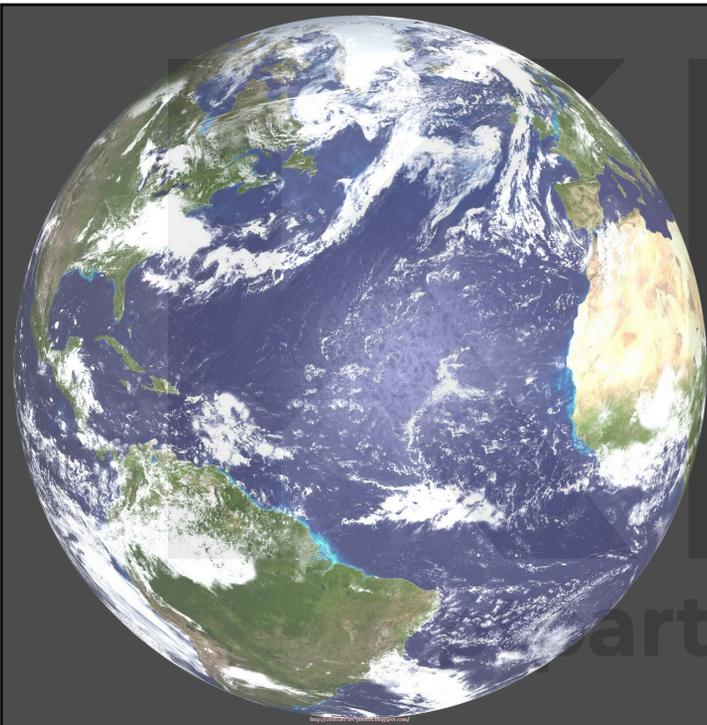


CANCER TREATMENT AND PHYSICAL THERAPY INTERVENTION



GLOBAL CANCER RATES

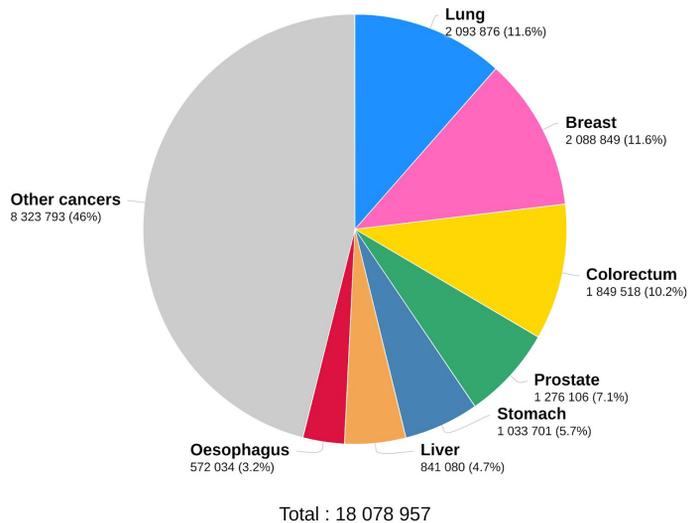
- Cancer is the second leading cause of death globally, and was responsible for an estimated 9.6 million deaths in 2018. Globally, about 1 in 6 deaths is due to cancer.
- Approximately 70% of deaths from cancer occur in low- and middle-income countries.
- Around one third of deaths from cancer are due to the 5 leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, and alcohol use.



UNITED STATES CANCER RATES

- Cancer is the second leading cause of death in the US as well, and was responsible for an estimated 599,108 deaths in 2017.
- Approximately 38.4% of men and women will be diagnosed with cancer at some point during their lifetimes (based on 2013–2015 data).
- In 2016, there were an estimated 15.5 million cancer survivors in the United States. The number of cancer survivors is expected to increase to 20.3 million by 2026.

Estimated number of new cases in 2018, worldwide, all cancers, both sexes, all ages





PHYSICAL ACTIVITY AND CANCER PREVENTION

Various studies demonstrated:

- the most physically active individuals had a 24% lower risk of colon cancer than those who were the least physically active
- the average breast cancer risk reduction associated with physical activity was 12%
- the average endometrial cancer risk reduction associated with high versus low physical activity was 20%
- In a study of over 1 million individuals, leisure-time physical activity was linked to reduced risks of esophageal adenocarcinoma, liver cancer, gastric cardia cancer (a type of stomach cancer), kidney cancer, myeloid leukemia, myeloma, and cancers of the head and neck, rectum, and bladder. (May not be directly caused by physical activities, but indirectly through other avenues such as lower rates of obesity)



PHYSICAL ACTIVITY AND IMPROVED CANCER OUTCOMES

Various studies demonstrated:

- Walking or cycling an average of 30 minutes per day has been associated with a 34% lower rate of cancer death and a 33% improved cancer survival.
- A recent meta-analysis reported that, post-diagnosis, physical activity reduced breast cancer deaths by 34%, all causes mortality by 41% and disease recurrence by 24%.
- Physical activity was found to reduce fatigue and depression and to improve physical functioning, social functioning, and mental health (32).
- In a large prospective cohort of patients with colorectal cancer, those who engaged in leisure-time physical activity had a 31% lower risk of death than those who did not, independent of their leisure-time physical activity before diagnosis
- Men with nonmetastatic prostate cancer who engaged in vigorous activity for at least 3 hours per week had a 61% lower risk of death from prostate cancer compared with men who engaged in vigorous activity for less than 1 hour per week



SURGERY

Surgery can be curative, primary (removing the primary tumor, followed by other therapies) or palliative (by removing obstruction or alleviating pressure). Surgery is usually used in combination with other therapies, since approximately 70% of patients have evidence of micrometastases at the time of diagnosis.

ptparty.co



SURGERY

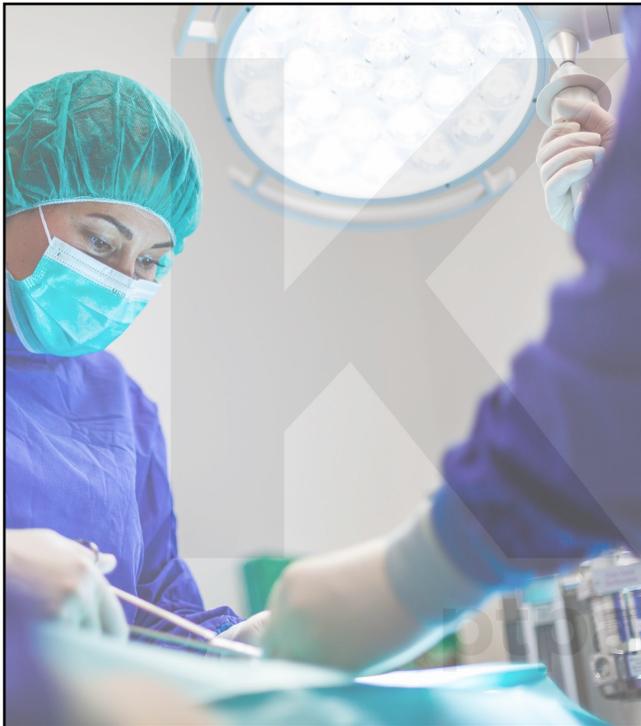
OPEN SURGERY

One large cut is used to remove the tumor, some healthy tissue, and sometimes nearby lymph nodes.

