REBUILDING HOPE: "A JOURNEY THROUGH CANCER REHABILITATION"

Abstract

Background: Cancer rehabilitation has gained recognition as an essential component of comprehensive cancer care, addressing the diverse and complex needs of cancer survivors throughout the continuum of their disease. With advances in cancer diagnosis and treatment leading to improved survival rates, the focus has shifted towards optimizing functional outcomes and quality of life for individuals affected by cancer. Cancer rehabilitation encompasses various interventions, including physiotherapy, aimed at addressing physical impairments, functional limitations, and psychosocial challenges associated with the disease and its treatments.

Prevalence and Incidence: The prevalence of cancer rehabilitation needs is substantial, reflecting the growing population of cancer survivors and the diverse range of sequelae experienced post-treatment. Cancer-related impairments can manifest across multiple domains, including musculoskeletal, neurological, cardiopulmonary, and psychosocial systems, impacting patients' ability to perform daily activities and participate in society. Incidence rates of impairments vary depending on cancer type, treatment modality, and individual patient factors, highlighting the heterogeneity of rehabilitation needs within the cancer population.

Physiotherapy Advantages: Physiotherapy plays a central role in cancer rehabilitation, offering a multitude of benefits to address physical impairments and optimize functional outcomes. Exercise-based interventions tailored to the unique needs of cancer survivors have been shown to improve strength, endurance, flexibility, and balance, thereby enhancing overall physical function and reducing disability. Additionally, physiotherapy interventions focusing on lymphedema management, scar tissue mobilization, and pain management contribute to symptom relief and improved quality of life for cancer survivors.

Authors

Dr. G. Sai Chetan
MPT(Neuro) PhD Scholar
Lecturer and
Clinical Physiotherapist
Vydehi Institute of Medical Sciences and research Center
Bengaluru, Karnataka, India.

Dr. Himanshu Sharma
MPT(Ortho &Sports)
Lecturer and
Senior Clinical Physiotherapist
Vydehi Institute of Medical Sciences and research Center
Bengaluru, Karnataka, India.

Dr. Srinivasulu. M
MPT(Ortho & Sports) PhD Scholar
Assistant Professer
Vydehi Institute of Medical Sciences and research Center
Bengaluru, Karnataka, India.

Numerous unpleasant physical and psychological symptoms that are related to cancer and its treatment might have an impact on patients for many years after therapy. As a result of chemotherapy, radiation therapy, and surgery, many cancer patients also have physical dysfunction and suffer from impairments in muscle strength, flexibility, and endurance. A thorough multidisciplinary approach to the assessment and care of individuals with various forms of cancer is physiotherapy. Physical therapy can help with functional issues such oedema or swelling, soft tissue tightness, joint stiffness, and weakness. Experts can determine the best ways for cancer patients to stay active through physiotherapy.Exercises used in physiotherapy are clinically useful and can enhance the quality of life for cancer patients. To maximise overall functional outcomes, physical therapists also collaborate with the rehabilitation team to construct the various aspects of a survivorship care plan. Cancer has four phases, and patients experience varying degrees of illness and disability at each stage. The importance of physiotherapy in cancer patients will be demonstrated by the frequent usage of cancer rehabilitation phases and identification of the stage prior to physiotherapy for cancer patients.

I. CANCER STAGE CHARACTERISTICS

Stage 1: The cancer is confined to the organ from which it began and is relatively small. This stage is known as cancer in situ, which simply means "in place." Cancers at stage 1 have not spread to the tissues around them.

Stage 2: The tumour is larger than in Stage 1 but the cancer has not yet started to spread to the nearby tissue. Stage 2 might occasionally indicate that cancer cells have entered nearby lymph nodes.

Stage 3: The cancer has grown. There may be cancer cells in the local lymph nodes, and it may have already begun to expand into the tissues around it. This stage denotes more significant tumours or malignancies.

Stage 4: The cancer has spread to further organs or body parts from the site where it first appeared. A secondary, advanced, or metastatic cancer is another name for it.

II. FOUR CANCER REHABILITATION STAGES

1. **Prevention-focused therapy:** Prior to the commencement of the consequences of the cancer and its treatment, the patient's level of function was improved by intervention that also included patient education and psychological support.

2. **Rehabilitative Restoration:** Restoring the patient to their previous level of function and resolving cancer-related and treatment-related impairments were the main goals of the intervention.

3. **Supportive Rehabilitation:** The goal of intervention is to help the cancer patient function as well as possible given their impairments, activity restrictions, and participation restrictions.

4. **Palliative Rehabilitation:** Intervention aimed to prevent consequences such contractures, pressure ulcers, and muscular deconditioning while providing the family with proper pain management and emotional support.

III. DEFINITION

Cancer comprises a diverse group of diseases characterized by abnormal cell growth , which has the potential to infiltrate or spread to other regions of the body . These diseases fall within the category of neoplasms , which refer to clusters of cells displaying uncontrolled proliferation and often result in the development of a lump or can be diffusely distributed.

All cancerous cells exhibit six distinctive hallmarks, which are essential for the creation of malignant tumors. These hallmarks encompass:

- Unregulated cell growth and division, disregarding the usual signaling mechanisms.
- Persistent growth and division, even when confronted with inhibitory signals.
- Evasion of programmed cell death.
- Infinite capacity for cell divisions.
- Stimulation of the formation of new blood vessels.
- Invasion of adjacent tissues and the establishment of metastatic growths.

The transformation from normal cells to cells capable of forming a discernible mass and eventually evolving into cancer entails a series of stages collectively referred to as malignant progression.

1. **Incidence:** Primary malignant bone tumours make up about 0.2% of all malignancies in the United States, with an age-adjusted incidence rate of 0.9 per 100,000 people per year.A uncommon type of cancer that can affect any bone in the body is called bone cancer.

2. **Causes:** About 90–95% of cancer cases are caused by genetic changes brought on by environmental causes.Inherited genetics are responsible for the remaining 5–10%.The term "environmental," as used by cancer researchers, refers to any element other than pollution, such as lifestyle, economic, and behavioural aspects.Tobacco (25–30%), food and obesity (30–35%), infections (15–20%), radiation (both ionising and non-ionizing, up to 10%), stress, inactivity, and pollution are common environmental variables that increase the risk of developing cancer.

3. **Chemical:** Smoking and the risk of developing lung cancer are closely associated. Specific forms of cancer have been related to exposures to particular chemicals. These are referred to as carcinogens. For instance, 90% of lung cancers are caused by tobacco smoke.Additionally, the larynx, head, neck, stomach, bladder, kidney, oesophagus, and pancreas are all affected by it.Alcohol use, particularly liver and digestive tract malignancies, is linked to 10% of male cancers and 3% of female cancers in Western Europe.Between 2 and 20% of cases of cancer may result from exposure to substances at work, resulting in at least 200,000 fatalities

4. **Diet and Exercise:** Up to 30–35% of cancer-related fatalities are attributed to diet, inactivity, and obesity.In the United States, increased body weight contributes to 14–20% of cancer deaths and is linked to the onset of many different forms of cancer. According to a UK study with information on more than 5 million people, a higher body mass index is linked to at least 10 different types of cancer and is thought to be the cause of 12,000 new cases there each year. Physical inactivity is thought to increase the risk of cancer, not only by affecting body weight but also by having a deleterious impact on the immunological and endocrine systems. one particular foods have been related to certain malignancies. Gastric cancer has been linked to a high-salt diet. Liver cancer is brought on by the common dietary contaminant aflatoxin B1.Chewing betel nuts can result in oral cancer. Cancer incidence variations could be partially explained by regional variations in food habits.

