Hematologic Problems

2007-2010 U.S. Demographics

- **Leukemia:**
  - 44,000 new cases resulting in 21,700 deaths in 2007
  - 43,050 new cases in 2010
  - Leukemia & Lymphoma Society 2011

- **Lymphoma 2007:**
  - Hodgkin’s Disease: 8,000 new cases, 1,000 deaths (2007-8225;1350)
  - Non-Hodgkin’s Lymphoma: 63,000 new cases, 18,000 deaths (2008-66,000;19,000)

2007-2010 Demographics

- **2010:** 628,000 people living with disease

References:
- Black, J., Hawks, J., 2009
- Lewis, S., Dirksen, S., Heitkemper, M., et al., 2011

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Leukemia

Loss of control of cell division → malignant bone marrow cells accumulate or proliferate, causing disorders affecting the blood and blood-forming tissues.

Etiology is unknown but risk factors alter DNA, preventing cellular maturity.

- Genetic/Hereditary Factors:
  - Down’s Syndrome
  - Twins and siblings
  - Familial tendency CML (Philadelphia chromosome)
- Exposure:
  - Radiation
  - Chemotherapy/Chemicals
  - Human T-cell leukemia virus type 1 (HTLV-1)

Further classified by:
- type of leukocyte involved
- site of origin
  - lymphocytic – lymphatic system
  - myelogenous – bone marrow
Leukemia

- Four major types
  - acute lymphocytic (ALL)
  - acute myelogenous (AML)
  - chronic myelogenous (CML)
  - chronic lymphocytic (CLL)
- Treatment Goal: destroy neo-plastic cells & maintain remission.
- Medical management varies for the 4 types
- Nursing Principles for 4 types are same

Leukemia - Incidence

- affects all ages: adults 10X more than children
- age of peak incidence
  - ALL - between 2-9 years old
  - AML - between 60-70 years old
  - CML - Philadelphia chromosome
  - CLL - most common in adults

Two major categories
- Acute - immature (“blast”) cells
- Chronic - cells more mature but not functional

Leukemia - Pathophysiology

- Divide more slowly than normal
- Take longer to synthesize DNA
- Blocks differentiation of blood cell precursors
- Compete with normal cell proliferation

Crowd out marrow and cause normal proliferation of other cell lines to cease.
Resulting in pancytopenia
Leukemia (review)

- Acute
  - Proliferation of immature cells (blasts)
  - Infiltration of blasts into bone marrow
  - Rapid onset (6 months-1 year)
  - Requires aggressive intervention

Leukemia - Chronic

- Differentiated, impaired mature neoplastic granulocytes
- More gradual onset
  - CML
    - Ages 25-60
    - Peripheral blood test shows Anemia, elevated PMN's, Lymph's WNL, Mono's WNL/low, and elevated Platelets which drop later
    - 3-4 years, then "blast" crisis resembles AML
    - 90% of cases - Philadelphia chromosome (translocation of long arms of chromosomes 9 & 22)

CML Blastic Phase

- Increasing #'s of immature myeloid precursor cells (esp. myeloblasts) proliferate
- Blast cells comprise >20% of blood, >30% in marrow
- Increased fibrotic tissue in bone marrow
- Pancytopenia
- Refractory to treatment, many patients die within 2 mos. of onset
Leukemia – Chronic Cont’ed
- CLL (immature B lymphocytes)
  - Age: men > 50 years
  - Infiltration of spleen, liver, lymph nodes & bone marrow
  - Survive 15 years without treatment

Acute Lymphocytic Leukemia
Abrupt or gradual manifestations
- weakness, fatigue, headache
- fever
- Bleeding, petechiae, bruising
- Bone tenderness
- RBC’s, Hb
- WBC’s
- Platelets
- pressure in intermedullary space

Treatment of Acute Leukemia
Initial goal is REMISSION: Restoration of Hematopoiesis
- complete remission
  - no evidence of disease on physical exam, bone marrow or blood work – bone marrow function restored
  - “blasts” cells < 5%
- partial remission
  - evidence of disease in bone marrow only
- relapse usually means a more difficult course of disease process with progressively shorter periods of remission
Treatment of Acute Leukemia

Induction Therapy

Aggressive chemotherapy treatment aimed at all abnormal cells: reduce ‘Blastic Cells’ to less than 5% of total bone marrow cells & return CBC to normal values for at least 1 month

- approximately 70% success (in newly dx’d)
- associated with many complications
  - anemia
  - neutropenia
  - thrombocytopenia

Why?

