

Hematology 101

- Red Blood Cells
 - Life span: 120 days, removed by spleen (the spleen is very important!)
 - 2 types of hgb: A (adult) and F (fetal)
 - Hgb molecule has 4 heme, 4 globin chains
- White Blood Cells
 - Early inflammatory response: neutrophils
 - Immunity: lymphocytes
 - Inflammatory/phagocytic: monocytes, macrophages
 - Life span from 10 days to “much much” longer
- Platelets
 - Life span: 10 days
 - Increased # in inflammatory states
- (See slide that shows where cells come from...if it's posted, it may not be)

Hemoglobin & Anemia

- Normal Hgb values (g/dl):
 - 2mo: 9 – 14
 - 6-12 yr: 11.5 – 15.5
 - 12-18 yr: 12 – 16
- Anemia (Hgb in g/dl):
 - Mild: 11 (could be asymptomatic, but could have problems with exertion)
 - Moderate: 3 – 7 (will be lethargic; will need nutrition deficiencies corrected; may need supplement; some may need transfusion)
 - Severe: < 3 (may end up with CHF; may have murmurs; will be extremely pale; will have poor wound healing)
- Affects of anemia on CV system can be profound
 - Hemodilution of severe anemia decreases peripheral resistance, causing greater blood return to the heart. This increased turbulence and circulation can produce a murmur. Cardiac workload is also increased and cardiac failure can ensue during exercise, infection, stress...

You need a hgb of at least 5 to even show cyanosis. If it's below this, they will be hypoxic but not be blue.

Sickle Cell Disease

- Types (there are more types than just these three):
 - Hgb SS (sickle cell anemia): all the adult hgb has been replaced with a sickled hgb; (look this up)
 - Hgb SC (sickle cell-C): a heterozygous variant of sickle cell disease including both HbS and HbC.
 - Hgb S / beta-thalassemia
- Autosomal recessive genetic disorder
- Africa, Mediterranean, Middle East, India
- Part of newborn screening in California...woo-hoo! But this is not the case with all states, so you could still have a child present with the S&S but not be diagnosed yet (swollen hands and feet, fussy, febrile). The reason they do not show symptoms right away is because of the presence of fetal hgb. Parents are taught to give prophylactic abx and ID early signs of infection.
- Hgb electrophoresis is the diagnostic tool, can also get a quickie preliminary dx using the “Sickle-Turbidity Test” (finger prick and results in 3 mins)
- Pathophysiology (problems are related to either obstruction or destruction of RBCs)
 - RBC sickling precipitated by: hypoxemia, acidosis, dehydration, stress, infection, temp extremes
 - Sickled RBC destruction leads to anemia
 - Accumulated RBCs in spleen, leading to spleen damage and fibrosis
 - Sickled RBCs stick to endothelium, obstruct capillaries/vessels, impair circulation
 - Pain, organ dysfunction and scarring (fibrous tissue)
- Multi-Organ Involvement
 - Brain: child can have small little infarcts which can negatively affect growing brain
 - Eyes: don't see retinopathy in kids?
 - Heart: bigger strain on heart caused by anemia

