Normal Immune Response:
- The body’s *ability to resist disease*
- Serves 3 functions
  - Defense
  - Homeostasis
  - Surveillance

*Antigens*: Substances the body recognizes as foreign that elicit an immune response
- Most are composed of protein

*Antibodies*: Immune globulins produced by lymphocytes in response to antigens.

**Humoral Immunity**: B-cells, antibodies, present.

**Protection**: Bacteria, Viruses (extracellular), respiratory pathogens, GI pathogens.

**Cellular Immunity**: T-lymphocytes, macrophages, sensitized T cells, Cytokines, present.

**Protection**: Fungus, viruses (intracellular), chronic infectious agents, Tumor cells.

**Dendritic Cells**: Important in activating the immune response
- Capture antigens at sites of contact with the external environment.
- Transport an antigen until it encounters a T cell with specificity for the antigens.

**Cytokines**: Soluble factors *secreted by WBC’s* and a variety of other cells in the body.
- *Act as messengers* among cell types
- Instruct cells to *alter their proliferation, differentiation, secretion, or activity*.
- Currently at least 100 different cytokines
- Have a beneficial role in hematopoiesis and immune function
- Can have detrimental effects
- Chronic inflammation
- Autoimmune diseases
- Sepsis

**Cytokine Types**:
- Interleukins
- Interferons
- Tumor necrosis factor
- Colony-stimulating factor
- Colony-stimulating factors
- Erythropoietin

**Variables that Effect Immune System Function**
- Age and gender
- Nutrition
- History of infection or immunization
- Allergies
- Presence of conditions or disorders: autoimmune disorders, cancer or neoplasm, chronic illness surgery or trauma.
Development of Cells of the Immune System

Bone Marrow -> Lymphoblasts

Lymphoblasts-> Bone marrow Maturation-> B Lymphocytes-> Memory Cells & Plasma Cells -> Antibodies (Humoral Response)

Lymphoblasts-> Thymus->Regular T cells-> helper T cells & Suppressor T cells
       -> Effector T cells-> Cytotoxic T Cells
       (Cellular cell mediated response)

**B-Lymphocytes** mature in the bone marrow.
**T-Lymphocytes** mature in the thymus, where they also differentiate into cells with various functions.

Phagocytic Immune Response:

**Mononuclear Phagocytes:** Include monocytes in the blood and macrophages found throughout the body.

- Capture, process, and present antigens to lymphocytes to initiate an immune response
- Capture antigens by **phagocytosis**

**Humoral Immunity:** Anti-body mediated immunity

**Antibodies** produced by plasma cells (B Lymphocytes)
- Primary immune response is evident **4-8 days after initial exposure to antigens**

5 Classes of immune globulins
- Each has a specific characteristic

**IgG** - Largest component of total immune globulins; **found in plasma and interstitial fluid**; only Ig to cross placenta and provide newborn with passive acquired immunity
IgA: Found in **body secretions**: *Saliva, tears, breast milk. Lines mucous membranes.*

**IgM**: Largest of immune globulins is found in plasma; responsible for primary immune response; forms antibodies to ABO blood antigens.

**IgD**: Found in **plasma**; present on **lymphocyte surface**; assists in *differentiation of B lymphocytes*.

**IgE**: Found in **plasma and interstitial fluids**; causes *symptoms of allergic reaction*.

**Cellular Immune Response**:

T-Lymphocytes: Cellular immunity
- Attack invaders directly, secrete cytokines, and stimulate immune system responses.
- Helper T cells
- Cytotoxic T-Cells
- Memory Cells
- Suppressor T cells (suppress immune response)

**Assessment of The Immune System**
- Health history, including nutrition, infections, immunizations, allergies, autoimmune disorders, cancer, and chronic illness.
- Physical exam including lymph node assessment in addition to other body systems.

**Signs of Primary Immunodeficiencies**
- Vary according to type, severe or recurrent infections, failure to thrive or poor growth, positive family history.

**10 Signs of Primary Immunodeficiencies**
1. Four or more new ear infections within 1 year.
2. Two or more serious sinus infections within 1 year
3. Two or more months on antibiotics with little effect
4. Two or more pneumonias within 1 year
5. Failure of an infant to gain weight or grow normally
6. Recurrent, deep skin or organ abscesses
7. Persistent thrush in mouth or fungal infection on skin
8. Need for intravenous antibiotics to clear infections
9. Two or more deep seated infections including septicemia
10. A family History of PI.

