2018 PSONS Scholarships

- 40th Annual Oncology Nursing Symposium
  - Rose Preston Memorial and PSONS
  - Non-Puget Sound
- ONS Congress
- National Educational Programs
- Seattle Nursing Research
- Ellen DeBont Memorial Poster Development
- ONCC Test Registration
- Psons.org

2018 Scholarship applications available early fall 2017

Care of the Patient with Myelosuppression and Fatigue

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Hematology/Oncology Nurse Practitioner
previous: Seattle Cancer Care Alliance at EvergreenHealth
PSONS President 2017-2019
Sponsor: CHI Franciscan
Objectives

- Identify causes, risk factors, signs & symptoms of myelosuppression and fatigue
- Discuss medical & nursing management as well as patient education for patients with myelosuppression and fatigue

CIRCULATING BLOOD CELLS LIFE SPAN

<table>
<thead>
<tr>
<th>Blood Cell</th>
<th>Life Span in Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythrocyte</td>
<td>120 Days</td>
</tr>
<tr>
<td>Platelets</td>
<td>7-8 Days</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>7-12 Hours</td>
</tr>
<tr>
<td>Eosinophil</td>
<td>3-8 Hours</td>
</tr>
<tr>
<td>Basophil/mast cell</td>
<td>7-12 Hours</td>
</tr>
<tr>
<td>Monocyte/macrophage</td>
<td>3 Days</td>
</tr>
<tr>
<td>B Lymphocyte</td>
<td>Type depend</td>
</tr>
<tr>
<td>T Lymphocyte</td>
<td>Type depend</td>
</tr>
</tbody>
</table>

Myelosuppression

- Definition:
  - Reduction in production & maturation of all blood cell lines
  - Resulting in leukopenia, thrombocytopenia, & anemia in peripheral blood
- One of most common & potentially life-threatening clinical complications experienced by patients with cancer

Causes of Myelosuppression in Cancer Patients

- Cancer-induced
- Medication and Chemotherapy –induced
- Radiation therapy-induced

Neutrophils

- Neutrophils, which are produced in the bone marrow and circulate in the blood, are a type of white blood cell.
- Neutrophils respond to infection and attack bacteria and other foreign invaders directly.
- Neutrophils are the first type of immune cell to respond to and arrive at the site of infection, often within an hour.

Segs and Bands

- Bands/stabs is percentage of young and immature neutrophils and normally 0-5%:
  - Elevated in bacterial infection and severe stress
  - Decreased in typhoid, cancer, bone marrow
- PolyMNls/segs is percentage of segmented or mature neutrophils and normally 45-70%:
- Elevated segs and bands indicate a probable bacterial infection and is called left shift

Absolute neutrophil count (ANC)

- is a measure of the number of neutrophil granulocytes (also known as polymorphonuclear cells, PMN's, polys, granulocytes, segmented neutrophils or segs) present in the blood.

Neutropenia

- Decreased number of circulating neutrophils:
  - Neutrophils 1st line of defense against bacterial infection (localize & neutralize bacteria)
Potential Consequences of Neutropenia

- Infection
- Sepsis and septic shock
- Death
- Delay in administering treatment on time or dose delay; dose reductions

Risk Factors for Neutropenia in Patients with Cancer

- Patient-related
  - Older clients
  - Comorbid diseases (diabetes, COPD, hepatic & renal insuff.)
  - Poor nutritional status
- Disease-related
  - Heme malignancies (leukemias, lymphomas, MDS, MM)
  - Invasion of marrow by metastasis, progressive/unresponsive cancer
- Treatment-related
  - Myelosuppressive chemotherapy (Fludara, Mito, 2CDA, AC...)
  - Radiotherapy
  - Corticosteroids

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### Examples of Disease Settings and Chemotherapy Regimens with a High Risk for Felty’s Neutropenia (2005)

**Acute Lymphoblastic Leukemia (ALL)**
- ALL induction regimens (see ASCO guidelines for ALL)
- **Rituximab**
- **Hyper-CVAD** (Prednisolone, vincristine, doxorubicin, cyclophosphamide, dexamethasone)
- **BEACOPP** (bleomycin, etoposide, doxorubicin, cyclophosphamide, vincristine, procarbazine)
- **KBs**
- **Children’s Cancer:**
  - **Borrelia burgdorferi**
  - **Tetanus**

**Hodgkin Lymphoma**
- **ABVD** (adriamycin, bleomycin, vinblastine, dacarbazine)
- **MOPP** (mechlorethamine, vincristine, procarbazine, prednisone)