- Lungs: more susceptible to infection (PNA); “acute chest” which we’ll talk about in a minute
- Spleen: child becomes “asplenic”, so child gets prophylactic abx
- Liver/Gallbladder: will look jaundiced, have yellow sclera; may also see gallbladder issues and teens may need to have cholecystectomy
- Abdomen: risk for pain b/c bowel is very vascular, impaired circulation hurts
- Renal/Urinary: very important issue for these kids; kidneys get a huge percentage of cardiac output and also have lots of tiny little capillaries. Will have issues with concentrating urine d/t micro-infarcts of these tiny blood vessels; this makes the child more susceptible to dehydration, especially during times of stress
- Endocrine: delayed puberty, small for age
- Bones/joints: avascular necrosis of femoral head is not uncommon (will need hip replacement); remember that bones are very vascular
- Extremities (hand/foot): avasculitis (little infarcts in capillaries of hands/feet); causes swelling
- Skin: adults are more prone to skin ulcers, but not so much for kids
- **Life-threatening complications**
 - Vaso-occlusive episodes (the most critical)
 - Pain (life-altering, not necessarily life-threatening); most kids with SS have pain on a daily basis
 - Stroke
 - Acute chest
 - Splenic Sequestration
 - Infection/Sepsis
 - Hemolytic (Aplastic)
- **Vaso-Occlusive Episode: Pain**
 - Pain is due to ischemia
 - Pain is both acute and chronic; treat both accordingly
 - “Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.” IASP, 1979
 - Understanding the child’s pain experience: “Pain is whatever the patient says it is. . .”
 - There’s some kind of pain tool where the kid (age 8 or older) circles the words that describe the pain
- **Complications: Stroke**
 - S&S: severe, persistent headache, other neuro signs
 - Transcranial Doppler can help screen for stroke risk; if positive for stroke risk, the child is put on “stroke protocol” which includes regular transfusions. One of the problems with frequent transfusions is that the child becomes at risk for iron overload. The iron gets deposited in different organs and can cause death. So...to prevent this from happening, the child gets chelation therapy.
 - Monitoring/Evaluation: transcranial doppler
 - After stroke or at high risk:
 - Blood transfusions: every 3-4 weeks
 - Chelation therapy: Desferoxamine SC infusion 5 nights/week (runs overnight) or Exjade orally
- **Other complications:**
 - Acute Chest Syndrome
 - Pneumonia like picture, hypoxemia, pain
 - TX: Transfusion or exchange transfusion and respiratory support
 - Splenic Sequestration:
 - Trapping of blood in spleen, can result in shock/rupture
 - 1/3 of circulating blood volume can get trapped in spleen; can put the pt very close to a “shock” state.
 - Parents are taught how to palpate spleen
 - Infection/Sepsis:
 - Fever, S&S infection are taken very seriously in children
 - Leading cause of death in SCD pts < 5 yrs
 - Hemolytic/Aplastic:
 - Bone marrow failure
 - Don’t see too often

- **Medical/Nursing Management of SCD**

- The goals of therapy are to prevent things that cause sickling and treat the medical emergencies of sickle crisis
- Wellness/prevention care
- Prevention consists of maintaining hemodilution
- During crisis: rest, hydration, electrolyte replacement, pain management, blood replacement and hydration, abx
 - oxygen can't reverse sickling, but it may prevent more sickling in child showing signs of respiratory difficulty; however, sustained oxygen use can depress bone marrow function leading to worsening anemia
- Immunizations, prophylactic penicillin, folic acid (a building block for red cells), family/patient education
- Monitoring for complications
- Pain management (early intervention); and education on living with a chronic illness
- Blood transfusion (see below)

- **Pain Management in SCD:**

- Nursing priorities
 - Individual patient history and assessment
 - Ongoing assessment/monitoring; the sickle process continues and pain may change when complications occur
 - Adequate oxygenation; want saturation to be 100% for anemic pts
 - Adequate hydration (1.5M) (dehydration leads to sickling)
 - Support coping, find out what works, see if any supportive measures work (massage, heat, etc...)
 - Observe for complications
- Effective pain management
 - Opioids: mainstay of pain meds
 - ATC: around-the-clock medication; it takes 4-5 regularly spaced doses in order to get a therapeutic level of pain medication.
 - PCA
- IV to oral transition of what? pain meds?
- Avoid meperidine; the byproduct builds up in the system that causes seizures that are not responsive to valium.
- NSAIDS (ibuprofen): most of them will be taking NSAIDS.
- Adjunctive interventions (she did not mention these)

- **Blood Transfusion**

- Pediatric considerations: volume, rate, temperature, complications, have had lots of opportunities to build up antibodies and will get to a point where there is only one donor in the area they can get blood from.
- Transcranial Doppler is done on child at risk for CVA
- Be aware of 4-hr limitations on giving blood; if you have a large volume of blood to give you will want the blood bank to separate it into two bags so you can give it slowly.
- Chronic transfusions for patients with severe disease or at high risk of stroke
- RBC destruction leads to iron overload, iron deposited in tissues; chelation therapy binds iron, allows excretion