5. **Infection:** Infectious infections account for roughly 18% of cancer-related fatalities worldwide. In the developed world, this percentage varies from less than 10% to a high of 25% in Africa. The typical infectious agents that cause cancer are viruses, but cancer-causing bacteria and parasites may also be involved. Once virus (viruses that can cause cancer) include human papilloma virus (cervical cancer), Epstein-Barr virus (B-cell lymphoproliferative disease and nasopharyngeal carcinoma), Kaposi's sarcoma herpes virus (Kaposi's sarcoma and primary effusion lymphomas), hepatitis B and hepatitis C viruses (hepato cellular carcinoma) and human T-cell leukaemia virus-1(T-cell leukemia's). Cancer risk may also be increased by bacterial infection, as was the case with stomach carcinoma brought on by Helicobacter pylori.Schist soma haematobium (bladder squamous cell carcinoma) and the liver flukes Opisthorchis viverrini and Clonorchissinensis (cholangio carcinoma) are examples of parasitic infections linked to cancer.

6. **Radiation:** Radiation exposure, including both ionising radiation and non-ionizing ultraviolet radiation, is linked to up to 10% of invasive cancers. Furthermore, non-melanoma skin cancers, which are primarily generated by non-ionizing UV radiation from sunshine, account for the bulk of non-invasive malignancies. Medical imaging and radon gas are ionising radiation sources. The mutagen effect of ionising radiation is not very significant. For instance, passive smoking and radon gas exposure in homes both increase the chance of developing cancer. When mixed with other cancer-causing substances like radon and tobacco smoke, radiation becomes a more potent source of the disease. Ionising radiation use for medical purposes is a tiny but increasing source of radiation-induced malignancies. Ionising radiation may be used to treat various tumours, but in certain situations, it may also result in the development of a different type of cancer. Melanoma and other skin cancers can develop as a result of long-term sun exposure's UV radiation.

7. **Hereditary:** The great majority of malignancies are spontaneous (not inherited).An inherited genetic flaw is the main cause of hereditary malignancies. A genetic mutation that has a significant impact on cancer risk is carried by less than 0.3% of the population, and it accounts for less than 3–10% of cancer cases. Some of these syndromes include hereditary nonpolyposis colorectal cancer (HNPCC or Lynch syndrome), which is present in about 3% of people with colorectal cancer, and certain inherited mutations in the

BRCA1 and BRCA2 genes, which carry a risk of breast cancer and ovarian cancer of more than 75%.

8. **Physical Agents:** Certain compounds, like asbestos, can have physical rather than chemical effects on cancer. Asbestos exposure is a prime cause of mesothelioma, and similar compounds like wollastonite and attapulgite may have comparable effects. Non-fibrous particulate minerals such as crystalline silica, cobalt, and nickel can also induce cancer and often require long-term exposure, typically through inhalation. Cancer resulting from physical trauma is uncommon, with no evidence linking bone fractures to bone cancer, or brain, breast, or cervical cancer to trauma. However, repeated burns or hot object contact can lead to skin cancer, particularly when other carcinogens are present. Scalding tea consumption can cause esophageal cancer, with trauma promoting cancer development during the healing process.

9. **Hormones:** Certain hormones, like insulin-like growth factors, play a crucial role in cancer cell proliferation, especially in sex-related cancers such as breast, endometrial, prostate, ovary, testis, thyroid, and bone cancers. Elevated hormone levels, like estrogen and progesterone, can increase the risk of breast cancer in daughters of breast cancer survivors. Similarly, higher testosterone levels in men of African descent are associated with a greater risk of prostate cancer. Obesity is linked to higher cancer-related hormone levels and increased cancer risk, while physical activity is associated with lower hormone levels and reduced cancer risk. Some cancer therapies and preventive measures involve lowering hormone levels to deter hormone-sensitive cancer development.

10. **Autoimmune Diseases:** Celiac disease is linked to a higher chance of developing all types of cancer. Untreated celiac disease patients are at a higher risk, but this risk falls over time with diagnosis and stringent treatment, most likely as a result of adopting a gluten-free diet, which appears to protect those with the disease from developing malignancies. However, it appears that waiting to get diagnosed and start eating gluten-free increases the risk of developing malignancies.Due to prolonged inflammation, persons with Crohn's disease and ulcerative colitis have higher rates of gastrointestinal malignancies.

IV. GENETICS

Fundamentally, cancer is a disorder of the control of tissue growth. The genes that control cell development and differentiation must be changed for a normal cell to change into a cancer cell. There are two major groups in which the impacted genes fall.Oncogenes are genes that encourage cell division and development.Tumour suppressor genes prevent cell growth and division. Novel oncogenes can develop, normal oncogenes can be inappropriately overexpressed, tumour suppressor genes can be underexpressed or disabled, or novel oncogenes can be formed. A normal cell must typically undergo changes in several genes before it may become a cancer cell. Different degrees and processes can lead to genetic alterations. Errors in mitosis can result in the acquisition or loss of a whole chromosome. The nucleotide sequence of genomic DNA can alter, and these mutations are more frequent. A significant section of a chromosome may be lost or gained in large-scale changes.When a cell acquires additional copies (commonly 20 or more) of a small chromosomal locus, typically containing one or more oncogenes and nearby genetic material, this is known as genomic

amplification.When two distinct chromosomal regions merge incorrectly, frequently at a specific site, translocation occurs. The Philadelphia chromosome, or the translocation of chromosomes 9 and 22, which occurs in chronic myelogenous leukaemia and causes the synthesis of the BCR-ablfusion protein, an oncogenic tyrosine kinase, is a well-known illustration of this. Point mutations, deletions, and insertions are examples of small-scale mutations. They can occur in a gene's promoter region and impact the expression of the gene, or they can occur in the gene's coding sequence and change the stability or function of the protein product. Integration of genomic material from a DNA Cancer fundamentally results from disrupted control of tissue growth, involving changes in genes that govern cell development. Two main gene groups are affected: oncogenes, promoting cell division, and tumor suppressor genes, preventing it. Genetic changes must typically accumulate in multiple genes for a normal cell to become cancerous. These changes vary in degree and process, including errors in mitosis, changes in nucleotide sequence, and large-scale chromosome alterations, like genomic amplification and translocations.

Epigenetics: DNA damage and epigenetic changes in DNA repair genes significantly contribute to cancer development. Initially, cancer was understood as a result of genetic abnormalities like mutations in tumor-suppressor genes and oncogenes, but later, the role of epigenetic changes was recognized. Epigenetic alterations, such as DNA methylation changes, histone modifications, and chromosomal layout alterations, influence gene expression without altering the DNA sequence. Cancers often exhibit epigenetic changes, with some affecting DNA repair genes, leading to reduced DNA repair protein production and genomic instability. Decreased DNA repair gene expression disrupts DNA repair, leading to increased DNA damage and a higher frequency of mutations and epimutations. In cells lacking homologous recombinational repair (HRR) or DNA mismatch repair, mutation rates significantly rise, and chromosomal rearrangements occur with faulty HRR. Hereditary mutations in DNA repair genes can significantly raise cancer risks, with some conditions guaranteeing a 100% lifetime risk. While some sporadic malignancies result from mutations in DNA repair genes, many are caused by epigenetic changes that suppress DNA repair gene expression. Heavy metals can reduce DNA repair enzyme expression through epigenetic mechanisms and are suggested to be carcinogenic primarily due to DNA repair inhibition. Epigenetic changes may occur more frequently than mutations in cancers, with 60 to 70 protein-altering mutations, including "driver" and "passenger" mutations, typically found in breast or colon cancers.