**Non-Hodgkin’s Lymphoma**
- **CHOP** (cyclophosphamide, doxorubicin, vincristine, prednisone)
- **B-BORAT** (bleomycin, vincristine, adriamycin, vincristine, prednisone, doxorubicin)
- **M-BCNU** (carmustine, vincristine, prednisone)
- **Procarbazine, cyclophosphamide, vincristine, prednisone (PVCP)**

**Cholangiocarcinoma**
- **Bilirubin**
- **Oncoprotein**

**Neutropenia**
- **CFU-gM** (granulocyte-megakaryocyte colony-forming unit)
- **CFU-gM** (granulocyte-megakaryocyte colony-forming unit)

**Bone Marrow Transplantation**
- **Bone Marrow Transplantation**
- **Peripheral Blood Stem Cell Transplantation**

**Acute Myeloid Leukemia**
- **Induction**
  - **Daunorubicin, cytarabine**
  - **Idarubicin, cytarabine**
  - **Mitoxantrone, cytarabine, daunorubicin**
- **Consolidation**
  - **Mitoxantrone, cytarabine, daunorubicin**
  - **Idarubicin, cytarabine**
  - **Mitoxantrone, cytarabine**

**Graft-Versus-Host Disease**
- **Graft-Versus-Host Disease**
- **Cytomegalovirus**

**Chemotherapy-Related Neutropenia**
- **Cytopenia**
- **Infection**
- **Toxicity**

**Nursing Interventions for Neutropenia**
- **Close monitoring of blood counts**
- **Antimicrobial prophylaxis**
- **Gastrointestinal supportive care**

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**Potential Consequences of Neutropenia**

- **Infection**
- **Sepsis and septic shock**
- **Death**
- **Delay in administering treatment on time or dose delay; dose reductions**
White Blood Cell (WBC) Count & Differential

<table>
<thead>
<tr>
<th>WBC Type</th>
<th>Relative Value</th>
<th>Absolute Value uL (mm$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutrophils (total)</td>
<td>50-70%</td>
<td>2,500 – 7,000</td>
</tr>
<tr>
<td></td>
<td>45-70%</td>
<td>2,500 – 6,500</td>
</tr>
<tr>
<td>bands</td>
<td>0-5%</td>
<td>0 – 500</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>1-3%</td>
<td>100 – 300</td>
</tr>
<tr>
<td>Basophils</td>
<td>0.4-1.0%</td>
<td>40-100</td>
</tr>
<tr>
<td>Monocytes</td>
<td>4-6%</td>
<td>200-600</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>25-35%</td>
<td>1,700-3,500</td>
</tr>
</tbody>
</table>

Assessing Neutrophils: The Absolute Neutrophil Count (ANC)

**ANC = Total WBC x % of neutrophils (bands + segs)**

**Example:**

<table>
<thead>
<tr>
<th>WBC</th>
<th>Segmented neutrophils</th>
<th>Band neutrophils</th>
<th>ANC</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>2,000/mm$^3$</td>
<td>55%</td>
<td>1,120/mm$^3$</td>
</tr>
<tr>
<td>Segmented neutrophils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Band neutrophils</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ANC Predicts the Risk for Infection

<table>
<thead>
<tr>
<th>Absolute Neutrophil Count</th>
<th>Grade</th>
<th>Risk of Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within normal limits</td>
<td>0</td>
<td>No Risk</td>
</tr>
<tr>
<td>&gt; 1,500 to &lt;2,000</td>
<td>1</td>
<td>No significant risk</td>
</tr>
<tr>
<td>&gt; 1,000 to &lt; 1,500</td>
<td>2</td>
<td>Minimal risk</td>
</tr>
<tr>
<td>&gt; 500 to &lt;1,000</td>
<td>3</td>
<td>Moderate risk</td>
</tr>
<tr>
<td>&lt; 500</td>
<td>4</td>
<td>Severe risk</td>
</tr>
</tbody>
</table>

Absolute Neutrophil Count Calculation

**WBC = 3,000/mm$^3$**

- Segmented neutrophils = 20%
- Band neutrophils = 5%
- Eosinophils = 3%
- Basophils = 1%
- Lymphocytes = 71%

What is the ANC?
**Absolute Neutrophil Count Calculation**

\[ \text{ANC} = 3,000/\text{mm}^3 \times 0.25 = 750 \]

What is the risk for infection?

**My Vision of the CBC**

- Total WBC’s = All of the Armed Forces
- Army = Neutrophils
- Navy = Lymphocytes
- Marines = Monocytes
- Coast Guard = Plasma
- Air Force = Eosinophils
- Reserves = Basophils

**Case Study:**

Looking at this CBC, do you expect the Neutrophils to increase or decrease?

What will happen if you give a Neupogen injection?

