheresis** – clients are connected to a machine similar to a *dialyzer*, filtering out the excess myeloma antibodies. Plasmapheresis thins the blood and eases the workload of the kidneys and heart.



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