MINIMALLY INVASIVE SURGERY

Laparoscopic procedures to remove tumors while minimizing effects to healthy tissues.

ptparty.co



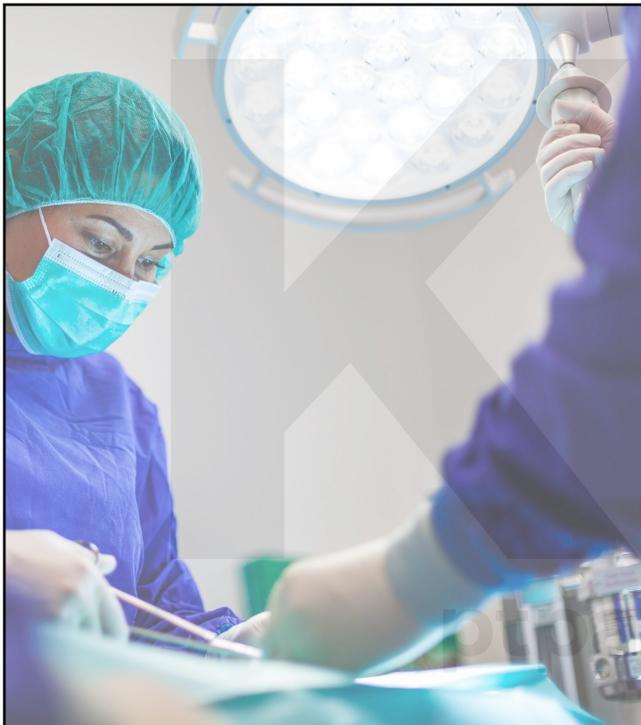
OTHER TYPES OF SURGERY

Cryosurgery - uses extreme cold produced by liquid nitrogen or argon gas to destroy abnormal cells. Used for: early skin and cervical cancers, some eye cancers

Lasers - can focus accurately on tiny areas, or shrink or destroy tumors/growths. Used for: cancers on surface of the body such as basal cell carcinoma, cervical, vaginal, esophageal, and non-small cell lung cancer

Hyperthermia - uses heat (up to 113°) to kill abnormal cells. Not yet widely used. Always in combination with chemo/radiation. Types include: radiofrequency ablation using high-energy radio waves, external applicators, probes, needles, heated drugs, thermal chambers, or even heating the patient's blood and recirculating it.

Photodynamic therapy - the patient is injected with a drug that reacts to light and stays in cancer cells longer than normal cells. The tumor is then exposed to light, which activates the drugs and produces an active form of O₂ which destroys cancer cells.



SURGERY SIDE EFFECTS

GENERAL

Fatigue, disfigurement, loss of function, infection, increased pain, deformity, bleeding/hemorrhage, scar tissue fibrosis

SITE SPECIFIC DEFICITS AND PRECAUTIONS

Examples:

Limited shoulder ROM/strength for breast cancer surgery

Avoiding Valsalva for abdominal surgeries

Avoiding the upright bike for colorectal, prostate, or gynecological surgeries



CHEMOTHERAPY

Treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing. Useful in treating widespread or metastatic disease. It may be given alone or with other treatments, such as surgery, radiation therapy, or biologic therapy.

ptparty.co

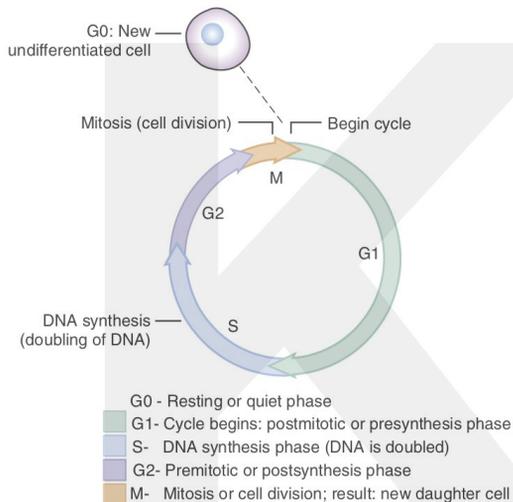


Figure 9-5

Cell cycle. *G0* represents the resting phase of cell proliferation. *G1* is the growth and preparation of the chromosomes for replication. *S* phase is the synthesis of DNA. *G2* is the preparation of the cell for division, and *M* represents mitosis (cell division). The final result of the cell cycle is the production of two identical daughter cells. [See text for complete description of the cell cycle in relation to chemotherapy and radiation therapy.] (Modified from Abeloff MD, Armitage JO, Niederhuber JE, et al: *Clinical oncology*, ed 3, 2004, London, Churchill Livingstone.)

CHEMOTHERAPY MECHANISM OF ACTION

Almost all chemotherapy agents kill cancers cells by affecting DNA synthesis or function.

Each drug varies in the way this occurs within the cell cycle. Combination therapies are used by administering drugs that target the cells at different phases of the cell cycle for optimum cell death.

artparty.co



CHEMOTHERAPY MECHANISM OF ACTION

Chemotherapy drugs are developed to specifically target cancer cells; however there is no easy way for a drug to distinguish cancer cells from healthy cells. The way many drugs target cancer cells is by targeting rapidly dividing cells like cancer. However, many of the cells in the body are rapidly dividing cells, like hair cells, the lining of the GI tract, and bone marrow. This is why chemotherapy often results in alopecia (hair loss), as well as anemia, sores/ulcers in the mouth/esophagus (mucositis), nausea and vomiting, bone marrow loss.



CHEMOTHERAPY METHODS OF ADMINISTRATION

Oral - pills, capsules, or liquids

Intravenous (IV) - through a catheter, port, or pump

Injection - subcutaneously or intramuscularly

Intracavity - into a body cavity such as the thoracic, abdominal, or pelvic cavity

Intrathecal - injected through the sheath of a structure, such as through the sheath of the spinal cord into the subarachnoid space

Arterial infusion - injected directly into an artery that leads to the cancerous tissue

Topical - a cream to rub into the skin

The method depends on the drug and its pharmacologic action and tumor location

Administration by any method is done intermittently in order to allow for bone marrow recovery between doses



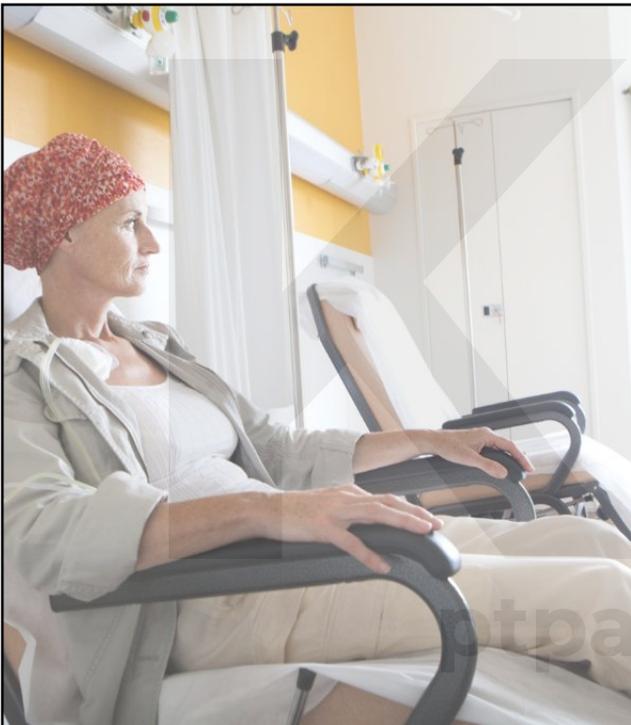
CHEMOTHERAPY TREATMENT

LENGTH OF TREATMENT - depends on many factors such as the extent of the cancer, type of cancer, type of drugs, and the expected toxicities of the drugs and required recovery times. Adjuvant chemo may last 4-6 months, such as breast or colon cancers. For testicular cancer, Hodgkin and non-Hodgkin lymphoma, and leukemias, tx may be up to 1 year.