**Tests to Evaluate Immune Function**
- WBC count and differential
- Bone Marrow Biopsy
- Humoral and cellular immunity tests
- Phagocytic cell function test
- Complement component test
- Hypersensitivity tests
- Specific antigen-antibody tests
- HIV infection tests

Management of patients with HIV infection and AIDS
- Survival Rates have increased dramatically in the past 20 years
- 1.2 million people in the US are living with HIV; 1 in 5 are unaware they are infected.
- 50,000 new infections per year
- Number of new HIV infections, globally, declined 19% over the past decade

Transmission of HIV
- Transmitted only through contact with body fluids under specific conditions
- Blood, semen, vaginal secretions, and breast milk.
- Sexual contact with an infected partner is the most COMMON mode of transmission.
- Contact with blood and blood products
- Sharing drug-using equipment is risky
- Infection through transfusions of blood or clotting factors is now unlikely with implementation of screening measures.
- Puncture wounds are most common means of work-related HIV transmission.

Perinatal Transmission
- Can occur during pregnancy or breastfeeding
- An average of 25% of infants born to women with untreated HIV will contract the infection.
- Treatment can reduce the rate of transmission to less than 2%.

Prevention
- Safer sex practices and safer behaviors
  - Abstain from sharing sexual fluids
  - Reduce the number of sexual partners to one
  - Always use latex condoms; if allergic to latex, use non-latex condoms.
- Do not share drug injection equipment
- Blood screening and treatment of blood products

Pathophysiology of HIV
- HIV uses the chemokine receptors CXCR4 and CCR5 as Co-receptors (CD4 is the main receptor) to support binding and entry into the CD4+T cell.
- HIV is a ribonucleic acid (RNA) Virus, which replicated by using its RNA as a template to produce deoxyribonucleic acid (DNA), which is then integrated into the human genome.
- Immune dysfunction in HIV infection is caused by damage and destruction of CD4+T cells (also known as T helper cells or CD4+T lymphocytes)

- Like all viruses, HIV cannot replicate unless it is inside a living host.
- HIV is surrounded by an envelope made up of proteins and contains a core of viral RNA and proteins.
-HIV has gp120, glycoproteins that attach to CD4 and chemokine CXCR4 and CCR5 receptors on the surface of CD4+T cells (fusion).

-Viral RNA then enters the cell, produces viral DNA in the presence of reverse transcriptase, and incorporates itself into the human genome in the presence of integrates, causing permanent cellular infection and the production of new virions.

-There are 2 consequences of this action.

1: Because all genetic material is replicated during cell division, all daughter cells will also be infected.

2: Viral DNA in the genome will direct the cell to make new HIV.

New Viral RNA develops initially in long strands that are cut in the presence of protease and leave the cell through a budding process that ultimately contributes to cellular destruction.

**Immune problems start** when CD4+T-cell counts drop to **Less than 500 cells/ul**

**Severe Problems develop** when **less than 200 cells/ul**

**Normal range is 800-1200 cells/ul**

**Insufficient immune response allows for opportunistic diseases**

**Viral Load in the Blood**

**Initial Infection:**
- Viremia (large viral levels in blood) for 2-3 weeks.
- Transmission is more likely when viral load is high.
- Followed by prolonged period (years) of low viral load.

During the time of low viral load, which may last for more than 10 years, clinical symptoms can be limited. Even without symptoms, HIV replication occurs at a rapid and constant rate in the blood and lymph tissues.

A major consequence of rapid replication is that errors can occur in the copying process, causing mutations that can contribute to resistance HIV and limit treatment options.