Hint: Normal mono’s 0-12

Claritin is antidotal
Nursing Management of Neutropenia

- Identify patients at risk for neutropenia
- Infection prevention strategies
- Frequent assessment for infection
- Education patients & caregivers about neutropenia precautions
- Management of neutropenic fever
- Follow up: telephone, clinic visit

Nursing Assessment

If an immunosuppressed patient is developing an infection, what would you expect to find on nursing assessment?

Continual Assessment for Infection

- Signs of infection MAY NOT be present
- Redness, inflammation, and drainage may be minimal or absent
- Neuro status?
- Exposures? Home, pets, travel, recent blood transfusion
- Co-morbidities: HIV status, medications (? Recent abx?)
- Performance status, time to travel to clinic/hospital

Nursing Management:

- Physical Assessment & review of labs
  - CBC/diff/plts, CMP; head to toe system review
- Attention to common sites of infection
  - Respiratory tract, GI tract, GU tract, anus, & skin
- Access devices
  - Swelling, drainage, erythema, or redness
- Vital signs
  - Fever may be only response to infection
  - Fever is most common & important sign of infection
  - Temp. of 100.5°F is significant in client with ANC < 500/mm³
  - HR >100 & ↓ BP, may be developing sepsis

Detecting Signs of Infection in Patients with Neutropenia

- Neutropenia: the often silent disorder
- **ONLY** sign of an infection may be **FEVER**:
  - Take temperature every 4 hours (inpatient)
  - Instruct patient to take temperature QO or BID (home)
  - Report temperature ≥ 100.4°F (38.0°C) (or institution standard)


ONS Putting Evidence Into Practice (PEP) Resource

- **Green** = GO!
  - Evidence supports the consideration of these interventions in practice
- **Yellow** = CAUTION!
  - Not sufficient evidence to say whether these interventions are effective or not
- **Red** = STOP!
  - Evidence indicates these interventions are ineffective or harmful


Recommended for Practice

- Hand Hygiene
  - Soap & water
  - Alcohol and sanitizer
- Granulocyte Colony-Stimulating Factors (GCSF or "g"-shots: granix/neupogen 5mcg/kg/day – neulasta 6mg)
  - Claritin for bone pain?
  - Chemotherapy with ≥ 20% risk of febrile neutropenia
- Influenza vaccine annually for all cancer patients
  - 2 weeks prior to or 3 months after immunosuppressive therapy
- Do not allow visitors with symptoms of respiratory infections
- Environmental interventions
  - Windows closed
  - Contact precautions for known resistant organisms (MRSA, VRE)


Recommended for Practice

- Pneumococcal vaccine for all cancer patients
  - At least 2 weeks prior to chemo, if possible
- Antifungal prophylaxis with quinolones for patients at high risk for infection
  - Hematologic malignancies
  - HSCT recipients
- Antifungal prophylaxis in high-risk patients
- Antifungal prophylaxis in high-risk patients
  - Acute leukemia, MDS
  - HSCT, patients with GVHD
  - At risk for reactivation of viral illness (HSV, Hep B)

Likely to Be Effective

- Private rooms to ↓ transmission of infection
- Flower & plant guidelines
  - Avoid fresh or dried flowers & plants due to risk of *aspergillus*
  - Change vase water Q 2 days, empty water outside patient room
- Animal encounters
  - Avoid contact with animal feces, saliva, urine, or solid litter box materials
  - Avoid direct & indirect contact with reptiles


Likely to Be Effective

- Antibiotic Abdominal Lavage in Colorectal Surgery
- Antibiotic Impregnated IV Catheters in Adults
- Chlorhexidine Impregnated Washcloths—Chlorhexidine Bath
- Pre-construction Planning

https://www.ons.org/practice/resources/pep/prevention-infection/prevention-infection-general

Effectiveness Not Established

- Protective isolation
- Gowns, gloves, and/or masks are not indicated for healthcare worker or visitor routine entry into room
  - Should be used according to standard precautions (e.g. contact precautions)


Benefits balances with harms

- consideration of IVIG is only suggested by NCCN guidelines for patients with significant hypogammaglobulinemia.
  - Adv events; no survival benefit although there was a reduction in infections

https://www.ons.org/practice/resources/pep/prevention-infection/prevention-infection-general
**Effectiveness Not Established**

- Antibiotic Coated Sutures, Antibiotic Impregnated IV Catheters in Pediatric Patients, Antibiotic IV Catheter Lock Solutions, Berbamine, Chlorhexidine Sponge Dressing, Cranberry Juice, Electroacupuncture, IV Port Protector, Mistletoe Extract, Omega 3 (Eicosapentaenoic Acid and Others), Probiotics, Protective Isolation, Staff Training, Tauralidine Catheter Lock, Urokinase IV Catheter Flush