Beta-thalassemia

- Autosomal recessive disorder
- Can be major (severe anemia), intermedia (splenomegaly and moderate to severe anemia), minor (asymptomatic carrier)
- Basic patho: impaired beta chains → overproduction of alpha and gamma chains → defective Hgb formation. This polypeptide unit is very unstable and when it disintegrates it damages RBCs, causing severe anemia. In turn there is increased erythropoiesis, but the RBCs aren't of good quality
- Mediterranean, Middle East, Africa, South China, Southeast Asia
- Pathophysiology
 - Synthesis beta hgb chain impaired
 - RBCs w/ less hgb
 - Shorter life span for RBCs (about 10 days instead of 120)
 - RBCs in marrow destroyed

- Increased erythropoietin, but ineffective RBC production
- Bone marrow hyperplasia b/c it is trying to keep up with the request to make RBCs
- Sequelae:
 - Severe anemia
 - Impaired growth/development
 - Without treatment: death by 5 – 6 years of age
- Diagnostics: hematological studies show characteristic RBCs, and Hgb electrophoresis confirms
- **Medical/Nursing Management in Thalassemia**
 - The goal of therapy is to maintain sufficient Hgb levels to prevent bone marrow expansion and resulting bony deformities, and to provide sufficient RBCs to support normal growth and physical activity.
 - Medical Treatment:
 - Chronic transfusions (q 3-4 weeks)
 - Sometimes splenectomy will be necessary
 - Bone marrow transplant
 - Nursing Issues:
 - Blood Transfusions
 - Chelation therapy b/c at risk for iron overload (deferoxamine/Desferal given with Vit. C.)
 - Risk of infection post-splenectomy
 - Patient/Family Education
 - If child is asplenic, make sure parents know to call doc if temp is over 38.5.

Aplastic Anemia

- Aplastic means bone marrow is not producing what it needs to produce (RBC, WBC and PLT are all decreased)
- Pancytopenia
 - Neutrophils < 500
 - Platelets < 20,000
 - Hemoglobin (RBCS) decreased
 - Reticulocytes < 1%; reticulocyte is an immature RBC...if you have a high reticulocyte count this means the bone marrow is making more red cells...when low you are looking at an aplastic situation.
- Etiology
 - Primary (congenital): Fanconi's anemia (can be tested for!); autosomal recessive trait
 - Secondary (acquired): d/t injury (viral injury to bone marrow, toxic, pharmacologic)
- Clinical manifestations: anemia, leukopenia, decreased PLT count (all are usually insidious)
- Diagnosis: bone marrow aspirate (will show the conversion of red bone marrow to yellow, fatty bone marrow) and chromosome studies
- Treatment
 - Immunosuppressive therapy may induce remission (ATG given via central vein if possible, cyclosporin for several weeks to months, steroids)
 - Only cure is bone marrow transplant
- Nursing Management:
 - Potential for infection (low WBCs)
 - Potential for injury (bleeding) (low PLT)
 - Inadequate tissue perfusion (low RBC)

Coagulation Disorders

- Hemophilia A (factor VIII)
 - aka "Classic hemophilia"
 - 80-805% of hemophilias
 - linked to x chromosome; girls carry it, boys get it
- Hemophilia B (factor IX)
 - aka "Christmas Disease"
 - 15%
 - linked to x chromosome; girls carry it, boys get it