**Stages of HIV Disease**
- Primary (Acute) Infection
- HIV asymptomatic
- HIV symptomatic
- AIDS

**Primary Acute Infection**
- Seroconversion (When HIV specific antibodies develop), is often accompanied by a mononucleosis like syndrome that may be mistaken for the flu. May take several weeks to detect antibodies (Window-period)
- These symptoms generally occur 2-4 weeks after the initial infection and last for 1-2 weeks, although some symptoms may persist for several months.
-Some people also develop neurologic complications, such as aseptic meningitis, peripheral neuropathy, facial palsy, or Guillain-Barre syndrome.
-During this time, a high viral load (the amount of HIV circulating in the blood) is noted, and CD4+T cell counts fall temporarily but quickly return to baseline or near baseline levels.
-Many people, including health care providers, mistake acute HIV symptoms for a bad case of the flu.

**HIV Asymptomatic**
- The interval between untreated HIV infection and a diagnosis of AIDS. Median interval of 11 years between infection and diagnosis of AIDS.
- During this time, CD4+T cell counts remain above 500 cells/ul (normal or only slightly decreased), and the viral load in the blood will be low.
- Because people are often unaware of their disease status, they have little reason to seek treatment or make behavior changes that could improve the quality and length of their lives and can unknowingly transmit HIV to others.
- Fatigue, headache, low grade fever, night sweats, and other symptoms.
- Upon reaching the viral set point, chronic asymptomatic state begins.
- Body has sufficient immune response to defend against pathogens.

**HIV Symptomatic**
- CD4T cell count begins to drop to 200-499
- Symptomatic Infection
  - Shingles
  - Persistent Vaginal Candidal Infections
  - Herpes
  - Bacterial Infections

**AIDS**
- A diagnosis of AIDS cannot be made until the HIV-infected patient meets criteria established by the CDC.
- AIDS is characterized by:
  - Severe immune system suppression and CD4+T cell counts less than 200 cells/ul

“Undetectable” indicates the viral load is lower than the test is able to report, “undetectable” does NOT mean the virus has been eliminated from the body, or that the individual can no longer transmit HIV to others.

**Diagnostic Studies:**
- Abnormal blood test results are common in HIV infection and may be caused by HIV, opportunistic diseases, or complications of therapy.
Decreased white blood cell (WBC) counts, especially below-normal numbers of lymphocytes (lymphopenia) and neutrophils (neutropenia); low platelet counts (thrombocytopenia) and anemia are often seen.

Altered liver function, caused by HIV infection, drug therapy, or co-infection with a hepatitis virus, is common. Early identification of co-infection with hepatitis B virus (HBV) and/or hepatitis C virus is extremely important because these infections have a more serious course in patients with HIV, may ultimately limit options for ART, and can cause liver-related morbidity and mortality.

Two Types of RESISTANCE TESTS can determine if a patient's HIV is resistant to drugs used:

Genotype Assay detects drug resistant viral mutations that are present in reverse transcriptase and protease genes.

Phenotype Assay: measures the growth of HIV in various concentrations of antiretroviral drugs (much like bacteria-antibiotic sensitivity tests). These assays help to determine new drug combinations for patients who are not responding to therapy.

Collaborative Care:
- Care of the HIV infected patient focuses on
  - Monitoring HIV disease progression and immune function
  - Initiating and monitoring antiretroviral therapy (ART)
  - Preventing the development of opportunistic diseases
  - Detecting and treating opportunistic diseases
  - Preventing or decreasing complications of treatment
  - PREVENTING CACHEXIA AND WASTING
  - Preventing further transmission of HIV.

Antiretroviral Therapy (ART)
- ART can significantly slow disease progression but it
  - Is complex
  - Has side effects
  - Does not work for everyone
  - Is EXPENSIVE

Drug Therapy
- Nucleoside, non-nucleoside, and nucleotide reverse transcriptase inhibitors
  - Inhibit the ability of HIV to make a DNA copy early in replication.
- Protease Inhibitors
  - Interfere with activity of enzyme protease
- Fusion Inhibitors
  - Interfere with HIV CD4 Receptor site binding and entry into cells
- Combination antiretroviral therapy
  - Three or more drugs from different groups are prescribed at full strength.