V. METASTASIS

The spread of cancer to further parts of the body is known as metastasis. While the main tumour is the original, the disseminated tumours are known as metastatic tumours. Most malignancies have the potential to spread.Cancer that has spread is what causes the majority of cancer fatalities.

In the advanced stages of cancer, metastasis is a frequent occurrence and can happen through the lymphatic system, blood, or both. Local invasion, intravasation into the blood or lymph, circulation throughout the body, extravasation into new tissue, proliferation, and angiogenesis are typical phases in metastasis. Different tumours have a tendency to spread to certain organs, but generally speaking, the lungs, liver, brain, and bones are the most typical sites for metastases to appear.

1. **Signs and Symptoms:** Cancer has no symptoms when it first develops. As the mass enlarges or ulcerates, signs and symptoms develop. The type and location of the malignancy will determine the results. Most symptoms lack specificity. Many typically develop in people who also have other illnesses. "Great imitator" describes cancer. Therefore, it is typical for people who have been diagnosed with cancer to have received treatment for other illnesses that were thought to be the source of their symptoms.

2. **Local Symptoms:** The tumor's bulk or its ulceration may cause local symptoms. For instance, the widespread effects of lung cancer may obstruct the bronchus, causing cough or pneumonia; esophageal cancer may induce esophageal constriction, making swallowing uncomfortable or difficult; and colorectal cancer may result in bowel narrowing or blockages, disrupting bowel habits. Breast or testicular masses may cause visible lumps.A bleeding ulcer may result in blood in the urine, anaemia or rectal bleeding in the bowels, blood in the stool or sputum in the bladder, and vaginal bleeding in the uterus. Advanced cancer may cause localised pain, but the early swelling is typically painless.

3. **Systemic Symptoms:** Effects that are unrelated to direct or metastatic spread can cause general symptoms. Unintentional weight loss, fever, severe tiredness, and skin changes are a few examples.A persistent fever can be brought on by leukaemia, liver or kidney cancer, Hodgkin disease, or other cancers. Known as par neoplastic syndrome, several malignancies might result in particular sets of systemic symptoms. Examples include clubbing in lung cancer and the occurrence of myasthenia gravis in thymomas.

4. **Metastasis:** Cancer can spread from its primary site in one of three ways: locally, lymphatically to nearby lymph nodes, or hematogenously (through the blood) to distant areas, a process known as metastasis. Hematogenous cancer dissemination typically results in widespread disease throughout the body. However, according to the soil and seed concept of cancer metastasis, cancer "seeds" only grow in specific chosen sites ('soil'). Depending on where the tumour is, the symptoms of metastatic cancers may include enlarged lymph nodes, which can be felt or occasionally seen under the skin and are usually hard, enlarged liver or spleen, which can be felt in the abdomen, pain or fracture of affected bones, and neurological symptoms. There are many types of cancers in that we are describing about bone cancers

VI. BONE CANCER

A malignant tumour that develops from the cells that make up the body's bones is one type of cancer. Primary bone cancer is another name for it. When cancer is found in the bones, it has either started there (primary bone cancer) or spread there from another location (cancer that has metastasized to bone). In actuality, when cancer is found in the bones, it most frequently originated in another organ or location before spreading to the bones. For example, metastatic prostate cancer that has progressed to the bone is termed for the location where the initial disease first appeared. Among the various malignancies are those of the breast, prostate, and lung. Less frequently, primary bone cancer—true bone cancer—can start inside the bone itself. The prognosis and treatment of primary and metastatic bone tumours differ significantly. It's also crucial to remember that benign (non-cancerous) tumours, which are more prevalent than bone malignancies, can also develop in the bones.

1. **Osteosarcoma:** The most prevalent form of bone cancer is osteosarcoma. Males are more likely to develop osteosarcoma than females, and it more frequently affects older kids, teenagers, and young adults (10–19 years of age). Young people's osteosarcoma typically appears at the extremities of long bones in regions of vigorous bone growth, frequently at the knee, either at the end of the thighbone (femur) or the end of the shinbone (tibia). The humerus, a bone in the arm, is where bone cancer is most frequently seen after the spine. Any bone, however, has the potential to develop an osteosarcoma.

2. **Chondrosarcoma:** The second most frequent bone cancer is chondrosarcoma. It develops from cartilage cells that surround or are connected to bone. Less than 5% of these cancers occur in those under the age of 20, and it is more common in those over the age of 40. It could develop slowly or quickly and violently. Chondrosarcoma most frequently develops in the hip and pelvic bones.

3. **Ewing Sarcoma:** The Ewing sarcoma family of tumours (ESFTs), also known as Ewing sarcoma, is an aggressive bone cancer that most frequently affects children between the ages of 4 and 15 years old. It is thought to develop from primitive nerve tissue and can happen in either the soft tissues or the bones. Males experience ESFTs more frequently than females do.

4. **Pleomorphic Sarcoma (Malignant Fibrous Histiocytoma) of Bone:** Malignant fibrous histiocytoma, or MFH, was the previous name for the malignancy known as pleomorphic sarcoma. This phrase is still regularly used. Pleomorphic sarcomas are often soft tissue malignancies rather than bone tumours. However, in up to 5% of cases, they might develop in the bone. Pleomorphic sarcomas can develop anywhere in the body and typically affect adults.

5. **Fibrosarcoma:** Fibrosarcoma stands as an infrequent form of bone cancer, with a typical occurrence site found behind the knee, primarily affecting adults.

6. **Chordoma:** Chordoma, an exceptionally rare cancer, typically emerges in individuals aged 30 and above. It predominantly manifests in the upper or lower regions of the spinal column. In contrast, osteosarcoma, the most prevalent type of bone cancer, predominantly afflicts older children, teenagers, and young adults. Ewing sarcoma and ESFT represent bone cancers that primarily impact children.

VII. RISK FACTORS

The precise causes of most bone cancers remain elusive, but several factors that elevate the risk encompass:

- **Previous Radiotherapy:** Undergoing radiotherapy for cancer treatment escalates the likelihood of developing bone cancer. The risk is particularly heightened for individuals who receive high doses of radiotherapy during their formative years. However, it's important to note that the majority of individuals receiving radiotherapy will not develop bone cancer.

- **Other Bone Conditions:** Certain individuals face an increased risk of bone cancer if they have pre-existing conditions like fibrous dysplasia, multiple enchondromas, or Paget's disease of the bone. Additionally, some studies suggest that those who have previously battled soft tissue sarcomas are at a heightened risk of developing bone cancer.

- **Genetic Factors:** Some genetic diseases, such Li-Fraumeni syndrome, raise the risk of developing bone cancer. Additionally at risk are individuals with a significant familial history of particular other cancer types. For more details, consult a family cancer clinic. Instead of inheriting a defective gene, some people acquire bone cancer as a result of genetic alterations that take place during their lives. Most cases of bone cancer are not inherited.

- **Diagnosis:** It is possible to utilise a range of imaging techniques to find bone tumours, including bone malignancies. On normal X-rays, very early bone tumours may or may not be visible.The site of bone tumours can be more precisely determined using CT and MRI studies. A bone scan is a technique that creates images of the entire skeleton using radioactive substances. This might make it possible for bone cancer to develop everywhere in the body. This test can show regions of inflammation associated with conditions like arthritis, fractures, and infections in addition to bone malignancies.

VIII. TREATMENT FOR BONE CANCER

Surgery, chemotherapy, and radiation therapy are all part of the treatment. If limb-sparing surgery is unsuccessful or is not practicable, amputation may be required. The mainstay of treatment for bone malignancies is an operation to remove the tumour. Most bone malignancies can be removed surgically without amputating the affected limb. Sometimes it's necessary to remove the cancer as well as the surrounding muscles and tissues. To maximise limb function, reconstructive surgery may be required in addition to cancer removal. Chemotherapy may be necessary in addition to surgery for Ewing sarcoma, osteosarcoma, and other bone malignancies. Chondrosarcoma is typically treated with radiation therapy.