- Hemophilia C (factor XI)
 - “Von Willebrand’s disease” (vWF)
 - Autosomal recessive, girls = boys
- **Hemophilia (A & B)**
 - Clinical Manifestations:
 - Hematomas, Hemarthroses (bleeding into joints, leads to great morbidity), Hematuria, Epistaxis, Intracranial bleed (super dangerous!), other bleeding (neck, abdomen, after dental work)
 - Diagnosis
 - History, Thromboplastin Generation test
 - Severity (based on % factor that is active)
 - Mild: 5-35% of normal
 - Moderate: 1-5%
 - Severe: < 1% (could bleed spontaneously; 60% that have hemophilia have severe hemophilia)
 - Lab Findings
 - Platelets: normal
 - Bleeding time: normal (length of time it takes to form a clot)
 - PT (or INR): normal
 - **PTT: prolonged**
 - Medical/Nursing Management
 - Primary therapy is replacement of the missing clotting factor
 - Monitor for bleeding episodes/complications
 - “First aid” for bleeding:
 - RICE
 - Administer factor-containing product
 - Clotting factor infusions
 - Plasma-derived or recombinant
 - DDAVP (Mild Hemophilia A)
 - Patient/Family Education
 - Emergency treatment of bleeding
 - IV factor administration
 - Anticipatory guidance:
 - Safety precautions
 - Physical activity
 - Monitoring for complications
- 26 von Willebrand’s Disease
 - vWf “transports” Factor VIII
 - Most common coagulation disorder
 - Types: decreased, abnormal or near absence of vWF
 - Results in : mucosal bleeding, epistaxis, easy bruising, menorrhagia
 - Treat with DDAVP, vWF replacement

High level of suspicion for an internal bleed if child shows: headache, slurred speech, loss of consciousness, black tarry stools.

Childhood Cancer

- Differences in Adult and Child Cancer
 - Origin is often from something primordial (left over from embryologic development)
 - Cause is often unknown
 - Prevention and screening
 - Metastasis at diagnosis; not necessarily an ominous sign for kids
 - Response to treatment; children are MORE responsive to chemo
 - Cure rate > 70% (5-year survival rate)
- Childhood Cancer
 - >12,000 diagnosed each year
 - Nearly 80% diagnosed become long-term survivors
 - Leading cause of death from disease in children under age 14

- Most common in order: leukemia, brain tumor, lymphoma, neuroblastoma, Wilm's tumor, bone, soft tissue sarcoma
- Clinical trials: organized coordinated approach to treatment (national/international); Children's Oncology Group (COG) is a main group responsible for clinical trials?. Child should always be treated by an oncology center that has an affiliation with COG. Clinical trials are so closely monitored that it can almost be safer to be part of a trial.
- Treatment Modalities
 - Surgery (biopsy, resect, debulk)
 - Chemotherapy (rapidly dividing cells)
 - Radiation therapy (shrink, residual)
 - Bone marrow transplant
 - Biologic response modifiers

Acute Lymphocytic Leukemia

- Also known as "ALL"
- Most common childhood cancer
- Peak incidence: 2-5 years
- Proliferation of abnormal lymphoblasts (immature lymphocytes), causes pancytopenia. The proliferating cells depress the production of formed elements of the blood in bone marrow by competing for and depriving the normal cells of the essential nutrients needed for metabolism.
- Organs most involved are: spleen, liver, lymph glands (show marked infiltration, enlargement and fibrosis); Next most common site of involvement is CNS
- Diagnosis: bone marrow aspirate, lumbar puncture to determine CNS involvement, CXR, lab data
- WBC and age = prognostic indicators
- Presenting symptoms
 - Fever, bone pain (b/c bone marrow is infiltrated with lymphoblasts and swelling as a result), pallor, bruising
- 3 Treatment phases (chemo)
 - Induction (4 weeks)
 - trying to convince bone marrow that it shouldn't make lymphocytes?
 - relatively moderate treatment
 - Consolidation (6 months)
 - more intensive chemotherapy
 - Maintenance (2 - 3years)
- For relapse, further chemo and/or bone marrow transplant

Acute Myelogenous Leukemia

- Also known as "AML"; It is a malignant proliferation of myeloid cells in bone marrow
- Presenting symptoms
 - flu-like, bleeding (d/t thrombocytopenia?), or as in ALL
- Poorer prognosis than ALL; pt with Down's Syndrome have better prognosis
- These kids are sicker than the ALL kids
- Treatment:
 - Induction phase can be about a month in the hospital
 - Intensive chemotherapy
- Increased incidence of DIC