Drug Side Effects
- Depression
-Diarrhea
-Peripheral Neuropathy
-Pain
-Nausea/Vomiting
-Fatigue
-Hyperlipidemia
-Insulin Resistance
-Bone disease
-Lactic acidosis
-Renal Disease
-Cardiovascular disease

Clinical Manifestations of HIV/AIDS - Respiratory

Pneumocystic Carinii Pneumonia (PCP): Most common life threatening infection.
-Initial symptoms may be nonspecific and may include nonproductive cough, fever, chills, dyspnea, and chest pain.
-If untreated, progresses to pulmonary impairment and respiratory failure.
-Treatment: TMP-SMZ or pentamidine, prophylactic TMP-SMZ

Mycobacterium Avium Complex (MAC)

Tuberculosis

Clinical Manifestations of HIV/AIDS - GI

Oral Candidiasis: May progress to esophagus and stomach.
Treatment with Mycelex troches or nystatin, ketoconazole

Diarrhea related to HIV infection or enteric pathogens
-Octreotide acetate (Sandostatin) for severe chronic diarrhea.

Wasting Syndrome: 10% weight loss and chronic diarrhea or chronic weakness and fever with absence of other cause.
-Protein energy malnutrition
-Anorexia, diarrhea, GI malabsorption, and lack of nutrition may contribute.

Clinical Manifestations of HIV/AIDS: Oncologic

Kaposi's Sarcoma
-Cutaneous lesions but may involve multiple organ systems.
-Lesions cause discomfort, disfigurement, ulceration, and potential for infection.

Management of patients with Allergic Disorders
-History and manifestations; comprehensive allergy history
-Diagnostic Tests
Screening procedures

Medications
- Oxygen, if respiratory assistance is needed.
- Epinephrine used for anaphylactic reactions
- Antihistamines
- Corticosteroids

Prevention and Treatment of Anaphylaxis
- Screen and prevent
- Treat respiratory problems, oxygen, intubation, and cardiopulmonary resuscitation as needed.

Assessment and Management of Patients with Rheumatic Disorders
- Hay fever, seasonal allergic rhinitis
- A common respiratory allergy presumed to be mediated by a type 1 hypersensitivity
- Affects 10% to 25% of the population
- Symptoms includes sneezing and nasal congestion, clear watery discharge, nasal itching, itching of throat and soft palate, dry cough, hoarseness, headache.
- May affect the quality of life, producing fatigue, loss of sleep and poor concentration.

Nursing Process: The Care of the Patient with Allergic Rhinitis - Assessment
- Health history
- Include personal and family history
- Allergy assessment
- Subjective data include symptoms and seasonal changes, emotional problems, or stress
- Note relationship between symptoms and seasonal changes, emotional problems, or stress.
- Identify nature of antigens, seasonal changes in symptoms and med history

Diagnoses
- Ineffective breathing pattern related to allergic reaction
- Deficient knowledge about allergy and the recommended modifications in lifestyle and self-care practices
- Ineffective individual coping with chronicity of condition and need for environmental modifications

Planning
- Goals may include:
- Restoration of normal breathing pattern
- Increased knowledge about the causes and control of allergic symptoms
- Improved coping with alterations and modifications
- Absence of complications
Assessment and Management of patients with Rheumatic Disorders

Rheumatic Diseases
“Arthritis”: Affect primarily the joints but also the muscles, bone, ligament, tendons, and cartilage.

Clinical Manifestations:
Pain
Joint Swelling
Limited Movement
Stiffness
Weakness
Fatigue

Assessment
-Health history: Include onset of and evolution of symptoms, family history, past health history, and contributing factors.

Functional Assessment:
- Arthrocentesis
- Radiography, bone scans, CT, and MRI
- Tissue Biopsy
- Blood Studies

Diagnoses
- Acute and chronic pain
- Fatigue
- Disturbed Sleep Pattern
- Impaired physical mobility
- Self-Care deficits
- Disturbed body image
- Ineffective coping

Planning
Major Goals may include:
- Relief of pain and discomfort
- Relief of fatigue
- Promotion of restorative sleep
- Increased mobility
- Maintenance of self-care
- Improved body image
- Effective coping
- Absence of complications

INTERVENTIONS of arthritis
- Anti-inflammatory meds
- Heat to joints for pain management
- Splints, but maintain mobility
Diffuse Connective Tissue Diseases
-A group of chronic disorders characterized by diffuse inflammation and degeneration in the connective tissue.
-Cause is unknown but thought to have an immunologic basis
-Characterized by a clinical course of exacerbation and remissions
-Includes RA, SLE, scleroderma, polymyositis, and polymyalgia rheumatica

Systemic Effects: Extraarticular Features
-Fever
-Fatigue
-Anemia
-Lymph Node enlargement
-Raynaud’s phenomenon and Sjogren’s syndrome (Dry eyes, mouth)
-Any organ system may be involved; neuropathy and other neurologic manifestations, pericarditis, pleural effusion, splenomegaly, renal involvement.
-Skin and mucosal manifestations.