Length of treatment also depends on the cancer's response. If it is visible and disappears, tx may only continue 1-2 more cycles. If it shrinks but does not disappear, tx may continue as long as tolerated. If it grows, that particular tx will be stopped.

DURATION OF THE CYCLE - minutes, hours, or days depending on the drug's protocol and methods of administration

FREQUENCY OF THE CYCLE - may be weekly, bi-weekly, or monthly



CHEMOTHERAPY SIDE EFFECTS

- Fatigue
- Pain
- Gastrointestinal effects: anorexia, nausea, vomiting, constipation, diarrhea, fluid/electrolyte imbalance
- Myelosuppression (Bone marrow suppression)
- Anemia
- Leukopenia (infection)/Neutropenia
- Decreased bone density with ovarian failure
- Anxiety & depression
- Hepatotoxicity
- Hemorrhage



CHEMOTHERAPY SIDE EFFECTS

- Muscle weakness
- Joint pain
- Hair loss, skin rashes
- Neuropathies
- Sterilization
- Stomatitis, mucositis (oral, rectal, vaginal)
- Sexual dysfunction
- Weight gain or loss
- Delirium
- Flu-like symptoms
- Memory or concentration problems
- Sleep problems



CHEMOTHERAPY & CARDIOTOXICITY

Classic chemotherapeutic agents, monoclonal antibodies, antiangiogenic drugs, and chemoprevention agents all have cardiovascular effects.

Cardiotoxicity may occur acutely, subacutely, or chronically.

May result in reduced left ventricular ejection fraction, symptomatic heart failure, arrhythmias, myocarditis, myocardial infarction, and pericarditis.

The most common chemotherapy drug to cause significant cardiotoxicity is doxorubicine (an anthracycline, topoisomerase inhibitor), which can lead to cardiomyopathy with heart failure.



CHEMOTHERAPY & NEUROPATHY

Chemotherapy-induced peripheral neuropathy (CIPN) is a toxicity-related injury of peripheral neurons

Observed with microtubule targeting agents (taxanes and vinca-alkaloids), heavy metal compounds (platinum compounds), some biologic agents (bortezomib, thalidomide).

The mechanism of injury is not well-understood, but these drugs are found in higher concentration in the dorsal root ganglion (sensory) than the ventral horn cell bodies (motor).



CHEMOTHERAPY & NEUROPATHY

Patients report paresthesias/dysesthesias /burning that progresses in a distal to proximal pattern as it becomes more severe.

Other symptoms include: diminished/absent DTRs, increased vibration or touch thresholds, hyperalgesia, allodynia, weakness/cramping of hand and feet muscles.

May also cause autonomic neuropathy, with orthostatic hypotension, constipation/ incontinence, sexual dysfunction

May last days, weeks, or years.

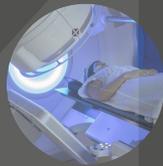


CHEMOTHERAPY & OTHER TOXICITIES

Other toxicities that may arise from chemotherapy: pulmonary, renal, hepatic

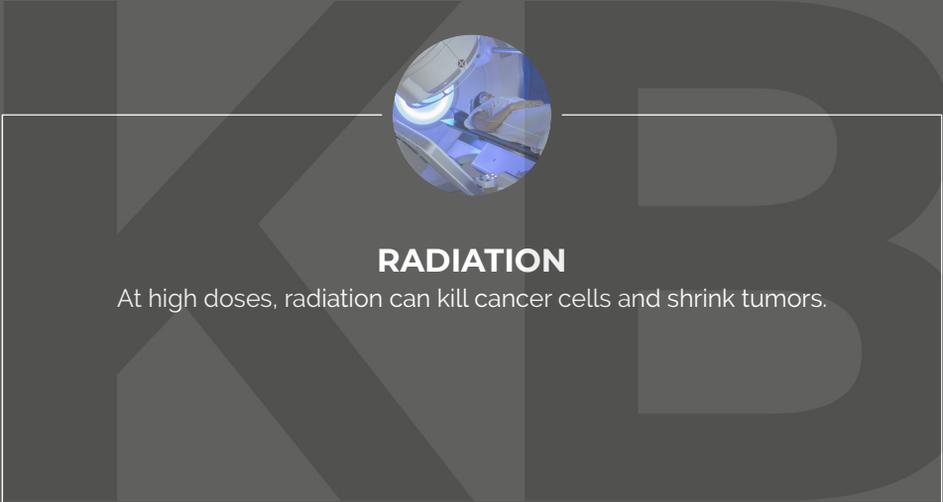


ptparty.co

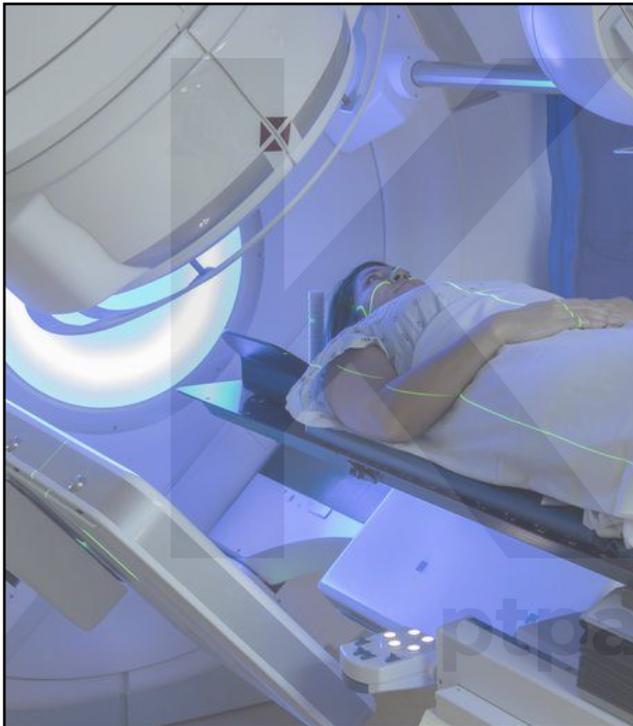


RADIATION

At high doses, radiation can kill cancer cells and shrink tumors.