**Effectiveness Unlikely**

- Low microbial diet for neutropenic patients
- Restriction of fresh fruits and veggies
- Basic food safety principles are prudent – avoiding uncooked or unwashed foods
- Laminar air flow
- Routine donning of gowns in high-risk units (e.g. HSCT unit)
- Extended post-op antibiotics

**Not Recommended For Practice**

- Live attenuated vaccines
- Flumist (intranasal attenuated influenza vaccine)
- Varicella (chicken pox) vaccine, oral polio vaccine, & MMR vaccine
- Antifungal prophylaxis for neutropenic patients with solid tumors
- Gram + prophylaxis and fluoroquinolone in combination for antibacterial prophylaxis in afebrile neutropenic patients
- Implantable Gentamycin sponges

**Educate Patients & Caregivers to Recognize & Minimize Infection**

- List measures to prevent infection
- Managing environment, hygiene, diet, activity
- Identify signs & symptoms of infection
- Emphasize when to report
- Give specific oral & written instructions
- Follow up- daily phone calls, clinic visits

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Campbell, D. In Han, J. & Tokus, K. eds. *Case Curriculum for Oncology Nursing*, 4th Ed. 2005: 259-274.
Febrile Neutropenia

ALWAYS A MEDICAL EMERGENCY
Left untreated, may be fatal
Sepsis is lethal in 47% of infected patients with neutrophil count <1000

WHO'S AT RISK?
- Older patients, 65 and over
- Previous Chemotherapy, Radiation
- Pre-existing neutropenia or bone marrow involvement with tumor
- Pre-existing conditions
  - Neutropenia, infection/open wounds, recent surgery
  - Poor performance status
  - Poor renal function
  - Liver dysfunction, elevated bilirubin

Febrile Neutropenia: Definition
- Febrile neutropenia
  - Single temperature > 38.3°C orally or ≥38.0°C over 1 hr
- Neutropenia
  - < 500 neutrophils/mcL or
  - <1,000 neutrophils/mcL and a predicted decline to <500/mcL over the next 48 hrs

Medical Management
Neutropenic Patients with Fever
- Obtain blood cultures x 2 sets
- Culture suspected sites of infection
  - Urine, sputum, stool, IV catheter sites, wounds/skin, throat, viral lesions
- Chest x-ray, ? Pulse-ox
- Growth Factor Support
- Immediate institution of broad spectrum antibiotics (allergy?)
  - Initiate after blood cultures obtained
  - If unable to obtain other cultures (sputum, stool, urine) DO NOT hold antibiotics pending cultures
- Admission to hospital (ANC<1000)
Preventing Infection

The single most important measure to prevent infection when caring for the neutropenic patient is 
**HANDWASHING!!!**


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Vaccination:

Ideally, patients should be vaccinated at least 2 weeks before receiving cytotoxic therapy or IST; however, this timing is often not feasible in patients with cancer. Administering vaccines on the same day as cytotoxic therapy is not advised, because proliferative lymphocytic responses are required for protective immunity. Immunization between cytotoxic chemotherapy courses is likely to be associated with higher response rates than during chemotherapy administration.76,78 Patients should be considered unprotected if they were vaccinated less than 2 weeks before starting cytotoxic therapy or IST or while receiving these agents. These patients should be revaccinated at least 3 months after therapy is discontinued once immune competence has been restored.79

Pneumococcal, meningococcal, and Hib vaccines should be administered at least 2 weeks before elective splenectomy.79

Influenza infections cause significant morbidity and mortality in cancer patients.80


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Flu:

Chemotherapy, and occasionally, death.80,81 As a result, annual vaccination against influenza with the inactivated influenza virus is currently recommended for all individuals at increased risk due to immunosuppression.82 The guidelines also include health care professionals and household members or caregivers in their target group for annual immunization to prevent transmission of influenza to high-risk patients.80

The intranasal influenza vaccine should be avoided in patients with immunosuppression, because it contains live attenuated influenza viruses still capable of replication, which could theoretically lead to infection in immunocompromised individuals.82-84 The CDC recommends that persons with known or suspected immunodeficiency diseases or those who are receiving immunosuppressive therapies should not be immunized with the live influenza vaccine.82-84 In addition, because no data are available assessing the risk for person-to-person transmission from patients receiving the live attenuated intranasal influenza vaccine to immunosuppressed contacts, the CDC also recommends that inactivated influenza vaccine should be given to household contacts, health-care workers, and others who have close contact with immunocompromised patients.80,84