Lymphoma

- Arise from lymphoid and hematopoietic systems; third-most common group of malignancies in kids
- Hodgkin Disease (most common form of lymphoma) PRESENCE OF REED-STERNBERG CELLS
 - Older children/adolescents
 - Focal, painless enlarged lymph tissue; may also have night sweats, fever, weight loss, cough, nausea
 - Node biopsy and staging
 - Tx: chemotherapy and radiation
 - Fairly good prognosis

- Non-Hodgkin Lymphoma
 - Peak 7-11 years (occurs more frequently in children than does Hodgkin's Disease)
 - Symptoms depend on location the lymphoma occurs in (mediastinal mass, pleural effusion, lymphadenopathy)
 - Mediastinal mass is of the most concern; sits near lung, airway, heart; risk for airway problems and respiratory compromise; this child will not lie flat or get sedated; will be sitting up to catch breath
 - Pain, swelling, generalized
 - Often advanced at diagnosis
 - With mediastinal mass, risk of respiratory distress and superior vena cava syndrome
 - Treatment with multi-agent chemotherapy
 - High risk of tumor lysis syndrome; elevated K, Ph, decreased Ca and end up with potential for seizure and renal failure.

Wilms Tumor

- Arises in kidney from primordial cells (b/c primordial cell, the younger child has a better prognosis than an older child), cure rate is 90%
- Symptoms: abdominal swelling (first sign), pain, hematuria, h BP, malaise
- Diagnosis: CT/MRI (has dark center with a rim around it)
- Surgery to remove tumor/kidney, chemo
- Pre-op: monitoring, no abdominal palpation (fragile outer capsule of tumor)
- Postop:
 - Care as for major abdominal surgery, may have ileus, may have NG tube
 - Large abdominal incision (pain, prep parents for the sight of it)
 - Fluids, BP (if glomerular apparatus affected during removal of tumor), pain (tylenol suppositories ATC), ventilatory problems (kids are diaphragmatic breathers and belly hurts!)

Neuroblastoma

- From neural crest cells:
 - brain, adrenal medulla, pelvis,
 - mediastinum, sympathetic ganglia
- Symptoms: caused by compression on adjacent structures/metastases (likely to metastasize)
- Diagnosis: scans, lab tests (depend on location), biopsy is common
- Staging: based on age, markers present, histology, extent of spread (62% have metastases)
 - Stage IV is the worst prognosis (most metastases)
- Treatment: surgical removal, intensive chemo, radiation (stage III), bone marrow transplant

Osteogenic Sarcoma (bone cancer)

- Occurs in growth end of long bones (distal femur, proximal tibia, proximal humerus)
- Symptoms: pain, swelling, limp
- Diagnosis: CT, bone scan, biopsy, metastatic workup
- Treatment: aggressive chemo, limb-sparing surgery (cadaver bone, rods)
- 10-20% have lung metastasis

60% are
astrocytomas

Ewing's Sarcoma (bone cancer)

- AKA: primitive neuroectodermal tumor; may also hear it called a "peanut tumor"; most often occurs in 4-20 yr olds.
- Occurs in any bone, arises in marrow spaces (most common: pelvis, tibia, fibula, femur)
- Symptoms: pain, swelling
- Diagnosis: biopsy, metastatic workup
- Treatment: radiation and intensive chemo

Rhabdomyosarcoma

- Arises from primitive muscle cells (undifferentiated muscle cells)
 - younger child: head/neck
 - older: trunk, arms, legs
 - 20% have mets at diagnosis

- Symptoms: related to tumor location and compression of adjacent organs
- Diagnosis: begins with careful exam of head and neck area (palpation for nontender, firm mass), chest x-ray, chest CT, bone surveys, bone marrow aspiration, biopsy, metastatic workup, LP if head/neck tumors
- Treatment: surgery, chemotherapy, radiation