If high-dose chemotherapy is unsuccessful in treating an Ewing sarcoma, radiation treatment or even a stem cell transplant may be necessary. The patient's stem cells—blood cells with the capacity to differentiate into all the different types of blood cells—are taken from the bloodstream during this process. The extracted stem cells are then reintroduced to the body in a manner similar to a blood transfusion after large doses of chemotherapy medicines to damage the bone marrow. The stem cells use the bone marrow to make fresh blood cells over the following three to four weeks.

1. **Medications that Relieve Bone Cancer Pain:** Painkillers known as analgesics are used to treat bone cancer pain. These medicines could be over-the-counter or prescribed ones. Acetaminophen (Tylenol) and nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen (Advil, Motrin) and naproxen (Naprelan, Aleve, Naprosyn, Anaprox), are used to treat mild to moderate pain. However, because of a higher risk of bleeding, patients who are taking anticancer chemotherapy medications occasionally need to avoid NSAIDs. Pain from moderate to severe cancer is treated with prescription drugs. To effectively manage severe pain, opioids—stronger narcotic painkillers—such as codeine,

morphine, oxycodone, hydromorphone, and fentanyl may be needed. To manage cancer pain, many drugs may occasionally be taken in combination. Constipation, nausea, and drowsiness are a few side effects of opioid medicines.

2. **Prognosis for Bone Cancer:** The specific form of cancer and the amount of its spread determine the prognosis, or chance of survival, for people with bone cancer. For all cases of bone cancer in both adults and children, the five-year survival rate is roughly 70%. Adult patients with chondrosarcoma generally have a five-year survival rate of roughly 80%.

   For localised osteosarcomas especially, the five-year survival rate ranges from 60% to 80%. The survival rate is between 15% and 30% if the malignancy has progressed beyond the bone. If an osteosarcoma is found in an arm or leg, responds well to treatment, and is typically entirely removed during surgery, the prognosis is generally better. people who are younger and feminine typically have better prognoses than people who are older or male. When Ewing sarcomas are discovered in a localised stage, their five-year survival rate is roughly 70%. The chance of survival falls to 15% to 30% if they have disseminated outside of the bone. Smaller tumour size, age under 10, having the disease in an arm or leg rather than the pelvic or chest wall, and having a strong response to chemotherapy medications are all factors that are linked to a better prognosis for Ewing sarcomas.

3. **Initial Assessment Before Doing Physiotherapy Rehabilitation:** For all patients, the initial health and fitness assessment is crucial since it reveals baseline physical measurements and any potential problem areas.The individualised treatment plan is created using the assessment's findings.Goal-setting, postural analysis, body composition assessment, range of motion and flexibility testing, balance and stability testing, muscle strength and endurance testing, physical function testing, and a cardiovascular fitness test are all included in the assessment. It also includes a thorough discussion of the history and treatments for cancer.An personalised treatment plan is created to address needs and goals after discussing the test results.

4. **Assessment for Physical Therapists:** Physical therapists routinely conduct assessments that encompass the following aspects:

   - Evaluation of Pain Levels
   - Assessment of the Affected Bone Tumor
   - Examination of Range of Motion (ROM)
   - Measurement of Muscle Strength (MMT)
   - Assessment of Fatigue
   - Evaluation of Activities of Daily Living (ADL)
   - Analysis of Gait Speed and Balance Function
   - Consideration of Quality of Life

Physical therapists must also remain cognizant of any limitations in motion and weight-bearing that may result from surgical procedures. In cases involving phantom limb pain, the assessment extends to muscle strength and mobility of the affected limb.

For patients with spine tumors leading to paralysis, physical therapists should employ the American Spinal Injury Association (ASIA) scoring system to assess sensory function, strength, mobility, and pain following surgery or chemo-radiotherapy.

5. **Exercise Prescription:** Programmes were developed in accordance with suggestions made by the American College of Sports Medicine roundtable on exercise recommendations for cancer survivors, and if practical, they contained elements of flexibility, cardiovascular, and resistance training. Additionally, given the data linking higher levels of energy expenditure (met-hours/week) with greater survivability and quality of life in cancer patients, exercise prescriptions centred mostly on raising baseline levels of physical activity. Patients were particularly instructed to identify everyday activities they typically engaged in and were then encouraged to either raise the intensity or frequency of those physical activities. Depending on the stage of their sickness and their current therapies, programmes were tailored to incorporate a combination of at-home exercise, training at a Wellness Centre, or taking part in exercise courses.

6. **Physical Therapy:** Physical therapy has not been shown to be useful in treating bone cancer patients in any prior research. Physical therapists should generally be cautious around delicate bones. Bone tumours make it simple for movements to break bones. Depending on the type of bone cancer being treated, physical therapy varies. Patients with bone cancer who only get chemotherapy and radiation therapy engage in strength and endurance training. However, physical therapists must be aware of workouts that should be avoided when patients have surgery. The physiotherapist, together with a prosthetist and an orthotist, should take into account limb prosthesis when patients undergo amputation. Physical treatment is administered in accordance with spinal cord injury physical therapy to bone cancer patients who have paraplegia due to conditions such bone tumours in the spinal cord. In addition, physical therapy frequently involves patient education, behavioural training, resistive exercise, PNF, stretching, and strengthening.

   Physical therapists must possess a thorough understanding of the location and progression of bone tumors as this knowledge is pivotal for post-therapy physical function recovery. Engaging in regular exercise can be beneficial during cancer treatment, leading to the following advantages:

   - Enhancement of Physical Abilities
   - Improved Balance, Reducing the Risk of Falls and Fractures
   - Prevention of Muscle Atrophy Due to Inactivity
   - Decreased Risk of Heart Disease
   - Mitigation of Osteoporosis Risk (Weakening of Bones)
   - Improved Blood Circulation to Lower Extremities and Reduced Risk of Blood Clots
   - Enhanced Independence in Activities of Daily Living
   - Boosted Self-Esteem
   - Reduced Likelihood of Anxiety and Depression
   - Alleviation of Nausea
   - Augmentation of Social Interactions
   - Alleviation of Fatigue Symptoms
   - Facilitation of Weight Management

- Augmented Quality of Life

While much remains to be discovered about how exercise and physical activity specifically impact cancer recovery and the immune system, evidence indicates that regular moderate exercise yields health benefits for individuals undergoing cancer treatment.

7. **Prescribing Exercise:** Exercise programs can be prescribed for most individuals undergoing cancer treatment. However, some may require adjustments or postponement of the program. Consult with your healthcare provider before commencing exercise if you experience any of the following issues, as it may necessitate modifications to your exercise regimen:

- Lymphedema
- Fatigue
- Anemia
- Shortness of breath
- Low platelet count
- Reactions to radiotherapy affecting the skin
- Compromised immune function
- Nerve damage (peripheral neuropathy)
- Primary or metastatic bone cancer

The Main Objectives if Exercise program:

8. **During Cancer Treatment**

- **Preservation of Physical Function:** A primary goal of exercise during cancer treatment is to help individuals preserve their physical function. Cancer and its therapies can lead to physical deconditioning, muscle weakness, and diminished stamina. Regular exercise can counteract these effects and maintain overall physical health.
- **Enhancement of Quality of Life:** Exercise can contribute to an improved quality of life during cancer treatment by alleviating some treatment-related side effects, such as fatigue, nausea, and emotional distress. It can also enhance mood and overall psychological well-being.
- **Management of Treatment Side Effects:** Exercise plays a vital role in managing and mitigating certain side effects of cancer treatment, such as fatigue, muscle loss, and neuropathy. It can also assist in maintaining a healthy body weight and muscle mass.
- **Personalized Approach:** Each individual's exercise plan should be customized to their specific needs, taking into account their current physical state, the type and stage of cancer, and the treatments they are receiving. It should be both safe and enjoyable for them.
- **Gradual Progression:** Individuals who were physically active before their cancer diagnosis may need to adjust their exercise intensity and frequency during treatment. The objective is to remain as active and fit as possible while respecting the person's physical limitations and the challenges posed by treatment.
- **Special Considerations:** Elderly individuals or those with specific medical conditions may require additional support, safety measures, or assistance from

healthcare professionals or caregivers during exercise. The emphasis should be on maintaining balance, safety, and preventing injuries.