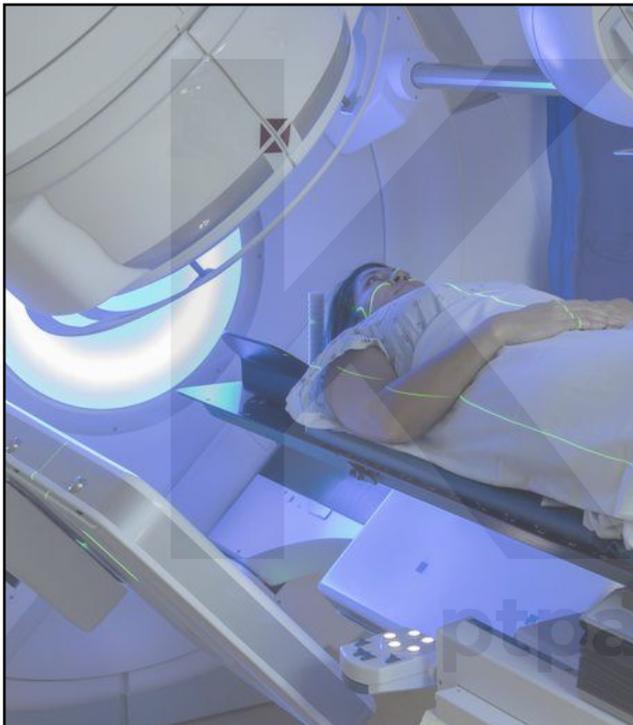
ptparty.co



RADIATION MECHANISM OF ACTION

Radiation destroys the dividing cancer cells by destroying hydrogen bonds between DNA strands

There are 2 types: ionizing radiation and particle radiation, which produces less skin damage.



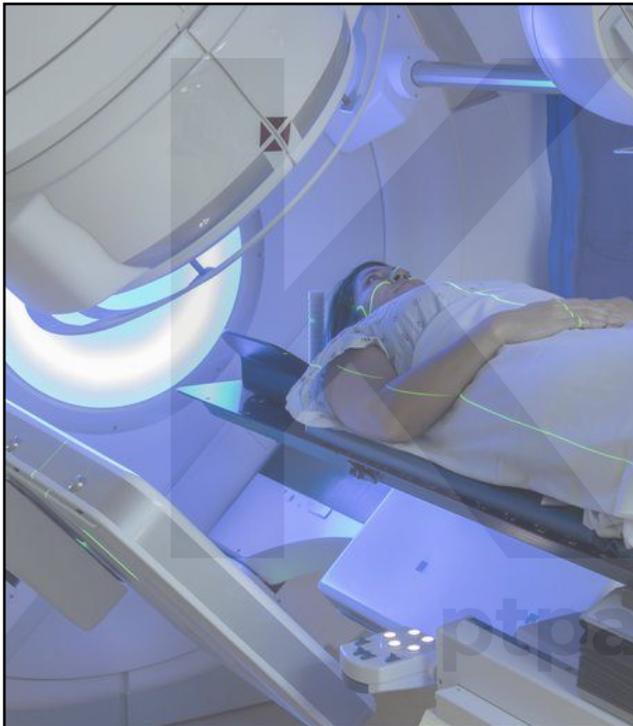
RADIATION METHODS OF ADMINISTRATION

External Beam Radiation Therapy

(teletherapy) - an external machine aims radiation locally to the cancer tissue. Uses either photons, protons, or electrons

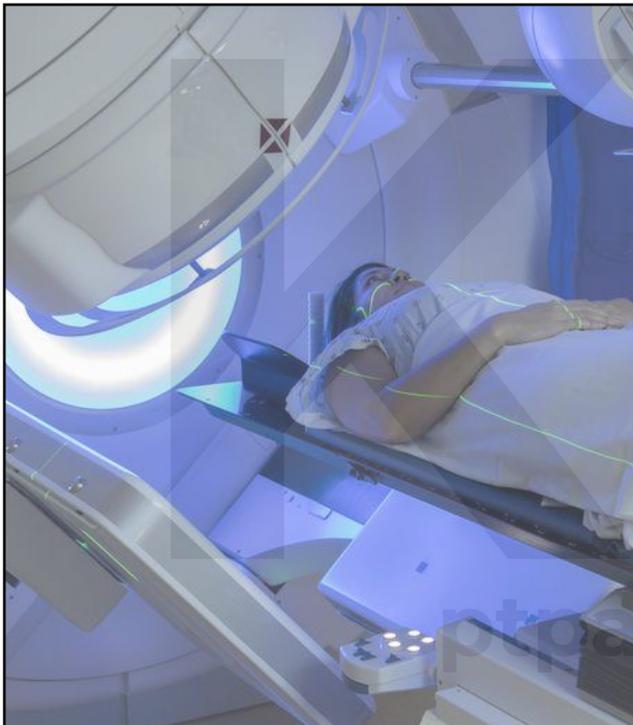
Internal Radiation Therapy

(brachytherapy) - Solid radioactive substances in the forms of seeds, ribbons, or capsules are placed in your body, in or near the tumor. The patient's body does emit radiation during and after treatment. They should limit time around others (especially pregnant women and children under 1 year)



RADIATION METHODS OF ADMINISTRATION

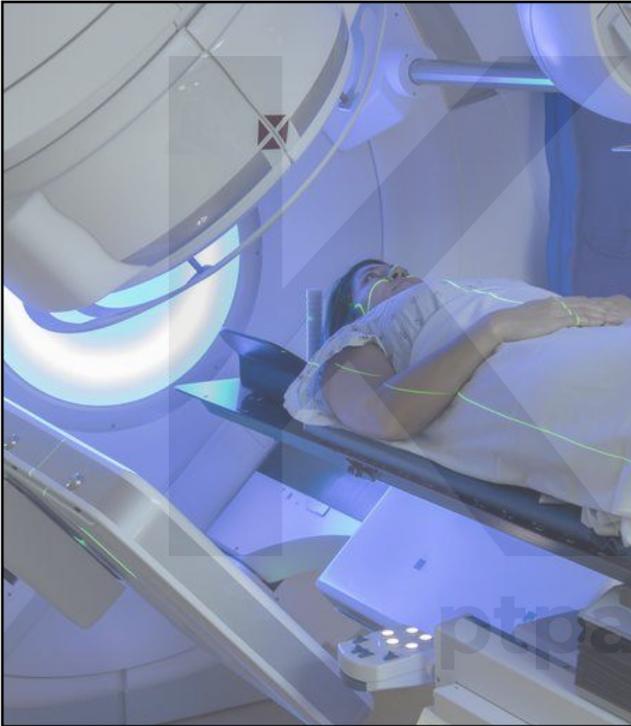
Internal Radiation Therapy (systemic therapy) - Liquid sources of radiation therapy are administered by swallowing, IV, or injection. The patient's body fluids such as urine, sweat, and saliva will emit radiation (although this is under current investigation).



RADIATION TREATMENT

LENGTH OF TREATMENT - For External-beam radiation therapy, sessions last about 15 min, 5 times per week, with weekends off to allow time for recovery.

For brachytherapy, you may stay in the hospital 1-7 days while the radiation is in your body. At the end of your stay the doctor removes the radiation implants. Or, you may only have it in for only 10-20 min at a time, twice a day for 2-5 days, or once a day for 2-5 weeks.