Assessment and Management of Problems Related to Male Reproductive Processes

Assessment:
-Urinary Function and symptoms
-Sexual function and manifestations of sexual dysfunction
-Symptoms related to urinary obstruction
  -Increased urinary frequency
  -Decreased force of stream
  -Double or Triple voiding.
  -Nocturia, dysuria, hematuria, hematospermia
-Medications, drug, and alcohol use
-Presence of conditions that may affect sexual function (Diabetes, cardiac disease, multiple sclerosis)

Diagnostic Tests
-Prostate-Specific antigen (PSA)
-Ultrasonography
-Prostate fluid or tissue analysis
-Tests of male sexual function

Conditions of the prostate
Prostatitis: Inflammation caused by an infectious agent
-Treatment includes appropriate anti-infective agents and measures to alleviate pain and spasm.

Benign Prostatic Hyperplasia (BPH; Enlarged Prostate)
-Effects half of men older than age 50 years and 80% of men older than age 80.
Manifestations are those of urinary obstruction, urinary retention, and UTI.

Treatment
- Pharmacologic: alpha-adrenergic blockers, alpha-adrenergic antagonists, antiandrogen agents
- Catheterization if unable to void.
- Prostate surgery

**Prostate Cancer**
- Second most common cancer and the second most common cause of death in men.
- Risk factors include, increasing age, familial predisposition, and African American race.
- Manifestations
  - Early disease has few or no symptoms
  - Symptoms of urinary obstruction, blood in urine or semen, painful ejaculation.
  - Symptoms of metastasis may be the first manifestations
- **Early diagnoses is vital, health screening**
- Treatment may include prostatectomy, radiation therapy, hormonal therapy, or chemotherapy.

**Collaborative Problems**
- Hemorrhage and shock
- Infection
- Venous Thromboembolism
- Catheter obstruction
- Complications with catheter removal
- Urinary incontinence
- Sexual dysfunction

**Planning**
- Major goals before surgery include preparation and reduction of anxiety and pain.
- Major goals after surgery include maintenance of fluid volume balance, relief of pain and discomfort, ability to perform self-care activities, and absence of complications.

**Relief of Pain**
- Monitor urinary drainage and keep catheter patent.
- Assessment of pain
- Bladder spasms cause feelings of pressure and fullness, urgency to void, and bleeding from the urethra around the catheter.
- Medication and warm compresses or sitz baths to relieve spasms.
- Administer analgesics and antispasmodics as needed.
- Encourage patient to walk but to avoid sitting for prolonged periods
- Prevent constipation
- Irrigate catheter as prescribed.

**Three Way System for Bladder Irrigation**
- Hang irrigation solution on IV pole.
- Solution goes in through the triple lumen catheter into the bladder
- Drainage then comes out through the drainage catheter into the catheter drainage bag.
**Testicular Cancer**
Most common cancer in men ages 15-40 years
-Highly treatable and curable
-Risk Factors: undescended testicles, positive family history, cancer of one testicle, Caucasian-American race.
Manifestations: Painless lump or mass in the testes
Early Diagnosis: Monthly Testicular Self exam (TSE) and annual testicular exam.
Treatment: orchidectomy, retroperitoneal lymph node dissection, radiation therapy, chemotherapy.

**Oncology**

**Pathophysiology of Malignant Process**
-Cancer cells are described as malignant. These cells demonstrate uncontrolled growth that does not follow physiologic demand.

**Cell Proliferation:** Uncontrolled growth, with the ability to metastasize and destroy tissue and cause death.

EX: Cut yourself=normal regrowth
Cancer=Aberrant uncontrolled growth.