Brain Tumors

- Most common solid tumor in children; second most common childhood cancer
- Location:
 - Infratentorial (posterior third) = 60%
 - Supratentorial (anterior two-thirds)
- Diagnosis: based on...
 - Clinical signs, neuro eval, scans, biopsy (histologic classification based on cell type)
 - Most common dx procedure is MRI, which determines the location and extent of the tumor
 - Other tests include CT, angiography, electroencephalography, LP (no LP with increased ICP)
- Prognosis depends on age, histology, location
- Symptoms related to anatomic location, size, age of child; infants may not show symptoms b/c sutures still open
- Presenting symptoms
 - Infratentorial
 - vague, irritable, headache, vomiting, double vision, increasing OFC in < 3yrs, bulging fontanel in infants
 - brain stem: cranial nerve abnormalities, spastic gait/ataxia, hemiparesis
 - Supratentorial
 - hemiparesis, hemisensory loss, seizures, visual field changes, cognitive problems
 - Midline
 - visual field and acuity changes, personality changes, endocrine abnormalities (affecting pituitary and pineal glands)
- Medical/Nursing Management of brain tumor pt
 - Treatment:
 - Surgery
 - Radiation
 - Chemotherapy
 - Other: steroids, anticonvulsants
 - Rehab (PT/OT/Speech)
 - Nursing Issues for brain tumor pt
 - Assessment/monitoring: Neuro, increased ICP
 - Preparation and support (child will be in ICU for 24-48 hours)
 - Postop: pain, neuro, increased ICP, infection, return of function

Venous Access Devices:

- These devices have revolutionized chemotherapy treatment in kids
- Tunneled silastic catheter
 - Tunneled under skin, skin grows around cuff
 - Dressing changed Q 3 days/Q week
 - Heparin flush Q day
 - Home care: dressing changes, flushing, cap change
 - Risks: infection, bleeding, breakage, clotting, dislodged
- Implanted port (single/dual)
 - Surgically placed under skin
 - Catheter tunneled and placed in SVC
 - Sterile access with non-coring needle
 - Daily flushing when accessed
 - Needle change weekly, occlusive dressing
 - When unaccessed, flushed monthly
 - No other care at home needed
 - Risks: infection, clotting, dislodged

Procedures

- Lumbar puncture/intrathecal chemo
 - CNS = “sanctuary” (leukemia cells hide in this area...same for testicles)
 - Lumbar punctures to monitor CSF for cancer cells and to administer chemo
 - Chemo given prophylactically and with CNS disease
- Bone Marrow Aspirate/Biopsy
 - Diagnosis, monitor treatment
- Use of sedation/anesthetic for procedures

Chemotherapy

- 6 drug categories
- Administered in combination/cycles based on cell replication cycles
- Routes: IV, PO, IM, SC, intrathecal
- Chemo safety
 - Protective equipment, preventing spills/leaks, handling units, etc...
- Complications: Tumor Lysis Syndrome
 - Results from tumor cell breakdown, either before or after chemo, can cause renal failure
 - Anticipate with high “tumor burden” (leukemia, lymphoma)
 - Electrolyte disturbances: hyperkalemia, hyperphosphatemia, hyperuremia, hypocalcemia
 - Prevention:
 - Allopurinol
 - IV fluids, IV NaHCO₃ (alkalinize urine to a pH 7- 8)
 - Monitor I&O
 - Labs: initially q6hrs

Chemotherapy Side Effects

- Myelosuppression (nursing can have a big impact on this one)
- Decreased RBCs, WBCs, platelets
- Gastrointestinal (nursing can have a big impact on this one also)
- Mucositis
- Anorexia
- Nausea/vomiting
- Constipation
- Hair loss (alopecia)
- Neuro toxicity
- Cardiac toxicity
- Liver toxicity
- Renal toxicity
- Hemorrhagic cystitis
- Skin irritation/sensitivity
- Infertility

Nursing Care: Nausea/vomiting

- Premed with antiemetics, assess need for additional meds
 - Ondansetron, dolasetron, granisetron
 - Hydroxyzine, diphenhydramine
 - Lorazepam
- Assess/monitor nausea, ask about triggers, what helps
- Offer small amounts food, frequently
- Encourage food from home
- Inpatient: Administer chemo at night