RADIATION SIDE EFFECTS

- Fatigue
- Radiation sickness
- Immunosuppression
- Decreased platelets
- Decreased white blood cells
- Infection
- Fibrosis
- Radiation recall
- Mucositis
- Diarrhea
- Edema
- Hair loss
- Ulceration, delayed wound healing
- CNS/PNS effects
- Malignancy



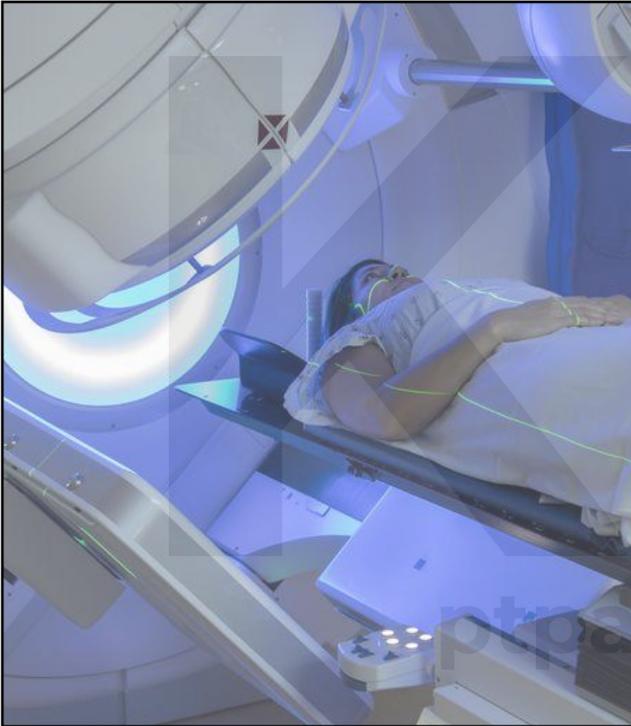
RADIATION TOXICITIES

Radiation can cause toxicity to many organs of the body, depending on their location, length of treatment, and sensitivity to radiotherapy.

Esophagitis - Can cause abnormal peristalsis activity, odynophagia, dysphagia, then stricture and fistula formation as a result of inflammation and fibrosis

Enterocolitis - Destruction of intestinal cells can cause difficulty absorbing nutrition, dehydration, diarrhea/cramping/nausea, fibrosis leading to strictures and fibrosis, abscess and ulcers

Radiation Heart Disease - May cause pericarditis, coronary heart disease, and myocardial disease, due to damage to the endothelium of the heart vasculature. Early cardiovascular disease is the leading noncancer cause of death in cancer survivors.



RADIATION TOXICITIES

Radiation Lung Disease - dyspnea, acute respiratory distress, pneumonitis, fibrosis

Radiation Dermatitis - Very common. Grades 1-4 with increasing severity, ranging from scaling to necrosis

Radiation & Connective Tissue - Very common. Can cause fibrosis, atrophy, and contraction of any tissue that underwent radiation, but especially collagen. Also causes edema, decreased ROM, and functional impairment. Bone weakness may lead to pathological fractures.

Radiation & the Nervous System - Very common. May cause memory difficulties, lethargy, changes in behavior/cognition, decreased appetite, dry skin, hearing loss, headache, nausea/vomiting, seizures. More rarely, myelopathy, plexopathy, cerebral radionecrosis

Table 5-7 Immediate and Delayed Effects of Ionizing Radiation*

System Affected	Immediate	Delayed Effect
Musculoskeletal		Soft-tissue (collagen) fibrosis, contracture, atrophy Orthopedic deformity
Neuromuscular	Fatigue Decreased appetite Subtle changes in behavior and cognition Short-term memory loss Ataxia (subacute)	Myelopathy (spinal cord dysfunction) Cerebral injury, neurocognitive deficits Radionecrosis (headache, changes in personality, seizures) Plexopathy (brachial, lumbosacral, or pelvic plexus) Gait abnormalities
Cardiovascular/ pulmonary	Fatigue, decreased endurance Radiation pneumonitis	Radiation fibrosis (lung) Cardiotoxicity Coronary artery disease Myocardial ischemia/infarction Pericarditis Lymphedema
Integumentary	Erythema Edema Dryness, itching Epilation or hair loss (alopecia) Destruction of nails Epidermalysis (loose skin) Delayed wound healing	Skin scarring, delayed wound healing, contracture Telangiectasia (vascular lesion) Malignancy (basal cell, squamous cell, melanoma)
Other	Gastrointestinal: anorexia, nausea, dysphagia; vomiting, diarrhea, xerostomia (dry mouth); stomatitis (inflammation of mouth mucosa); esophagitis; intestinal stenosis	Bone marrow suppression (anemia, infection, bleeding) Cataracts Endocrine dysfunction (cranial radiation) including amenorrhea, menopause, infertility, decreased libido Hepatitis Nephritis, renal insufficiency Malignancy
	Renal/urologic: urinary dysfunction	Skin cancer Leukemia Lung cancer Thyroid cancer Breast cancer

*Some of the delayed effects of radiation (e.g., cerebral injury, pericarditis, pulmonary fibrosis, hepatitis, nephritis, GI disturbances) may be signs of recurring cancer. The physician should be notified of any new symptoms, change in symptoms, or increase in symptoms.



IMMUNOTHERAPY (BIOTHERAPY)

Aims to strengthen the host's immune system's biological response to the malignant cells

ptparty.co

IMMUNOTHERAPY MECHANISM OF ACTION

Inhibits immune system checkpoints which block the immune system from being too strong

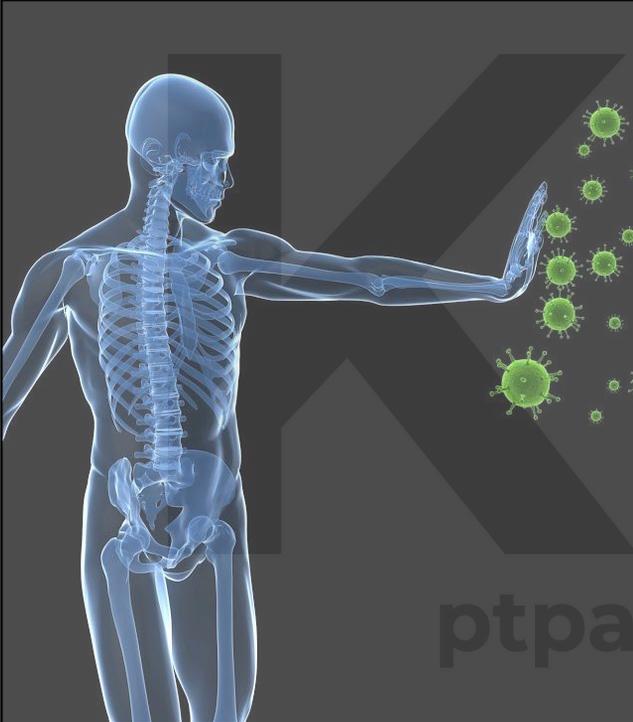
T-cell transfer therapy

Treatment vaccines

Agents used to help the patient's immune system identify and kill cancer cells: interferons, interleukin-2, bone marrow transplant, stem cell transplant, monoclonal antibodies, hormonal therapy, and colony-stimulating factors

Administered intravenously, orally, topically, or intravesically (into the bladder)