**Cell Characteristics:** Presence of tumor-specific antigens, altered shape, structure, and metabolism.

G1 (gap one) phase: RNA and protein synthesis (enzymes for DNA synthesis are manufactured)
S (Synthesis) phase: During a long time period the DNA component doubles for the chromosomes in preparation for cell division
G2(Gap 2) phase: This is a short period: protein and RNA synthesis occurs, and the mitotic spindle apparatus forms.
M (Mitosis) phase: The cell divides into 2 identical daughter cells.
-Cell not active in the cell cycle are designated as resting (G0). Cells in this phase for the most part are refractory to chemotherapy.

**Detection and Prevention of Cancer.**
Tobacco is the major cause of cancer related deaths with about 180,000 deaths in 2003 being attributed to tobacco use.

-Excessive alcohol is linked with cancers of the mouth, larynx, throat, esophagus, liver.
-Exposure to carcinogens such as asbestos, benzene, and radiation
- Solar UV exposure is related to skin cancer
-Hereditary predisposition such as breast cancer

**Primary Prevention:** Concerned with reducing cancer risk in healthy people.

**Secondary Prevention:** involves detection and screening to achieve early diagnosis and intervention.

**PRIMARY PREVENTION**
-make appropriate lifestyle changes
-Stop smoking
-Limit alcohol intake
-Eat healthy diet
-Be physically active
-Avoid sun exposure/tanning beds
SECONDARY PREVENTION
-identification of patients at HIGH cancer RISK
-Cancer screening
  -Self-breast exam
  -Self-testicular exam
  -Screening colonoscopy
  -Pap test

Tumor Staging and Grading
-Biopsy of tumor site to determine pathologic diagnosis
-Malignancy is classified according to anatomic extent and histopathologic analysis.
-Biopsy is obtained from most accessible site.
  -Need tissue for diagnosis.
-The grade of the tumor (rating 1-4) is based on how well differentiated the tissue or cells appear
-For most tumors the higher the grade, the less differentiated the poorer the prognosis
-Lab tests including CBC with differential, platelet count, liver function tests, BUN and creatinine are done to determine base line data.

Tumor Markers (Blood Test) 20 different types. Used to follow response to therapies.
Colon= carcinoembryonic antigen
Prostate= PSA
Breast- CA15-3
Ovarian- CA125

TNM system: Most widely used cancer staging system.
-Based on the size and/or extent of the primary TUMOR (T), the amount of spread to nearby Lymph NODES (N), and the presence of METASTASIS (M).

Cancer Management
Cure
Control
Palliation

Radiation Therapy
Effects:
Skin: Erythema may develop as soon as 2 weeks into the course of treatment
Ranges from mild-severe with possible dry-wet desquamation
-Areas having folds are an increased risk because of warmth and moisture
GI: nausea, vomiting, diarrhea, esophagitis
Oral: Changes in taste, oral mucosa
Pulmonary Effects: Dyspnea, productive cough, radiation pneumonitis (usually occurs 1-3 months after radiation of the lung)
Renal: Cystitis and urethritis
Cardiovascular: damage to vasculature of organs, thrombosis
Bone Marrow: suppression

NURSING CARE
- maintain optimal skin care
- Inform patient about risks of side effects
- Do not apply lotions, ointments or cosmetics to the site unless prescribed
- Discourage vigorous rubbing, friction or scratching
- Avoid wearing tight-fitting clothing over the treatment field
- Take care not to expose radiation field to sunlight or extreme temps
- Do not apply tape over site
- Avoid Shaving
- Use lukewarm water and mild soap when bathing
- Use radiation precautions with patients who have implants
- Monitor time, distance, use shields as recommended
- Assess patient for dislodgment of implants
- Use long-handled forceps or tongs to remove any dislodged implants

Chemotherapy
The use of antineoplastic drugs to promote tumor cell destruction by interfering with cellular function and reproduction.
Adjuvant Therapy: given to patients who have no evidence of residual disease but who are at high risk for relapse
Neoadjuvant Therapy: administration of several courses of chemotherapy before definitive surgical intervention. Goal is to decrease the amount of tissue that needs to be removed.
High dose/ Intensive Therapy: Administration of high doses of chemo usually done before bone marrow transplant
Preoperative Chemo: Administered prior to surgery in an attempt to downstage the primary tumor so that less invasive surgery is needed
Dose Intensification: Used for overcoming resistance to chemo
Malignant cells may be resistant to certain drugs from the start of therapy or become resistant after therapy has begun.
- Chemo is given at the highest tolerated dose over the briefest interval to overcome resistance