9. After Cancer Treatment

- **Recovery and Rehabilitation:** Post-cancer treatment, exercise aims to aid the recovery process by helping survivors regain strength, stamina, and physical function that may have been affected during treatment.
- **Management of Lingering Side Effects:** Some side effects of cancer treatment may persist or develop later. Exercise can help manage these long-term side effects, such as neuropathy or persistent fatigue.
- **Customized to Individual Capacity:** The exercise program should be tailored to the individual's current physical capabilities. What might be considered low- or moderate-intensity exercise for a healthy person may be more challenging for a cancer survivor, necessitating adjustments.
- **Gradual Progression:** As individuals recover, they can gradually increase the duration and intensity of their exercise. The goal is to regain and maintain physical well-being while avoiding overexertion.
- **Enhancement of Quality of Life:** Exercise can continue to contribute to an improved quality of life by boosting mood, reducing stress, and enhancing overall well-being for cancer survivors.

When individuals are living without disease or with stable disease, it is imperative to maintain an active lifestyle for overall health and an improved quality of life. Some evidence suggests that maintaining a healthy weight, following a balanced diet, and engaging in regular physical activity may not only enhance overall well-being but also potentially reduce the risk of a second cancer or other chronic diseases. However, further research is needed to substantiate these potential benefits.

The American Cancer Society provides recommendations for cancer survivors to take the following steps:

- **Engage in Regular Physical Activity:** It is strongly advised for cancer survivors to incorporate regular physical activity into their lives to support their overall health.
- **Avoid Prolonged Inactivity:** It is crucial to steer clear of extended periods of inactivity and return to regular daily activities as soon as possible after a cancer diagnosis.
- **Aim for 150 Minutes of Exercise Weekly:** The objective is to engage in at least 150 minutes of exercise per week to promote physical health and well-being.
- **Include Strength Training:** To maintain muscle strength and overall fitness, it is recommended to include strength training exercises at least two days per week.

Numerous research studies have explored the impact of physical activity on cancer survival and the likelihood of cancer recurrence. Exercise has been demonstrated to provide various benefits for cancer survivors, including improvements in cardiovascular health, muscle strength, body composition, reductions in fatigue and anxiety, and enhancements in overall quality of life. Existing research suggests that physically active cancer survivors are at a lower risk of cancer recurrence and experience improved survival rates compared to their

inactive counterparts. This positive effect has been observed in numerous studies involving individuals with breast, colorectal, prostate, and ovarian cancer. However, more randomized clinical trials are necessary to gain a more precise understanding of the effects of exercise on these outcomes.

10. Precautions

- If you are going out to exercise, let someone know when you will be back or take a phone with you in case you become fatigued or unwell.
- Start any new exercise program slowly, and increase your activity gradually.
- You may get sore muscles when you start a new form of exercise, but the soreness should go away in a few days. If it doesn't, tell your doctor.
- Some symptoms are warning signs. If you experience any of the following symptoms while exercising, stop the activity immediately and call 000 for urgent medical assistance: pain or pressure in your chest or pain down your arms; severe shortness of breath; dizziness or fainting; irregular or unusually rapid heartbeat; nausea and/or vomiting; extreme weakness or extreme fatigue.
- When undergoing cancer treatment and in the immediate post-treatment phase, it is crucial to consult with your healthcare provider before commencing any exercise program. This is particularly significant if your treatments have the potential to affect your lung or heart function, or if you have pre-existing risks for lung or heart disease. Ensure you have a clear understanding of what is safe and advisable for you.
- Your cancer care team will regularly monitor your blood counts during treatment. It is advisable to discuss the results with them and seek their guidance on whether it is safe for you to engage in exercise.
- Avoid exercising if you have a low red blood cell count (anemia).
- If your white blood cell counts are low or if you are taking medications that weaken your ability to fight infections, it is recommended to refrain from using public gyms or other crowded public spaces until your counts return to safe levels.
- Do not exercise if there are imbalances in your blood minerals, such as sodium and potassium, which may occur due to persistent vomiting or diarrhea.
- If your doctor approves, ensure you stay well-hydrated during exercise.
- Refrain from exercising if you are experiencing unrelieved pain, nausea, vomiting, or any other symptoms of concern, and promptly contact your healthcare provider.
- Before engaging in exercise beyond a moderate level of exertion, consult with your doctor. Moderate exertion can be likened to the effort required for a brisk walk.
- If you have a catheter or feeding tube, avoid activities that could lead to infections, including exposure to pool, lake, or ocean water, and refrain from engaging in resistance training that involves the muscles near the catheter. Discuss safe practices with your cancer care team.

11. Before Planning the Exercise following Factors should be Considered

- **Consult Your Healthcare Provider:** Before embarking on any exercise regimen, it is crucial to have a discussion with your doctor. They can provide guidance on what types of exercise are safe and suitable for your specific situation.

- **Start Gradually:** Begin with slow, manageable activities. Even if you can only engage in an activity for a few minutes a day, it's beneficial. You can gradually increase the frequency and duration of these activities. Pay attention to your muscles – they will signal when you need to slow down and rest.
- **Incorporate Short Intervals with Rest Breaks:** Divide your exercise into shorter intervals with frequent rest breaks. For instance, briskly walk for a few minutes, then slow down, and briskly walk again until you accumulate 30 minutes of brisk activity. If needed, break it down into three 10-minute sessions, which still provides exercise benefits.
- **Engage Large Muscle Groups:** Include physical activities that engage large muscle groups such as the thighs, abdomen, chest, and back. A well-rounded exercise program should focus on strength, flexibility, and aerobic fitness.
- **Maintain Muscle Mass and Bone Strength:** Consider exercises that help preserve lean muscle mass and bone strength, such as using resistance bands or light weights.
- **Enhance Flexibility:** Incorporate exercises that improve flexibility and maintain joint mobility.
- **Warm-Up and Cool Down:** Always begin with warm-up exercises lasting 2 to 3 minutes. These may include shoulder shrugs, lifting arms overhead, toe tapping, marching, and knee lifts. End your session with stretching and flexibility exercises. Hold stretches for about 15 to 30 seconds, remembering to breathe and relax your muscles. Examples of stretches include reaching overhead, deep breathing, and bending over to touch your toes.
- **Listen to Your Body:** While undergoing treatment, exercise according to your capabilities. Do not push yourself too hard. Pay attention to your body's signals and take breaks when needed.