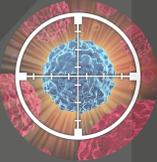
ptparty.co



IMMUNOTHERAPY SIDE EFFECTS

- Fatigue
- Fever
- Chills
- Nausea, vomiting
- Anorexia
- Fluid retention
- CNS effects
 - Slowed thinking
 - Memory problems
- Inflammatory reactions at injection sites
- Anemia
- Leukopenia
- Altered taste sensation

ptparty.co



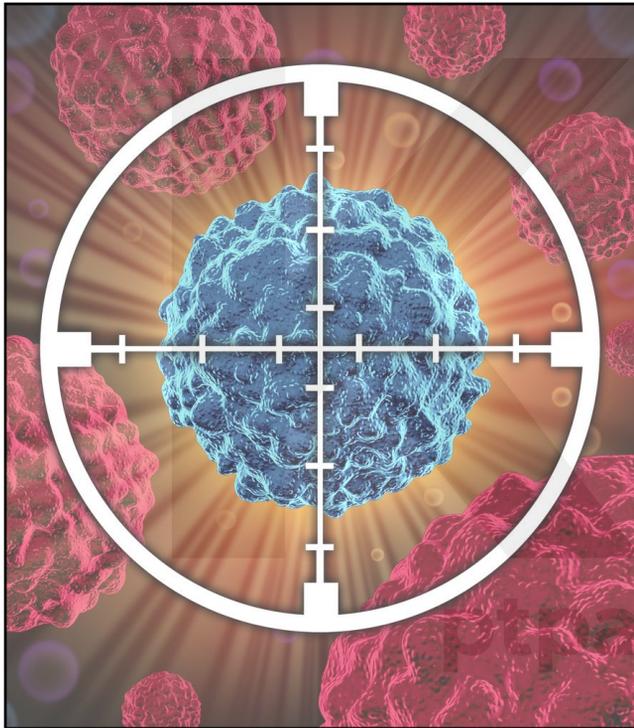
TARGETED THERAPY

"Smart drugs"

A form of immunotherapy including two broad categories

- 1) small-molecule drugs (like tyrosine kinase enzyme)
- 2) monoclonal antibodies (mAb)

ptparty.co



TARGETED THERAPY MECHANISM OF ACTION

Help the immune system through marking cancer cells, or boosting immune system

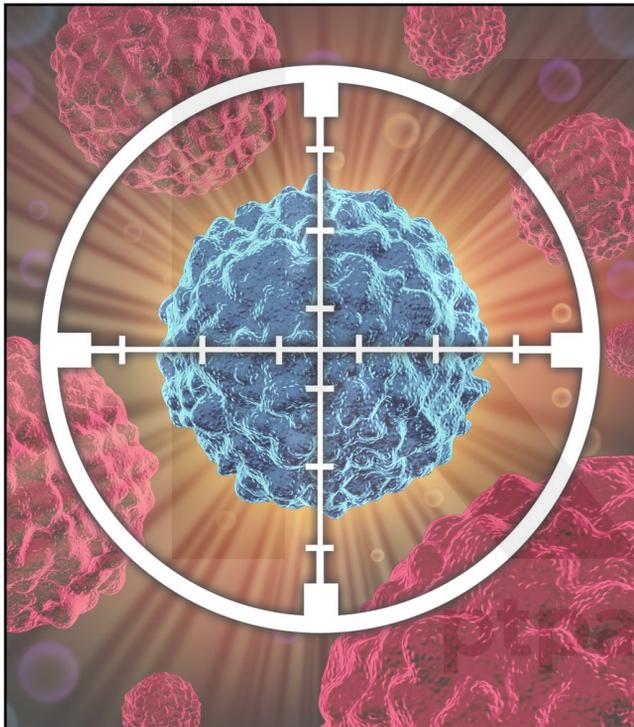
Stop cancer cells from growing through interfering with proteins that signal cell division

Stop signals that help form blood vessels - Angiogenesis is crucial for tumor survival, so cutting off the blood flow hurts the tumor

Combining with other therapies to target cancer cells more specifically - deliver toxins, chemo, and radiation to cancer cells

Cause cancer cell death - some cancer cells are programmed to avoid apoptosis, targeted therapy subverts this process

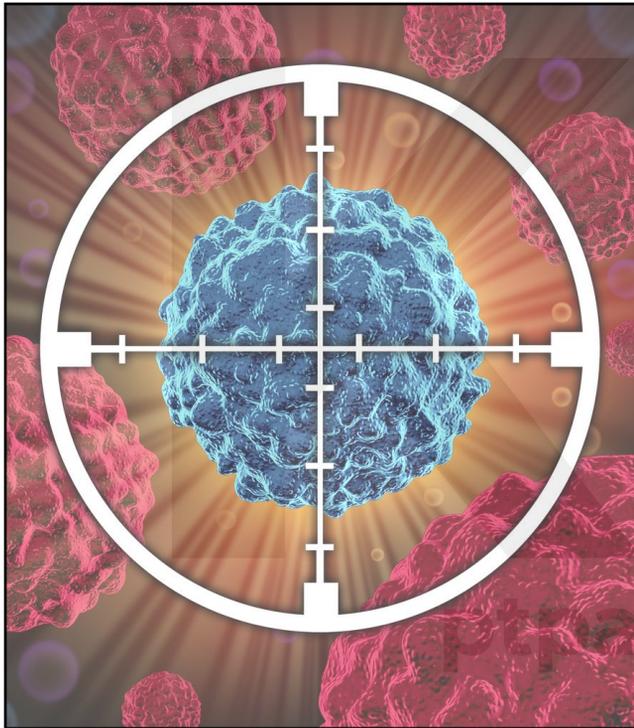
Starve the cancer of hormones it needs to grow



SMALL MOLECULE DRUGS

small molecules can enter cells, and can target enzymes/molecules specific to cancer cells

Administered via pills or capsules



MONOCLONAL ANTIBODIES

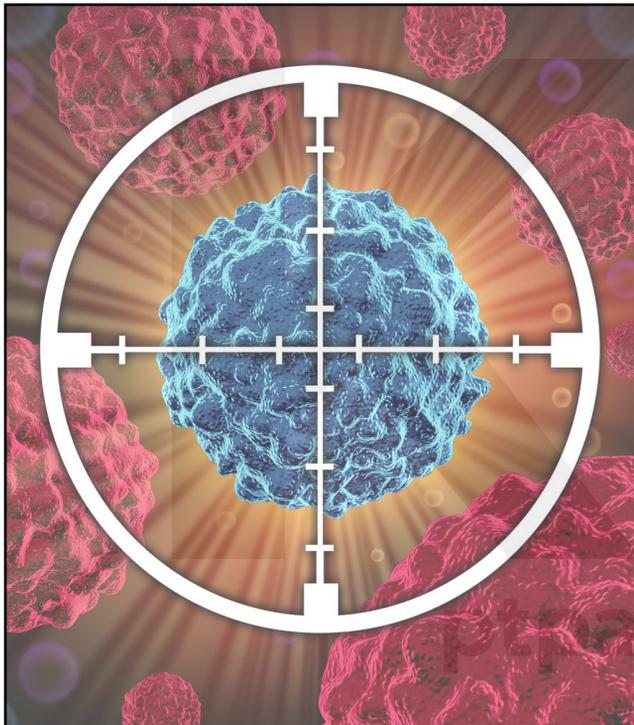
-mab

Rituximab (Rituxan), trastuzumab (Herceptin), bevacizumab (Avastin), alemtuzumab (CamPath), and cetuximab (Erbix)

Monoclonal antibodies are laboratory-produced molecules engineered to serve as substitute antibodies that can restore, enhance or mimic the immune system's attack on cancer cells. They are designed to bind to antigens that are generally more numerous on the surface of cancer cells than healthy cells.