Vaccinations in Ca pts re: NCCN

- Live viral vaccines may cause disease in immunocompromised pts, not recc
- Immunogenicity may be reduced in immunocomp pts but some is better than none
- Pts on chemo/XRT NO live vacc for 3 mos after cessation of chemo
- MMR safe for family members, not small pox

Vaccinations-summary

- Ideally: vacc 2 weeks prior to chemo
- Same day vacc not advised
- INACTIVATED flu shot not nasal (live)
Thrombocytopenia

- Decrease in circulation platelets below 100,000/mm$^3$
  - Normal platelet count 150,000 – 400,000/mm$^3$
  - Life span of platelets – 8 to 10 days

<table>
<thead>
<tr>
<th>Platelet Count</th>
<th>Grade</th>
<th>Risk of Bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within normal limits</td>
<td>0</td>
<td>No Risk</td>
</tr>
<tr>
<td>&lt; LLN – 75,000/mm$^3$</td>
<td>1</td>
<td>No significant risk</td>
</tr>
<tr>
<td>&lt;75,000 – 50,000/mm$^3$</td>
<td>2</td>
<td>Minimal risk</td>
</tr>
<tr>
<td>&lt; 50,000 – 25,000/mm$^3$</td>
<td>3</td>
<td>Moderate risk</td>
</tr>
<tr>
<td>&lt; 25,000/mm$^3$</td>
<td>4</td>
<td>Severe risk</td>
</tr>
</tbody>
</table>

Causes of Thrombocytopenia in Cancer Patients

- **Disease-related**
  - Myeloproliferative disorders
  - Invasion of marrow by metastasis
  - Coagulation disorders
    - Liver disease
    - DIC
    - ITP or TTP

- **Treatment-related**
  - Chemotherapy
  - Radiation therapy
  - Infection – endotoxin release
  - Medications
    - Aspirin
    - Heparin
    - Phenytoin (dilantin)
    - Sulfonamides (Bactrim)

Clinical Consequences of Thrombocytopenia

- Bleeding – Internal or External
- Refractory to platelet transfusions

Nursing Assessment: Physical Exam

- Assess for Bleeding - rectum, eyes, nose, ears, oral cavity, menstrual, vascular devices
- Skin
  - Petechiae – lower extremities & pressure points
  - Ecchymosis
- HEENT
  - Gingival bleeding
  - Conjunctival hemorrhage & sclera injection
- Neurological
  - Changes in LOC
  - Restlessness, headache, seizures, pupil changes
**Recommended for Practice**

- **Platelet thresholds**: keep at
  - 10,000: majority of patients
  - 20,000: minor procedures
  - 40,000 to 50,000: patients undergoing invasive procedures
- **Platelet transfusions**
  - Active bleeding with thrombocytopenia
  - Mesna for prevention of hemorrhagic cystitis

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**Platelet Transfusions**

- **Effectiveness of platelet transfusion variable, depends on**:
  - Fever & infection: ↑ consumption platelets
  - Hypersplenism
    - Spleen: filters old and damaged cells from your bloodstream: overactive, removes blood cells too early and too quickly
  - Alloimmunization
    - Formation of antibodies to human leukocyte antigen (HLA) on platelet cells surface from contamination of white cells in platelet concentrate
    - Refractory to platelet transfusions

---

**Effectiveness Not Established**

- **Clotting promoters**:
  - Desmopressin : (DDAVP)
  - Tranexamic acid : (Lysteda) - heavy menses
  - Aminocaproic Acid : (Amicar)
- **Platelet growth factors**
  - Recombinant Interleukin-11 (Neumega)

---

**Effectiveness Not Established**

- **Menstrual bleeding**:
  - Hormonal methods are effective in preventing menstruation; however few studies specify patients with cancer
  - interventions to prevent or attenuate
  - depo-provera & lupron better than nothing but not statistically significant b/t these two, also small populations
  - Oral contraceptives, progesterone: no dosing recommendations were made
Effectiveness Unlikely or Not Recommended For Practice

- No interventions as of May 2008
- Beware of herbal remedies

Nursing Interventions: Minimize Bleeding

- Avoid invasive procedures (enemas, rectal temperatures, suppositories)
- Environment to avoid trauma
- Firm pressure to venipuncture sites for 5 minutes
- Avoid use of sharp objects (straight-edge razor)
- Implement bowel regimen to prevent constipation
- Discourage heavy lifting or Valsalva maneuver
- Soft toothbrushes
- Monitor pad count (menstrual bleeding) and amount of saturation