12. Tips to Reduce Fatigue

- **Establish a Daily Routine:** Plan your activities during the times of day when you feel most energized.
- **Engage in Light-to-Moderate Exercise:** Regular, light-to-moderate intensity exercise can help combat fatigue.
- **Get Fresh Air:** Spend time outdoors to rejuvenate and re-energize.
- **Maintain a Balanced Diet:** Consume a well-rounded diet that includes protein sources (e.g., meat, milk, eggs, and legumes) unless advised otherwise.
- **Stay Hydrated:** Aim to drink about 8 to 10 glasses of water daily, and increase your fluid intake if you're exercising vigorously, sweating, or in a hot environment.
- **Manage Symptoms:** Address any issues like pain, nausea, or depression that may contribute to fatigue.
- **Conserve Energy:** Keep commonly used items within easy reach to reduce energy expenditure.
- **Enjoy Pleasurable Activities:** Engage in hobbies and activities that bring you joy and relaxation.
- **Stress Reduction:** Incorporate relaxation and visualization techniques to alleviate stress.
- **Balance Activity and Rest:** Ensure your activity level doesn't interfere with nighttime sleep, and rest as needed.

- **Seek Support:** Don't hesitate to ask for assistance when required.

13. **Effective Exercise:** Working your heart is crucial for exercise to be most effective (provide you the finest effects). Keep an eye on your respiration, heart rate, and muscle fatigue. When you become exhausted or out of breath, take a brief break before continuing your exercise as soon as you are able. The aim is to exercise for at least 10 minutes at a time when you first begin. Start out slowly and gradually increase your workout time over the following few weeks. If you use blood pressure medication that also regulates your heart rate, use caution. Although your heart rate won't increase, your blood pressure might. If you have any questions about this, consult your physician, nurse, or chemist. The ideal level of activity for someone with cancer is unknown. Your exercise regimen should assist you maintain your muscle strength and your ability to perform the tasks you need and wish to perform.

14. Tips for Staying Committed to Your Exercise Routine

- **Set Goals:** Establish both short-term and long-term goals to provide motivation and direction.
- **Prioritize Enjoyment:** Focus on making your exercise sessions enjoyable.
- **Vary Activities:** Keep things fresh by trying different activities like yoga, dancing, or tai chi.
- **Seek Support:** Don't hesitate to ask for support from friends, family, and co-workers, or even invite them to exercise alongside you.
- **Track Progress:** Use charts or logs to record your exercise progress, providing a tangible way to monitor your achievements.
- **Celebrate Success:** Recognize and reward your accomplishments along the way.

Beginning an exercise program can be a considerable endeavor, especially if you are dealing with a chronic illness and had little prior experience with exercise. Start slowly, and gradually build up your activity level as you feel capable. If you were exercising regularly before your cancer diagnosis, you may need to adjust the intensity and duration of your workouts.

Remember the many benefits of exercise, as it can:

- Help prevent muscle wasting.
- Reduce the side effects of treatment.
- Enhance your overall fitness.
- Improve your quality of life.

Incorporate physical activity into your daily routine with these practical tips. Only engage in activities that you feel comfortable doing:

- Take a post-dinner walk around your neighborhood.
- Go for a bike ride.
- Opt for manual yard work like mowing the grass or raking leaves instead of using a blower.

- Engage in household chores like scrubbing your bathroom or washing and waxing your car.
- Play active games with children, such as freeze tag or jump rope.
- If you have a well-behaved dog, take them for a walk.
- Tend to your garden by weeding.
- Keep track of your daily steps with a pedometer and aim to increase your step count.

The cancer survivors should exersise in low intensity and with slow progression to avoid complications and the problems .

15. **Treatment side effects and Exercise:** Cancer treatment causes a range of physical effects that are different for different people. Exercise has been shown to help people cope with many of the common side effects, including fatigue, feeling sick (nausea), loss of appetite, anemia, depression and anxiety, weight changes and loss of muscle tone. Some side effects need extra care if you are starting an exercise program.

- **Lymphoedema:** Starting an exercise program early in treatment may lower the risk of developing lymphoedema. For those with lymphoedema, regular exercise can reduce the severity of the condition and its symptoms.

- **Fatigue:** Many patients experience fatigue during and after cancer treatment—feeling fatigued even when resting. Exercise intensity and duration modifications, together with careful monitoring of your condition, can help you manage fatigue. When feeling really fatigued, it's crucial to continue doing some low-intensity exercise (unless you have severe anaemia; see below). It might be easier to manage shorter, more frequent sessions. Stopping all exercise puts you at danger of losing strength and fitness, which could make the exhaustion worse.

- **Anemia:** Low red blood cell and/or hemoglobin count is another common side effect of cancer treatment. Symptoms of anemia include unexplained tiredness and fatigue. Combined with good nutrition, exercise has been shown to improve anemia. For mild or moderate anemia, try a low-intensity exercise program, with gradual increases in intensity and/or duration. However, in cases of severe anemia (when a blood test shows a hemoglobin level of less than 80 g/L), consult your doctor about whether you should avoid exercise until it improves.

- **Poor Balance And Coordination:** If the cancer or its treatment has affected your coordination or causes dizziness, it is safer to avoid exercise that relies on balance and coordination, such as cycling outdoors or using a treadmill. It is also best not to lift free weights without a training partner.

- **Skin Irritation:** Areas of skin affected by radiotherapy can be extremely sensitive and often uncomfortable. Choose activities and clothing to minimize fabric rubbing affected areas. Chlorine can be irritating, so avoid pool-based exercise if your skin has a rash or is reddened after radiotherapy.

- **Bone Weakness or Pain:** Some hormone treatments for breast and prostate cancer can increase the risk of fractures, as can osteoporosis (bone thinning) or primary or secondary bone cancer. In these cases, it is best to avoid contact sports and high-impact activities such as running and jumping.

- **Warming up:** Initiating your exercise session with a warm-up is a crucial step. Warming up serves to prepare your body, reduce the risk of injury, and get your heart rate slightly elevated compared to its resting state. After a proper warm-up, your muscles are more pliable and your body is ready for exercise.

  A well-rounded warm-up should encompass five to ten minutes of low-intensity aerobic activity coupled with gentle stretching. Suitable activities for a warm-up include a leisurely walk outdoors or utilizing indoor exercise equipment. If you intend to incorporate weight training, consider using light weights during your warm-up. A few sets with lighter weights can prepare your muscles and joints for the upcoming exercises.

- **Training:** The training phase of your exercise program is where the actual work occurs. Different types of training elicit specific effects on your body, and a comprehensive weekly exercise regimen should encompass activities from three main categories:

16. Aerobic Exercises

- Aerobic exercises engage large muscle groups and elevate heart rate, contributing to improved cardiovascular fitness and making daily tasks easier.
- Examples of aerobic activities include walking, cycling, swimming, and even gardening or yard work.
- Aim for 30 minutes of light to moderate aerobic activity on most days of the week, which can be achieved in one continuous session or divided into shorter, 10-minute segments.
- The exercise intensity can vary, from low to moderate to vigorous, depending on your comfort level and preferences. For adults, it's recommended to accumulate at least 2.5 hours of moderate-intensity aerobic activity or 1 hour of vigorous-intensity aerobic activity per week. It's essential to progressively work towards these goals, understanding that some exercise is better than none. Choose activities you enjoy to stay motivated.

17. Resistance Exercises

- Resistance exercises, also known as weight training or strength training, use weights to enhance muscle strength and endurance.
- Benefits include increased muscle function, strength, improved body composition, increased muscle and bone mass.
- You can perform resistance exercises with your own body weight (e.g., push-ups, squats), free weights (dumbbells, barbells), weight machines, or elastic resistance bands.
- Proper technique is crucial, as incorrect form can lead to injuries.

- Resistance exercises should be performed one to three times a week on alternate days, incorporating one to four sets of six to nine different exercises per session.
- Each set should consist of six to twelve repetitions of the movement, with rest periods of 60 to 90 seconds between sets.
- As you become more comfortable with the program, you can gradually increase repetitions, sets, or the resistance level.