SAFETY MEASURES
- Can be irritating to skin, eyes, and mucous membrane
- wear chemo gloves when working with or hanging chemo agents. If not available, double glove. Wash hands before and after.
- If contact is made with eyes, immediately flush the eye with water and seek medical attention.
- Spill kits should be available in all areas where chemo is stored, prepared and administered.
- Body fluids of the person receiving chemo should be flushed twice.
- Linens contaminated with chemo or excreta from patients who have received chemo within the last 48 hours should be contained in specially marked chemo bins.

ADVERSE EFFECTS
-grades on a scale of 0-4 with 0 being normal and 4 indicating life threatening.
Scoring of adverse effects will determine if a delay in therapy is necessary, dose modification is necessary or cessation of therapy must occur.
-ALOPECIA: most agents cause some degree of alopecia. Dependent on drug dose, half life, and duration of therapy.
-usually begins 2 weeks after administration.
-Regrowth takes 3-5 months
-ANOREXIA: chemo changes the reproduction of taste buds, absent or altered taste can lead to a decrease food intake, concurrent renal or hepatic disease can increase anorexia.
-FATIGUE: #1 effect reported, cause is generally unknown, may be related anemia, weight loss, altered sleep patterns, and coping
-NAUSEA AND VOMITING: caused by the stimulation of vagus nerve by serotonin released by cells in the upper GI tract.
-Incidence depends upon particular chemo agent and dosafe.

**PATTERNS OF NAUSEA AND VOMITING**
- Anticipatory: Conditioned response from repeated associated between therapy and vomiting.
- Acute: Occurs 0-24 hours after chemo
- Delayed: can occur 1-4 days after

-MUCOSITIS: caused by destruction of oral mucosa, causing and inflammatory response.
-Initially presents as burning sensation with no change in the mucosa and progresses to significant breakdown, erythema, and pain Consistent oral hygiene is importnat to avoid infection.
-ANEMIA: caused by suppression of the stem cell or interference with cell proliferation.
-NEUTROPENIA: Defined as an absolute neutrophil count (ANC) of 1,500/mm3 or less.
  -Risk of infection is greatest with ANC less than 500
-THROMBOCYTOPENIA: Platelets less than 50,000

**Oncology Emergencies**
-Septic Shock: A systemic disease associated with the presence and persistence of pathogenic microorganisms or their toxins in the blood. It is characterized by hemodynamic instability, abnormal coagulation, and altered metabolism.
Clinical Manifestations: fever greater than 100.3, warm flushed, dry skin, hypotension, tachycardia, tachypnea, decreased LOC, decreased urine output.
  -antibiotics, IV fluids, vasopressors to support B/P, monitor V/S urine output, respiratory failure, acidosis, DIC

SPINAL CORD COMPRESSION: the result of tumor compression on the spinal cord or in the epidural space.
-Any abnormal neurological symptoms in a patient with cancer should be considered an SCC until proven otherwise.
Clinical Manifestations: vertigo, pain in neck and back of head, upper extremity weakness, sensory loss, paresthesia, weakness, unsteady, difficulty walking.
Treatment is usually palliative because it is associated with metastatic disease.
- Bed rest
- Corticosteroids
- Radiation therapy
- Surgery
- HYPERCALCEMIA: elevated serum calcium level above 11mg/dL
- Results when bone resorption exceeds both bone formation and the ability of the kidneys to excrete extracellular calcium released from the bones.

SUPERIOR VENA CAVA SYNDROME: Obstruction and thrombosis of the superior vena cava by a tumor or an enlarged lymph node resulting in impaired venous drainage of the head, arms, and thorax.

Clinical Manifestations: vary, can be very dramatic and life threatening, dyspnea, cough, feeling fulness in head, hoarseness

TUMOR LYSIS SYNDROME: occurs when large numbers of neoplastic cells are killed rapidly, leading to release of intracellular ions and metabolic byproducts into the systemic circulation.