Patient/Caregiver Teaching

- Report to health care team bruising or bleeding
- Avoid drugs that increase risk of bleeding
  - aspirin, ibuprofen, ginkgo biloba and warfarin
- Measures to decrease occurrence of bleeding
  - Wear shoes when ambulating
  - Use electric razor rather than straight-edge
  - Blow nose gently
  - High-fiber diet with fluids

Procedures to attenuate bleeding

- Endoscopic: stents, band ligations
- Endovascular embolization
- Ultrasound surgical instruments: scissors, cautery
Procedures to attenuate bleeding

**Wound Care Interventions**
- Gentle dressing removal using saline if the dressing adheres to the wound
- Nonadherent or amorphous dressings or moist wound products
- Multiple layers dressings to prevent wound trauma
- Direct pressure for 10–15 minutes when bleeding occurs
- Packing with or without pressure (on nose, vagina, or rectum)
- Minimization of the frequency of dressing changes to prevent trauma

**Hemostatic Interventions**
- Gauze saturated with topical vasoconstrictors (epinephrine to control profuse bleeding) or 2% silver paste
- Packing wounds containing hemostatic agents (acetyls, in vagina or cocaine in nose)
- Topical dressings, including the use of thromboplastin, absorbable gelatin (in nose, rectum, or vagina), fibrin sealants, collagen, or alginate
- Vasoconstricting or cauterizing agents (epinephrine, silver nitrate, formalin, or alcohol)

**Figure 5. Recommendations to Prevent Wound and Orificial Bleeding**

[Note: Based on information from Galay, 2000; Persl & Phan, 2004; Seaman, 2006.]

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Prohemostatic Interventions

**Table 1: Most Frequently Counting Serious Adverse Events with Prohemostatic Interventions**

<table>
<thead>
<tr>
<th>Prohemostatic Intervention</th>
<th>Adverse Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urticaria</td>
<td>Anaphylactic reaction (after IV administration)</td>
</tr>
<tr>
<td>Epistaxis</td>
<td>Periorbital ecchymosis, serous blood output</td>
</tr>
<tr>
<td>Delirium</td>
<td>Prophylactic, prophylaxis composed of a skin test</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>Infection, fever, or chills</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Hypotension, low blood pressure</td>
</tr>
<tr>
<td>Rigors</td>
<td>Rigors, chills, or fever</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>Hypocalcemia, hypomagnesemia</td>
</tr>
<tr>
<td>Hyperglycemia</td>
<td>Hyperglycemia, hyperuricemia</td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>Hyperkalemia, hyperphosphatemia</td>
</tr>
<tr>
<td>Allergic reaction</td>
<td>Anaphylaxis, anaphylactic shock</td>
</tr>
<tr>
<td>Gastrointestinal toxicity</td>
<td>Gastrointestinal toxicity in cases of food or drug intolerances</td>
</tr>
<tr>
<td>Neurologic adverse effect of treatment</td>
<td>Neurologic adverse effect of treatment</td>
</tr>
<tr>
<td>A potential concern with the use of particular prohemostatic intervention</td>
<td>A potential concern with the use of particular prohemostatic intervention</td>
</tr>
</tbody>
</table>


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ITP: Idiopathic thrombocytopenic purpura

- A bleeding disorder in which the immune system destroys platelets and patients with the disease have too few platelets in the blood.
- ITP occurs when certain immune system cells produce antibodies against platelets.
- The antibodies attach to the platelets. The spleen destroys the platelets that carry the antibodies.
- Treatment: Prednisone, splenectomy, Promacta, Nplate, IVIG, Rituxan

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Anemia

- Symptom of abnormally low red blood cells (RBC’s), quality of hemoglobin (Hgb), and/or volume of packed cells.
- Hemoglobin (Hb) is the protein contained in red blood cells that is responsible for delivery of oxygen to the tissues

<table>
<thead>
<tr>
<th>Hemoglobin (g/dl)</th>
<th>Grade</th>
<th>Severity of Anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within normal limits</td>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>10 - normal</td>
<td>1</td>
<td>Mild</td>
</tr>
<tr>
<td>8 - &lt;10</td>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>6.5 - &lt; 8</td>
<td>3</td>
<td>Severe</td>
</tr>
<tr>
<td>&lt; 6.5</td>
<td>4</td>
<td>Life threatening</td>
</tr>
</tbody>
</table>

Causes of Anemia in Cancer Patients

**Disease-related**
- Slow or persistent blood loss
- Malignancy of bone marrow
- Tumor invasion of bone marrow
- Impaired absorption, intake, or utilization of iron, folic acid, B12
- Autoimmune disorders
- Inherited predisposition
- Renal disease

**Treatment-related**
- Chemotherapy
- Radiotherapy
- Pharmacologic agents
  - Oral contraceptives (folate and B12)
  - Phenobarbital (Luminal)
  - Losartan
  - Bactrim