18. Flexibility Exercises

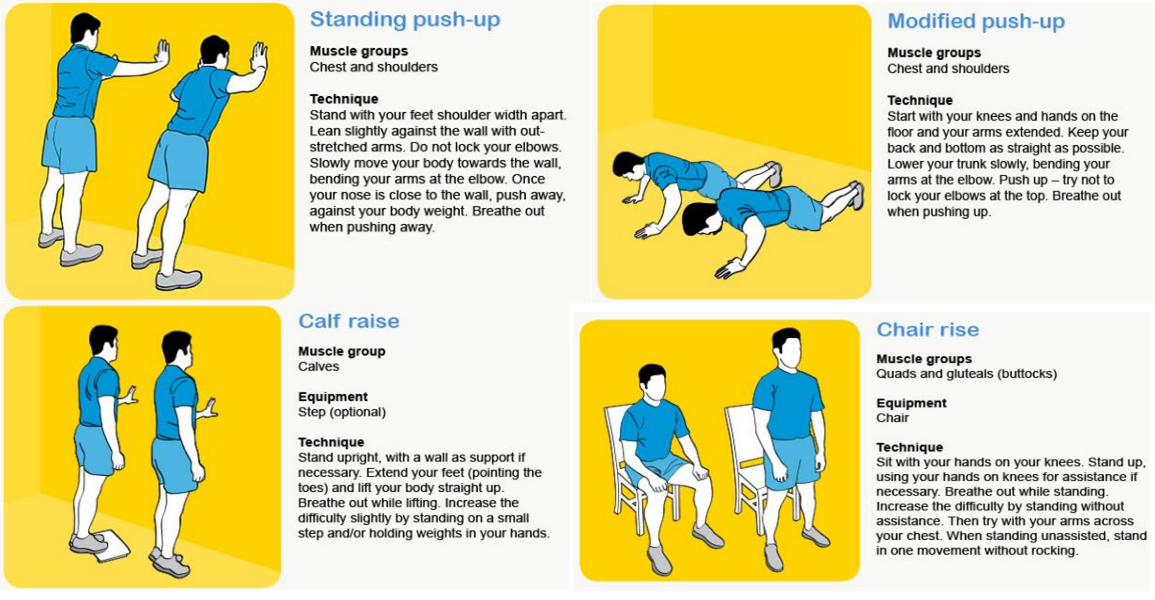
- Flexibility exercises involve stretching to lengthen muscles and tendons, which helps maintain or improve joint and muscle flexibility.
- Stretching is particularly beneficial, as it combats the reduced flexibility that can result from cancer treatments and aging.
- Aim to incorporate stretching three to four times a week, performing two to four sets of four to six different stretches.
- Include stretches for arms, legs, and trunk flexibility, holding each stretch for 15 to 30 seconds.

➢ **Cooling Down:** As essential as warming up is, cooling down after your exercise session is equally vital. The cool-down phase allows your heart rate and blood pressure to gradually return to their normal levels and helps dissipate the heat generated during your workout.

A suitable cool-down involves five to ten minutes of gentle activity or light stretching.

The choice of cool-down activities depends on the nature of your exercise:

- If you've just completed an aerobic exercise session, a slow walk or light cycling is ideal for cooling down.
- If your workout involved resistance training, engage in light stretching as part of your cool-down routine.
- By following these guidelines we can get safer and effective exercise

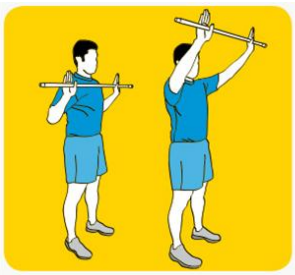


Squat

Muscle groups
Quads and gluteals (buttocks)

Equipment
Gymstick™, barbell or a pole (a broomstick is okay), chair (optional)

Technique
Stand with your feet shoulder width apart and with the bar just below your shoulders. Squat down by bending your knees and hips.Do not bend your knees beyond the tips of your toes and keep your feet flat on the floor. Return to the starting position by straightening your knees and hips. You may want to start with a chair behind you, touching (but not resting) your bottom on the chair on each repetition. Increase the difficulty by adding resistance (weights or elastic) to the bar.

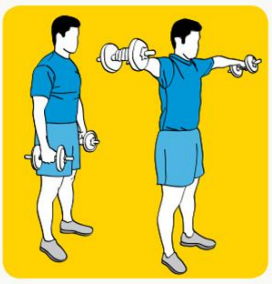


Shoulder press

Muscle group
Shoulders

Equipment
Gymstick™, barbell hand-held weights or a pole (a broomstick is okay)

Technique
Stand with your feet shoulder-width apart. Hold the bar at chest height with your elbows almost completely bent (almost touching sides). Push the bar up until it is directly over your head and shoulders. Breathe out during the lift and maintain good posture at all times. Increase the difficulty by adding weight or elastic resistance to the bar.

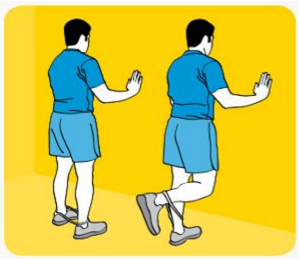


Lateral arm raise

Muscle group
Shoulders

Equipment
Hand-held weights

Technique
Stand with your arms by your side and your feet shoulder width apart. Hold the weights with your palms facing your thighs. Lift your arms slowly out to your sides until they are shoulder height. Breathe out when lifting the resistance. Maintain your head and neck position, looking straight ahead.



Standing leg curl

Muscle group
Hamstrings

Equipment
Elastic resistance band

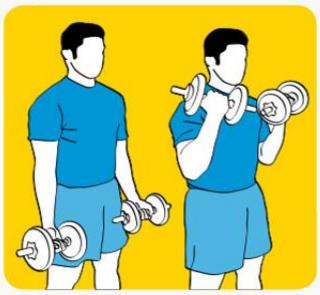
Technique
Stand with your feet shoulder-width apart and the elastic wrapped around your ankles. Stand facing a wall or chair, in case you need support. Bend your knee to your buttocks at approximately 90 degrees. Breathe out when lifting the leg. (You can start without the elastic.) Repeat with the other leg.

Triceps kickback

Muscle group
Triceps (the muscles on the back of your arm)

Equipment
Hand-held weights

Technique
Lean on a bench or table, lean with one arm on the table. In the other hand, hold the weight by your side, with your elbow pointing upwards and looking straight ahead. Without moving, straighten your arm and move the weight upwards. Breathe out when lifting the weight. Return to the starting position. Repeat with the other arm.



Biceps curl

Muscle group
Biceps

Equipment
Hand-held weights, Gymstick™ or barbell

Technique
Stand with your arms by your side. Hold the weights with your wrists pointing forward. Lift the weights to your chin in a smooth motion by bending both elbows. Make sure that you do not move your shoulders and your body does not sway during the lift. Breathe out during the lift. Slowly return to the starting position.

Techniques for flexibility exercises

Shoulder stretch

Muscle group
Shoulder

Technique
Stand with your feet about hip width apart. Pull one arm across your chest. Keep your elbow just below your shoulder line. Hold the position for fifteen to thirty seconds. Repeat the exercise for the other side.

Triceps stretch

Muscle group
Triceps

Technique
Lift one arm with your elbow bent and your forearm down your back. Using the elbow as a lever, pull the arm down your back. Hold the stretch for fifteen to thirty seconds. Perform the exercise for both sides.