Post-Induction Therapy

Intensification Therapy

- high doses of same or 1-2 drugs used in induction therapy
- combination therapy: Radiation added if infiltration of CNS, skin, testes, rectum, mediastinal mass

Consolidation Therapy

- after remission, this phase of treatment to kill any possible remaining leukemic cells

Maintenance therapy

- maintain remission using similar drugs
- small doses every 3-4 weeks for 1 - 3 years
- used mostly for adults with ALL

Post Therapy Management of Complications

- Therapy destroys normal and aberrant cells causing pancytopenia
- Transfusions of Red Blood Cells (RBC's)
- IV Antifungal agent Amphotericin B

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Tumor Lysis Syndrome

- Large number of WBC tumor cells destroyed → release of intracellular contents
  - renal involvement → uric acid crystals
  - metabolic effects → ↑ serum uric acid, PO4, K, ↓ serum Ca

Clinical Manifestations

- Confusion
- Weakness
- Numbness
- Tingling
- Muscle cramps & tetany
- Seizures
- Bradycardia
- EKG changes
- Dysrhythmias
- Uric acid crystalluria
- Renal obstruction
- Acute renal failure (ARF)

Prevention & Treatment

- Prevention is the best treatment
  - identify high risk patients
  - IV hydration
  - prevention of electrolyte imbalances
  - Allopurinol & Rasburicase to ↓ uric acid formation
  - Hemodialysis: ↓ Creatinine levels
  - Leukapheresis: ↓ WBC count

What CM’s would you anticipate?
Lymphomas:
Hodgkin’s and non-Hodgkin’s
- Malignant conditions
- abnormal lymph cell proliferation
- unknown etiologies: ? viral, immune-related ?
- starts at one site; spreads through lymphatic system

Hodgkin’s and non-Hodgkin’s
- How do they differ?
  - Non-Hodgkin’s: spreads by skipping lymph node areas (no Reed-Sternberg cells);
  - Hodgkin’s: spreads in “orderly” fashion, has characteristic Reed-Sternberg (giant) cells, found in 2 age groups (mid-20’s and 50+ years) in “1st World” countries

Clinical Manifestations
Painless lymph node enlargement
Hodgkin’s Disease

- Can start anywhere—most commonly in upper body: chest, neck, axilla
- Spreads in orderly fashion
- Reed-Sternberg (giant) Cells
- Associated with: Genetic Predisposition, Epstein-Barr Virus, Hx of Mononucleosis, Organ Transplant, Immunodeficiency Disease

Copstead & Banasik 2009

Clinical manifestations

- Painless swelling of >1 inch
- Lasting > 6 weeks
- Unrelated to infectious process

Stage A symptoms
- Often asymptomatic

Stage B (Systemic) symptoms
- Older clients
- Unexplained weight loss (>10% in last 6 months)
- Unexplained fever (>100°F)
- Drenching night sweats

Stage B (Systemic) symptoms

Staging- Cotswold Staging Classification for Hodgkin’s Disease

Stage I
- Confined to one node region or lymphoid structure

Stage II
- 2 or more nodal regions same side of diaphragm

Stage III
- Involved lymphoid regions or structures on both sides of diaphragm

Stage IV
- Extranodal sites
  - Present in non-lymphoid tissue such as liver, bone marrow

Staging by symptoms

- A - asymptomatic
- B - fever, chills, night sweats, weight loss

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Management of Patients with Cancer
Leukemias/Lymphomas

Stage 1
Stage 2
Stage 3

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PET Scan

- Positron Emission Tomography Scan can detect malignant tumor cells in the body. A small amount of radioactive glucose is injected into a vein and then the PET scanner rotates around the body, taking pictures of where glucose is being used in the body. More glucose is metabolized by malignant tumor cells than normal cells, leaving more radioactive material as a residue, so they show up brighter in the picture.

Treatment of Hodgkin's Disease

- Stages I & II
  - Chemotherapy w/wo Radiation Therapy
  - 95% - complete remission
  - 90% - 95% 5 Year Survival & 20 Years for 70-80%

- Stages III & IV
  - Chemotherapy
  - Partial remission
  - Follow up with radiation Rx
  - Up to 90% 5 Year Survival
Chemotherapy

- **Systemic Chemotherapy:** Administered Orally, Intravenous or Intramuscular for systemic treatment.

- **Regional Chemotherapy:** injected into the spinal column, an organ, or a body cavity such as the abdomen, the drugs mainly affect cancer cells in those areas.