Incidence of Anemia Associated with Chemotherapy Agents

<table>
<thead>
<tr>
<th>Agent</th>
<th>Grade 1/2 (%)</th>
<th>Grade 3/4 (%)</th>
<th>Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisplatin</td>
<td>Not reported</td>
<td>11%</td>
<td>H &amp; N</td>
</tr>
<tr>
<td>Docetaxel</td>
<td>73-85</td>
<td>2-10</td>
<td>NSCLC</td>
</tr>
<tr>
<td>5-FU</td>
<td>Not reported</td>
<td>11</td>
<td>H &amp; N</td>
</tr>
<tr>
<td>Paclitaxel</td>
<td>93</td>
<td>7</td>
<td>Breast</td>
</tr>
<tr>
<td>Topotecan</td>
<td>Not reported</td>
<td>32</td>
<td>SCLC</td>
</tr>
<tr>
<td>Vinorelbine</td>
<td>67-71</td>
<td>5-14</td>
<td>Breast &amp; Lung</td>
</tr>
</tbody>
</table>

Incidence of Anemia Associated with Chemotherapy Regimens

<table>
<thead>
<tr>
<th>Agent</th>
<th>Grade 1/2 (%)</th>
<th>Grade 3/4 (%)</th>
<th>Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisplatin-cyclophosphamide</td>
<td>43</td>
<td>9</td>
<td>Ovarian</td>
</tr>
<tr>
<td>CDDP-etoposide</td>
<td>59</td>
<td>16-55</td>
<td>SCLC</td>
</tr>
<tr>
<td>VIP</td>
<td>Not reported</td>
<td>52</td>
<td>SCLC</td>
</tr>
<tr>
<td>SFU-carboplatin</td>
<td>42</td>
<td>14</td>
<td>H &amp; N</td>
</tr>
<tr>
<td>CHOP</td>
<td>49</td>
<td>17</td>
<td>NHL</td>
</tr>
<tr>
<td>Paclitaxel-doxorubicin</td>
<td>78-84</td>
<td>8-11</td>
<td>Breast</td>
</tr>
<tr>
<td>Paclitaxel/Carbo</td>
<td>10-59</td>
<td>5-34</td>
<td>NSCLC</td>
</tr>
</tbody>
</table>

Assessment of Anemia

Vary depending on the rapidity of onset, patient age, degree of anemia, & co-morbid illnesses
**Nursing Assessment**

- Monitor for complications related to anemia
  - Evidence of inadequate oxygenation
    - Pallor, ↓ capillary refill, prolonged redness
  - Postural BP’s- dizziness, SOB
  - Constipation or diarrhea related to iron supplements

**Medical Management**

- Identify underlying cause & correct, if possible
  - CBC, CMP, retic ct, coombs, DIC panel, haptoglobin, Iron studies, guiac, genetic studies (thalassemia)
- Supplements
  - Iron, vitamins, folic acid, B12
- RBC transfusions indicated for
  - Symptomatic anemia (dyspnea, tachycardia) regardless of hematocrit;
  - CAD/CVD/COPD pts who may be asymptomatic but high risk
  - Active bleeding
  - Hemoglobin <8 g/dl
- Erythropoietin administration (weigh benefit w/harm)

**Nursing Management**

**Patient/Caregiver Education**

- Signs & symptoms to report
- Avoid sudden changes in position
- Assist with ambulation & self-care as needed
- Instruct to avoid hazardous activities, if syncopal episodes (e.g. driving)
- Balanced diet and/or supplements
- Energy conservation

**How do you describe fatigue?**
Fatigue:
A symptom, reported by the patient versus a sign, that is observed by others
- Exhaustion
- Lethargy
- Listlessness/weariness
- Tiredness
- Apathy
- Mental Fatigue

Cancer-related fatigue
“a distressing, persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning”
National Comprehensive Cancer Network (NCCN), 2008, p. FT-1

Cancer related fatigue
- Generally more severe
- Is disproportionate to the level of exertion
- Not relieved by rest or sleep
- Impacts quality of life
- Consequences affect both physical and psychosocial functioning

Mechanisms of Fatigue
- Poorly understood
- Several hypothesis
  - Serotonin dysregulation
  - HPA-Axis Dysfunction
  - Circadian Rhythm Disruption
  - Muscle Metabolism and ATP Dysregulation
  - Vagal Afferent Nerve Activation
  - Cytokine Dysregulation
Risk and Contributing Factors

- Anemia
- Hypothyroidism
- Hypogonadism
- Adrenal insufficiency
- Cardiomyopathy
- Pulmonary dysfunction
- Nausea
- Pain
- Fluid & Electrolyte imbalances
- Depressed mood
- Emotional distress
- Sleep disturbances
- Sedation secondary to medications

What causes Fatigue in Survivors?