Nursing Care: Mucositis

- Assess/monitor oral mucous membranes (ulcers, candida, extension of ulcerations to throat)
- Use soft toothbrush/toothette
- Rinse mouth after eating with NS, prescribed oral rinse
- If mouth sores: may use topical analgesics (BMX), treat pain

Nursing Care: Myelosuppression

- Monitor blood counts
- Monitor absolute neutrophil count (if no neutrophils, will not be able to mount inflammatory response)
- Assess/monitor for infection, bleeding, fatigue
- Nothing per rectum
- Administer prophylactic antibiotics
- Transfuse as ordered

Absolute Neutrophil Count (ANC)

- To estimate infection fighting capacity
 - <500 = high risk of infection
 - < 200 = severe risk
 - Calculation: $\# \text{ WBC} \times (\% \text{ segs} + \% \text{ bands}) = \text{ANC}$

Example:

$\text{WBC} = 0.2 = 200$

$\text{segs} = 30\% = 0.3$ $\text{bands} = 1\% = 0.01$

$200 \times (0.3 + 0.01) = 200 \times 0.31 = 62$

Nursing Care: Fever/Neutropenia

- Admit for fever >38.5 (101.5) or $> 100.4 \times 2$
- Workup: CBC w/diff, cultures, exam, history
- Viral vs. bacterial vs. fungal
- Nursing Priorities:
 - Obtaining labs/cultures
 - Prompt initiation of antibiotics
 - Monitor with initial doses
 - Monitoring for s/s sepsis
- Potential for Infection
 - Assess/monitor for sepsis/shock
 - VS (esp. HR & BP), perfusion/cap refill, mental status
 - Assess/monitor for s/s infection
 - Monitor for pain, oral/skin lesions, rectal abcess/fissures
 - Strict handwashing
 - Minimize exposure to infection
- Potential for Injury
 - Monitor for bleeding
 - Monitor for fatigue
- Pain
- Altered Nutrition

Radiation Therapy

- Used with lymphomas, solid tumors, brain tumors, for pain control/palliative care, & pre-BMT
- Types: fractionated, hyperfractionated, stereotactic, total body
- Nursing Care:
 - Specific care dependent on location
 - Avoid sun exposure to area treated
 - Monitor for skin breakdown

- Monitor hydration/nutrition (I/O, wt)
- Mouth care (cleaning, keep moist)
- Patient preparation, Family education
- Radiation side effects:
 - bone marrow: myelosuppression
 - head/neck: mucositis, xerostomia
 - chest/upper back: esophagitis
 - abdomen/pelvis: nausea, vomiting, diarrhea
 - skin: dryness, redness, itching
 - scalp: alopecia
 - bone/soft tissue: impaired growth
 - lung/chest: pneumonitis
 - whole brain: inflammation, edema, incr. ICP
 - Acute toxicity: headache, n/v
 - Subacute (somnolence syndrome) sleepy, drowsy, nausea, malaise 5-7 wks after

Biologic Response Modifiers

- Colony stimulating factors: accelerate WBC recovery (GCSF)
- Interleukins
- Monoclonal antibodies
- Interferon
- Tumor necrosis factor

Bone Marrow Transplantation

- Replacement of stem cells
- Autologous, allogeneic/syngeneic, umbilical cord blood
- Used with leukemias, lymphomas, certain solid tumors
- HLA type matching
- Three stages
 - Pre-transplant
 - Transplant
 - Cyto-reduction: chemo/radiation
 - IV infusion of donor marrow
 - Post-transplant
 - Prolonged pancytopenia
 - Immunosuppressive drugs
 - Graft vs. host disease

Late Effects of Cancer Therapy

- Cognitive/learning problems
- Psychosocial issues
- Secondary malignancy
- Delayed puberty/sterility
- Cardiomyopathy (from chemo)
- Delayed growth (from radiation)

Resources

- www.curesearch.org
- www.leukemiasociety.org
- Association of Pediatric Hematology/Oncology Nurses
- American Cancer Society
- National Cancer Institute

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