Radiation Therapy

- **high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing.** The way the radiation therapy is given depends on the type, location and stage of the cancer being treated.

- **External radiation therapy:** uses a machine outside the body to send radiation toward the cancer.

- **Internal radiation therapy:** uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer.

Prognosis – 5 year survival rates

- **Stage I:** >95%
- **Stage II:** >95%
- **Stage III:** 85-90%
- **Stage IV:** 60-90%

Factors affecting survival:

- B stage symptoms
- WBC > 15,000
- Hb < 10.5
- Lymphocyte < 600
- Male gender
- > 45 years
- ↓ serum albumin

Overall 10 year survival: 77%
Late Effects from Childhood and Adolescent Hodgkin Lymphoma Treatment

- Side effects may appear months or years after treatment. Regular follow-up exams are important.
- Late effects may include problems with the following:
  - Development of sex organs in males.
  - Fertility (ability to have children).

Late Effects

- Thyroid, heart, or lung disease.
- An increased risk of developing a second primary cancer.
- Bone growth and development.
- The risk of these long-term side effects will be considered when treatment decisions are made.

Cleveland Clinic 2013

Non-Hodgkin’s Lymphoma

- Types
  - low-grade - indolent
  - intermediate and high-grade - aggressive
- Etiology
  - multiple possible causes include EBV, H pylori, immuno-deficiency, autoimmune disorders, infectious physical & chemical agents
- CM’s
  - painless lymph node enlargement
  - lymphadenopathy &t obstruction

Copstead & Banasik 2009
Non-Hodgkin’s Lymphoma

Diagnosis
- History & Physical (H&P)
- Radiologic studies (including PET Scan)
- CBC, ESR, chemistry panels
- Lymph node, bone marrow biopsy

Treatment
- Instituted after staging
- Cure rates vary with each grade
  - International Index used for predicting survival
  - Single or combined treatment depending upon stage of disease

Nursing Diagnoses
- Coping, ineffective (individual or family)
  - Encourage expression of feelings
  - Relaxation techniques/support group
  - Take prednisone in a.m. to prevent insomnia
- Infection, risk for r/t bone marrow suppression

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Management of Patients with Cancer
Leukemias/Lymphomas

Nursing Diagnoses

- Body Image disturbance
- Wig/hats prior to first chemo
- Skin changes/photosensitive
- Reproductive issues
- Sperm banking
- Contraception
- Menstrual changes and menopausal symptoms

Alternative & Complimentary Therapy

- Herbs/Tinctures
- Supplements
- Chiropractic/Massage
- Spirituality
- Imagery
- Nutritional

It is important for the client to inform health care providers of use of alternative treatments - adjust dose of chemo? drug interactions?

Transplantation: Bone Marrow and Stem Cell

- Indications:
  - Hematologic disorders
  - Rare genetic disorders
  - Treatment of patients undergoing high-dose chemotherapy for solid tumors

- Procedure
  - IV administration of bone marrow that contains cells capable of differentiation into RBC’s, WBC’s and Plts.
  - Approximately 20,000+ transplants/year
Transplantation: Bone Marrow and Stem Cell

Types of BMT
- allogenic - from a donor, often from a sibling
- autologous - transplanting to “self” after marrow is treated
- syngeneic - from an identical twin

Donor marrow tested for matching HLA
- National Marrow Donor Program maintains registry and conducts donor drives
- Only perfect match is between identical twins
- Bone marrow is aspirated from multiple sites, treated and stored for future use

For allogenic BMT patient is conditioned pre-procedure
- receives high-dose chemo and/or TBI
- associated with many side effects
- protective isolation
- Treated marrow re-infused intravenously

Complications
- infection
- interstitial pneumonia
- graft v. host disease (GVHD)
- host v. graft

Preventing GVHD

Suppression of:
- Recipient’s immune system before transplant.
  Drug Therapy: tacrolimus & cyclosporin prevent cell-mediated attacks upon transplant tissues/organs, no adverse effect upon bone marrow function/inflammatory response.

Suppression of:
- Donor’s immune cells in recipient after transplant
Investigational and Other Treatments

Molecular genetics
  - gene transfer therapy

Alternative or complementary therapies
  - diet supplements
  - macrobiotic diet
  - pharmacological therapies
  - psychological therapies

Clinical Trials

Planned investigation of a new regime

- Therapeutic or preventative
  - 4 phases of studies must be completed for FDA approval
  - Role of the Institutional Review Board
  - Informed consent

- Polit and Beck 2008
References

- Leukemia and Lymphoma Society (lls.org retrieved 11/22/11)

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