- Anemia is NOT common in survivors
- Hypothyroidism, endocrine changes
- Most medical problems increase fatigue (pain, infection)
- Medications can increase fatigue
- Cardiac, pulmonary and vascular problems
- Poor nutrition
- Sleep disturbances
- Lack of physical activity
- Mental Health (56% depression; 46% anxiety)

Fatigue- Assessment

- Most common symptom, 80-100%
  - 20-53% long term survivors
  - 81% of long term survivors report at 6 months +
  - 75% w/ metastatic disease
- Commonly occurs w/ other symptoms: pain, distress, anemia, sleep disturbances
- Physical Symptoms:
  - Shortness of breath, heart palpitations, general lack of energy/stamina, muscle weakness

Fatigue and Depression are not the same, but they can be hard to tell apart and one can lead to the other
Clinical measurement tools

**FATIGUE SCALE**
Select the number that best describes how you feel today.

- **NO FATIGUE**: 0
- **MILD FATIGUE**: 1
- **MODERATE FATIGUE**: 2
- **EXTREME FATIGUE**: 7
- **THE WORST FATIGUE**: 10

*Numeric Rating Scale*

**Recommended for Practice**

- **Exercise!!!!!!!**
  - Individualized
  - Moderate intensity
  - How much? unknown
  - Weight resistance better for fatigue
  - Unclear what is best for prevention

**PT referral**

- **Pts w/ comorbidities**: COPD, CVD
- **Recent major surgery**
- **Specific functional or anatomical deficits**
- **Substantial deconditioning**
- **Caution for**: bone mets, thrombocytopenia, anemia, fever, active infection

**FATIGUE SCALE**

3. Can move, but can’t do much more than watch TV.
4. Can watch TV and play a game on my phone simultaneously.
5. Can do work on my computer lying in bed.
6. Can get around the house, but definitely couldn’t go out.
7. Can run a light errand.
8. Can get in my 10,000 steps for the day, making my fitbit happy.
9. Can do three or more activities in a single day.
10. GOING CLUBBING!
Category 1 NCCN
- Physical activity
- Physically based therapies
  - massage, acupuncture
- Psychosocial interventions
  - Counseling about coping, anxiety, depression
- Nutritional consultation
- Cognitive behavioral therapy for sleep

Pharmacologic
- Antidepressants not recommended
- Methylphenidate - mixed results
- Modafinil - improvement in pts with severe fatigue but not for those with mild or moderate fatigue
- Sleep medicines - use cautiously - other problems which may contribute to fatigue

Likely to Be Effective
- Energy conservation and activity management
- Education
- Optimizing sleep quality
- Relaxation

Benefits balances with harms
- Correction of Anemia with ESA’s
Effectiveness not established

Medications:
- Paroxetine,
- donepezil,
- bupropion SR,
- venlafaxine,
- sertraline, targeted
- anti-cytokine therapy,
- levocarnitine,
- vitamins

Adenosine 5’
triphosphate infusions,
mistletoe, Essiac,
Chinese medicinal
herbs, omega 3 fatty
acid supplementation,
combinations of dietary
supps and lipid
replacement plus
antioxidant
supplementation

Effectiveness not established

Structured
rehabilitation
Individual & group
psychotherapy
Cognitive-behavioral
therapy for fatigue
Cog-behavioral
therapy for concurrent
symptoms
Expressive writing
Hypnosis

reiki, yoga,
mindfulness based
stress reduction,
acupuncture, art,
music or animal
assisted therapy,
distraction,
combination
therapy: aromatherapy, foot
soak and reflexology

What I tell my patients:
- Fatigue is the best indicator that you
  need to MOVE and drink water
- Rebuild muscles to re-energize the body
- Eat!! If you don’t put gas in your car, it
  isn’t going to move. Think of your body
  as your (sports) car

Patient Education
- Exercise daily!!!! (PT/OT referral prn)
- Rest when you need to
- Sleep well, eat well
- Labor saving devices
  (wheelchair/commodes)
- Discuss with provider
Summary: Myelosuppression and Fatigue

Did we?

- Identify causes, risk factors, signs & symptoms
- Discuss assessment and management as well as patient education?

Resources

- Practice Guidelines in Oncology: Cancer & chemotherapy-induced Anemia, Prevention and Treatment of Cancer-Related Infections, Cancer Related Fatigue, Myeloid Growth Factors
- ONS PEP Card… on line versions

Thank You