Administered intravenously

arty.co



SIDE EFFECTS OF TARGETED THERAPY

- diarrhea
- liver problems
- thrombus formation
- prolonged bleeding
- hypertension
- fatigue
- mouth sores
- nail changes
- the loss of hair color
- skin problems including rash or dry skin
- very rarely, fistulas of the esophagus, stomach, small intestine, large bowel, rectum, or gallbladder
- Renal toxicity
- Infusion reaction (fever, chills, shortness of breath, chest pain, back pain, flushing, changes in heart rate and blood pressure)

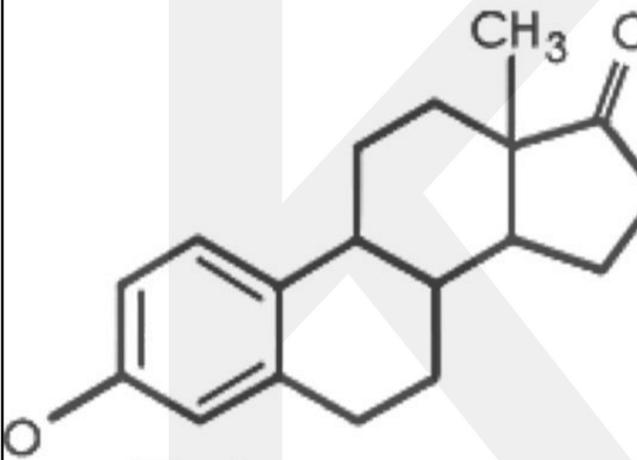
arty.co



HORMONE THERAPY

Many cancers use hormones to thrive. Hormone therapy is used to block the receptors for these hormones to limit tumor growth. Hormone therapy might also be used to ease cancer symptoms.

ptparty.co



Estrogen

Examples of hormone therapy:

Tamoxifen - antiestrogen hormonal agent. Used to block estrogen receptors in breast tumor cells.

Leuprolide - luteinizing hormone-releasing hormone. Inhibits testosterone release and tumor growth.

Hormonal therapies are also used to treat myelodysplasia and hematologic malignancies (lymphoma, myeloma, leukemia)

Administration of hormone therapy:

Administered orally, via injection or through removal of ovaries/testes

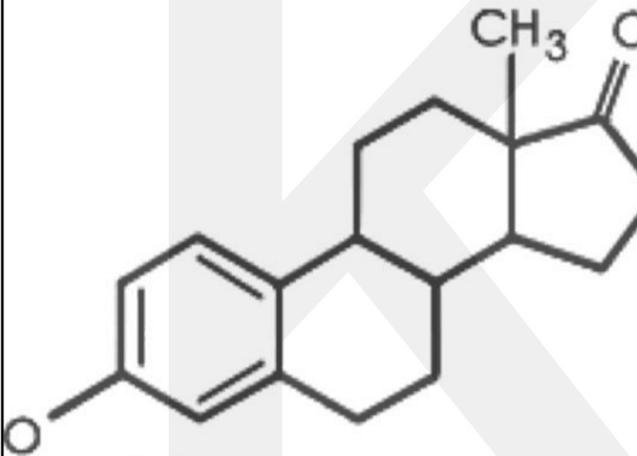
SIDE EFFECTS OF HORMONE THERAPY

In men receiving therapy for prostate cancer:

- Hot flashes
- Loss of interest in or ability to have sex
- Weakened bones
- Diarrhea
- Nausea
- Enlarged and tender breasts
- Fatigue

In women receiving therapy for breast cancer:

- Hot flashes
- Vaginal dryness
- Changes in your periods if you have not yet reached menopause
- Loss of interest in sex
- Nausea
- Mood changes
- Fatigue



Estrogen



OTHER TYPES OF CANCER TREATMENT

Transplant (bone marrow, stem cell): restoring bone marrow or blood forming cells if they have been destroyed by treatment

Antiangiogenic therapy: prohibiting tumors from growing vascular structures so they can't survive

Precision Medicine: tailoring the treatment to the genetic changes in individual's cancer



CANCER RELATED FATIGUE

All of the the treatment for cancer, cancer itself, and the side effects of cancer can cause fatigue.

ptparty.co



CANCER RELATED FATIGUE

70-100% of all individuals with cancer will experience cancer-related fatigue.

Symptoms include: persistent tiredness not relieved by rest, shortness of breath, difficulty concentrating, difficulty performing ADLs.

Most patients experiencing fatigue during the course of their treatment, but as much as 35% will experience fatigue 24 months after the completion of therapy.

Due to a variety of causes: cancer, cancer treatment, anemia; infection; accompanying pulmonary, hepatic, cardiac, and renal disorders; sleep disorders; pain; lack of exercise, hormonal changes, and malnutrition; as well as psychological causes such as anxiety, depression, and cognitive issues.

Responds best to both a physical and psychological approach.

ptparty.co



PHYSICAL THERAPY & CANCER CONSIDERATIONS

Many side effects of cancer and cancer treatments require special care from the patient and physical therapy.

ptparty.co



Neutropenia (low WBCs) - take steps for infection control & hygiene, monitor for signs of infection, avoid exposure to infectious agents, wear shoes

Anemia (low Hgb and Hct) - monitor patient's energy levels, monitor for dyspnea, heart palpitations, dizziness. Advise patients to get enough sleep and rest during activity, and change positions slowly. If the anemia is severe enough, the patient may need to avoid exercise.

Thrombocytopenia (low platelets) - avoid contact sports or anything that may cause bruising, avoid tight clothing, try to avoid cuts (as with all patients)

Avoid strenuous activity following implantation of radioactive seeds for brachytherapy.

Skin tattoos are used to guide beam alignment for external beam radiation, avoid taping and some soft tissue/myofascial mobilizations if they would change the position of the tattoos



Protect irradiated skin from any chafing/rubbing/wetness/chlorinated water and avoid massage and heat

Patients with indwelling catheters should avoid water, exposure to causes of infection, and resistance training of muscles that could dislodge the catheter

Recumbent stationary bike may be a better choice than the treadmill if the patient has peripheral neuropathy/gait disturbance

Check any modalities for precautions/contraindications for that patient's specific type and location of cancer (for example, no ultrasound over malignancies)



Precautions to aerobic exercise in chemotherapy clients:

Platelet count <math>< 50,000/\text{mL}</math>

Hemoglobin <math>< 10 \text{ g/dL}</math>

White blood cell count <math>< 3000/\text{mL}</math>; 10,000 with fever (no exercise)

Absolute granulocytes <math>< 2500/\text{mL}</math>



Anyone with cancer experiencing any of the following (especially brought on or exacerbated by exercise) should contact his or her physician.