Pectoral and biceps stretch

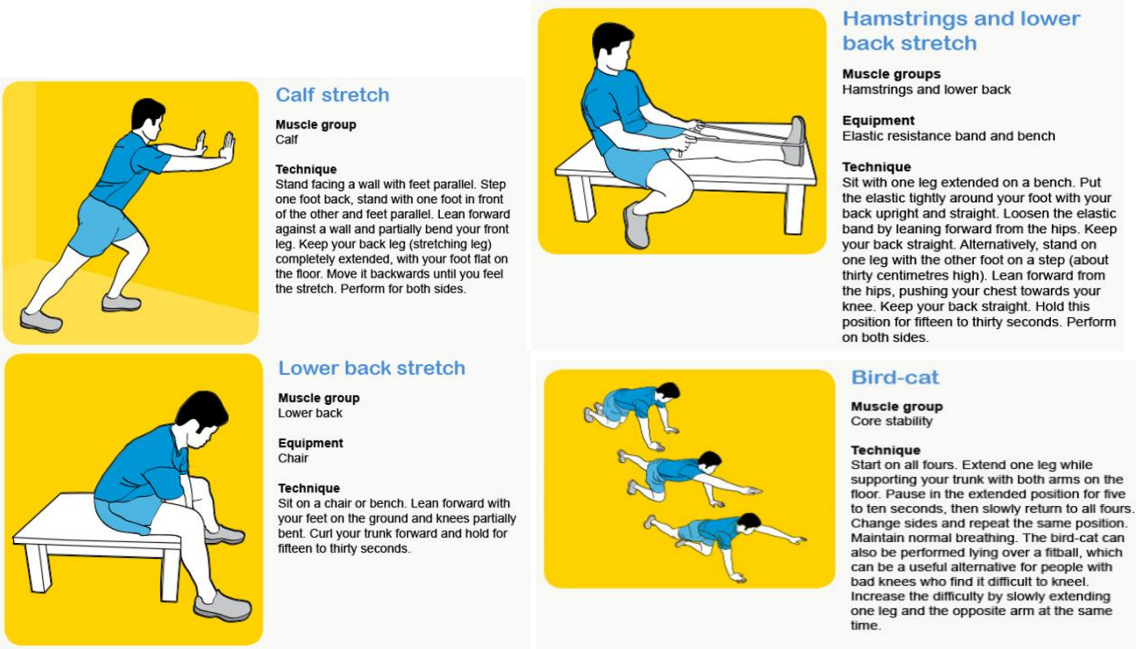
Muscle groups
Chest and shoulder

Technique
Stand near a wall or a pole. Raise one arm to your side at shoulder height and hold the wall or pole with your hand. Partially turn your body away from the arm holding the wall/pole. Hold the stretch for fifteen to thirty seconds. Perform on both sides.

Quadriceps stretch

Muscle group
Quadriceps

Technique
Stand on one leg, with a wall or chair for support if necessary. Hold your foot with your hand and pull the leg toward your buttocks by the ankle. Keep your trunk straight. Hold the stretch for fifteen to thirty seconds. Perform for both sides.



19. **Pelvic Floor Exercises:** The pelvic floor muscles, situated at the base of your pelvis, play a pivotal role in supporting your bowel, bladder, and, for women, the uterus. These muscles are integral not only for providing support but also for controlling urination and bowel movements, ensuring normal sexual function, and stabilizing the abdomen and spine.

    Similar to other muscles, the pelvic floor muscles can become weak. Various factors contribute to the weakening or damage of these muscles, including age, childbirth, straining during bowel movements (constipation), obesity, chronic cough, heavy lifting, and abdominal or pelvic surgery.

    Before embarking on pelvic floor exercises, it's advisable to consult with a physiotherapist or continence advisor if you fall into any of the following categories:

    - Recent pelvic or abdominal surgery
    - Experience urine or feces leakage during activities like coughing, sneezing, laughing, or exercising
    - Frequently have urgent trips to the toilet
    - Struggle with controlling bowel movements and gas
    - Regularly feel as though you haven't fully emptied your bowel
    - Experience sensations of dragging, heaviness, or a vaginal bulge
    - Encounter a lack of sexual sensation

    ➢ **How to Identify Your Pelvic Floor Muscles:** You can discern the activity of your pelvic floor muscles by halting your urine stream mid-flow. Pause the flow for a few seconds to become familiar with these muscles.

Alternatively, you can identify the muscles by envisioning yourself stopping the flow of urine or holding in gas (flatus). This can be practiced while standing, sitting, or lying down.

- **How to Exercise Your Pelvic Floor Muscles:** Pelvic floor exercises can be performed in various positions, including standing, sitting, or lying down.

Here's a step-by-step guide:

- Begin by relaxing all of your pelvic floor and abdominal (tummy) muscles.
- Contract and hold your pelvic floor muscles while continuing to breathe normally.
- Aim to sustain the contraction for up to ten seconds.
- Repeat this exercise up to ten times, allowing ten to twenty seconds of rest between contractions.
- Perform these exercises at different times throughout the day to enhance the strength of your pelvic floor muscles.

It's essential to execute these exercises with proper technique. Incorrect form may render the exercises ineffective or lead to potential injury. Remember these key points:

Do not hold your breath., Avoid tightening your tummy muscles above the belly button. Proper technique may result in some tensing or flattening of the tummy below the belly button., Do not overexert yourself, as this may engage the surrounding muscles instead of the pelvic floor. If you struggle to feel your pelvic floor muscles lifting and squeezing, consider changing your position.

Measuring Exercise Levels: Achieving the right balance between not exerting yourself enough and pushing too hard is crucial. Your exercise intensity can be classified as low, moderate, or vigorous based on how hard your body works during physical activity.

Australia's National Physical Activity Guidelines for Adults advocate for working at moderate intensity. Various methods can be employed to gauge exercise intensity:

Talk Test

- If you can sing while performing the activity, it's likely too light.
- If you can maintain a conversation but need occasional breath pauses, you're engaging in moderate-intensity activity.
- When you can only provide one-word answers, the activity becomes more vigorous.
- If speaking becomes challenging, the activity is considered vigorous.

Rating of Perceived Exertion (RPE)

- RPE assesses the intensity of an activity by asking, "How hard am I working?" Choose the number on the scale that best corresponds to your perception of effort.

Heart Rate

- Heart rate increases proportionally to exercise intensity. You can measure your heart rate to determine exercise intensity, with various methods available.

Measuring Your Heart Rate:

Measuring your heart rate is a straightforward process:

- Place the first three fingers of one hand on the inner part of your wrist or your neck.
- Count your pulse for fifteen seconds.
- Multiply the resulting number of beats by four to calculate your heart rate in beats per minute (bpm).

Incorporating regular exercise into your routine offers a multitude of physical and mental benefits. It can:

- Strengthen muscles and bones, enhance circulation.
- Assist in maintaining or attaining a healthy weight.
- Boost energy levels and mobility.
- Improve appearance and self-esteem.
- Aid in coping with stress, anxiety, and depression.
- Provide social opportunities and interaction.
- Lower the risk of high blood pressure, heart disease, stroke, diabetes, osteoporosis, and certain cancers.

IX. CONCLUSION

In summary, individuals battling cancer often experience physical limitations, and the inclusion of physical therapy plays a significant role in aiding their recovery. Nonetheless, it's vital for physical therapists to be vigilant in identifying and managing potential risk factors that cancer patients may encounter during their therapy.

Moreover, the positive impact of physical therapy extends beyond the treatment phase. For cancer survivors, it has the potential to enhance physical function, activities of daily living (ADL), and overall quality of life (QOL). It's worth noting that cancer survivors can potentially extend their survival by up to five years in various cancer conditions.