- Fever
- Extreme or unusual tiredness or fatigue
- Unusual muscular weakness
- Irregular heartbeat, chest palpitations, or chest pain
- Sudden onset of dyspnea
- Leg pain or cramps
- Unusual joint pain
- Recent or new-onset back, neck, or bone pain
- Unusual bruising, nosebleeds, or bleeding from any other body opening
- Sudden onset of nausea during exercise
- Rapid weight gain or weight loss
- Severe diarrhea or vomiting
- Disorientation, confusion, dizziness, or light-headedness • Blurred vision or other visual disturbances
- Skin pallor or unusual skin rash
- Night pain



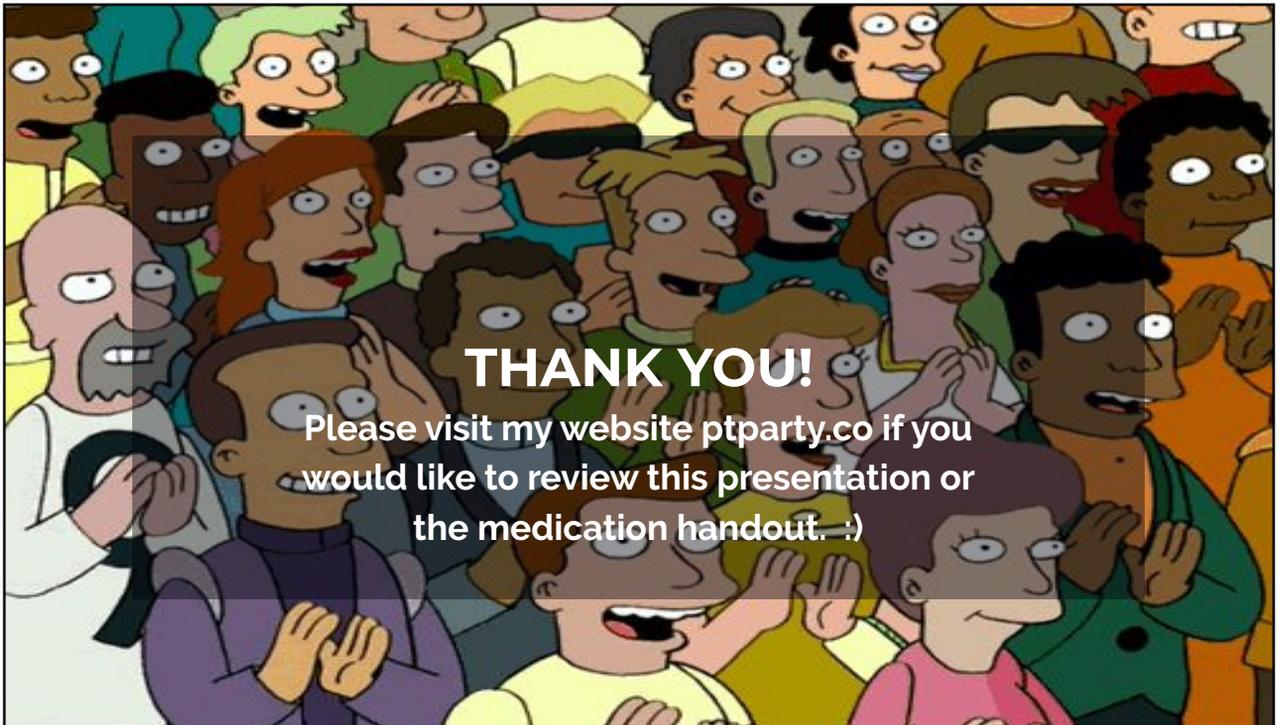
RESOURCES

1. Goodman, C; Fuller, Kenda. *Pathology: Implications for the Physical Therapist*. Elsevier Saunders. St Louis, MO. 2015.
2. World Health Organization. "Cancer". <https://www.who.int/news-room/fact-sheets/detail/cancer> 2020.
3. Center for Disease Control. "FastStats - Leading Causes of Death". <https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm> 2020.
4. World Health Organization. International Society for Research on Cancer. "Estimated Number of New Cases in 2018, Worldwide."
5. National Cancer Institute. "Physical Activity and Cancer Fact Sheet." <https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity-fact-sheet>
6. World Confederation for Physical Therapy. "The role of physical therapy in cancer." https://www.wcpt.org/sites/wcpt.org/files/files/WPTDay11_Cancer_Fact_sheet_C6.pdf
7. National Cancer Institute. "Cancer Treatment", <https://www.cancer.gov/about-cancer/treatment>
8. Physiopedia. "Physiotherapy and cancer treatment". https://www.physio-pedia.com/Physiotherapy_and_cancer_treatment
9. Giles, S. *PT Exam*. Scorebuilders. 2018.
10. The Ultimate Guide to Oncology Pharmacy for the Non-Oncologist. Brandon Dyson <https://www.tldrpharmacy.com/content/the-ultimate-guide-to-oncology-pharmacy-for-the-non-oncologist> 2020.
11. Cleveland Clinic Cancer. "How Long is Chemotherapy Given?" <https://chemocare.com/chemotherapy/what-is-chemotherapy/how-long-is-chemotherapy-given.aspx>
12. ELECTROPHYSICAL AGENTS - Contraindications And Precautions: An Evidence-Based Approach To Clinical Decision Making In Physical Therapy. *Physiother Can.* 2010 Fall; 62(5): 1-80. Published online 2011 Jan 5. doi: 10.3138/ptc.62.5 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3031347/>



IMAGE RESOURCES

1. <https://ehonami.blob.core.windows.net/media/2017/08/alternative-cancer-treatments-work-find.jpg>
2. http://4.bp.blogspot.com/-w-v_hr-pDDs/UdDsiRx-IKI/AAAAAAAAAIM/1cvNycpo8aM/s1600/earth.jpg
3. <http://imcc.allpostersimages.com/images/P-473-488-90/77/7705/HEV1300Z/posters/night-time-satellite-view-of-the-united-states-of-america.jpg>
4. <https://static.independent.co.uk/s3fs-public/thumbnails/image/2017/06/08/16/getting-back-into-exercise.jpg>
5. https://www.inquirer.com/resizer/HJ_6nQmwAdi8HmDvD9RXPFibicQ=/1400x932/smart/arc-anglerfish-arc2-prod-pmn_s3.amazonaws.com/public/GY3ZNV1HSRDOXFES54DJK4OAUJA.jpg
Photo by [Artur Tumasian](#) on [Unsplash](#)
6. <https://alaskaavenuedental.files.wordpress.com/2015/02/iv-bag.jpg>
7. <https://d1f2yo4rht0zy2.cloudfront.net/wp-content/uploads/2018/02/chemotherapy-woman-sitting-in-chair.png>
8. [https://www.verywellhealth.com/thumb/EXBNdpp4Krl_ZSihEn5N9OdZ3hp/=768x0/filters:no_upscale\(\)max_bytes\(150000\)strip_icc\(1\)/GettyImages-613327714-5a6a164c8e1b6e001a5d644e.jpg](https://www.verywellhealth.com/thumb/EXBNdpp4Krl_ZSihEn5N9OdZ3hp/=768x0/filters:no_upscale()max_bytes(150000)strip_icc(1)/GettyImages-613327714-5a6a164c8e1b6e001a5d644e.jpg)
9. <https://i.ytimg.com/vi/iuX1JbQWfUj/maxresdefault.jpg>
10. <http://www.diagnosisdiet.com/wp-content/uploads/2013/01/cancer-target-licensed.jpg>
11. <http://roguehealthandfitness.com/wp-content/uploads/2017/10/estrogen.jpg>
12. <https://pilbox.themuse.com/image.jpg?url=https://assets.themuse.com/uploaded/attachments/16676.jpg?v=None&fmt=jpeg&h=367&mode=fill&w=750>
13. <https://practiceperfectemr.com/blog/wp-content/uploads/2017/06/physical-therapy-marketing-bootcamp.jpg>



KB

ptparty.co