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

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

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>

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
- PolyMN5/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.

http://ehs.umbc.edu/ce/Welcome/new%20downloads/Lab%202%20Interpretation.pdf
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 (leuks, lymphomas, MDS, MM)
  - Invasion of marrow by metastasis, progressive/unresponsive cancer
- Treatment-related
  - Myelosuppressive chemotherapy (Fludara, Mito, 2CDA, AC...)
  - Radiotherapy
  - Corticosteroids

Examples of Chemo Regimens with High Risk of Febrile Neutropenia (>20%)

- Bladder: MVAC
- Breast: Doc+Herceptin, dose dense AC-T, ATaxotere, TAC
- Esoph/Gastric: DOC/Cisp/5FU
- Hodkinks: BEACOPP
- Kidney: Adria/Gem
- NHL: CFAR, ICE, RICE, MINE, CHOP ± R, DHAP, ESHAP, HyperCVAD+R,
- Melanoma: DTIC/Cis/Vinblas, DTIC + IL2, IFN+ chemo
- MM: Modified HyperCVAD
- MDS: ATG, Decitabine
- Ovarian: Topotecan, Taxol, Taxotere
- Sarcoma: MAID
- Small Cell Lung: Topotecan
- Testicular: VeIP, VIP, BEP, TIP

(And there are more Regimens for the 10-20% risk)
# 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>segmented (polys)</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)

\[
\text{ANC} = \text{Total WBC} \times \% \text{ of neutrophils (bands + segs)}
\]

**Example:**

- WBC = 2,000/mm$^3$
- Segmented neutrophils = 55%
- Band neutrophils = 1%

\[
\text{ANC} = 2,000 \times 0.56 = 1,120/mm^3
\]

## 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>≥ 1,500 to &lt;2,000</td>
<td>1</td>
<td>No significant risk</td>
</tr>
<tr>
<td>≥ 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>

**Note:** ANC = Absolute Neutrophil Count

## Absolute Neutrophil Count Calculation

\[
\text{WBC} = 3,000/mm^3
\]

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

What is the ANC?
Absolute Neutrophil Count Calculation

**WBC = 3,000/mm³**

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

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

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:

<table>
<thead>
<tr>
<th>WBC</th>
<th>3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE%</td>
<td>42.9</td>
</tr>
<tr>
<td>LY%</td>
<td>37.1</td>
</tr>
<tr>
<td>MO%</td>
<td>12.8</td>
</tr>
<tr>
<td>EO%</td>
<td>5.9</td>
</tr>
<tr>
<td>BA%</td>
<td>1.3</td>
</tr>
<tr>
<td>NE#</td>
<td>1.5</td>
</tr>
<tr>
<td>LY#</td>
<td>1.2</td>
</tr>
<tr>
<td>MO#</td>
<td>0.4</td>
</tr>
<tr>
<td>EO#</td>
<td>0.2</td>
</tr>
<tr>
<td>BA#</td>
<td>0.0</td>
</tr>
</tbody>
</table>

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

- Adherence to general infection control recommendations
- Hand Hygiene with Alcohol and sanitizer
- Granulocyte Colony-Stimulating Factors (GCSF or “g” shots: neupogen/neulasta)
- Chemotherapy with > 20% risk of febrile neutropenia
- Catheter care bundle for prevention of central line associated infection
- Do not allow visitors with symptoms of respiratory infections
- Environmental interventions
  - Windows closed
  - Contact precautions for known resistant organisms (MRSA, VRE)


Recommended for Practice

- Influenza vaccine annually for all cancer patients
- 2 weeks prior to or 3 months after immunosuppressive therapy
- Pneumococcal and meningococcal vaccine for all cancer patients
- At least 2 wks prior to chemo, if possible
Recommended for Practice

- Antibiotic prophylaxis with quinolones for patients at high risk for infection
  - Hematologic malignancies
  - HSCT recipients
  - Expected neutropenia > 7 days
- Antifungal prophylaxis in high-risk patients
- Antiviral Prophylaxis for Select At-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
  - Plant care by staff NOT caring for patient
  - 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
- Antimicrobial coated CVC Catheters in Adults
- Chlorhexidine Impregnated Washcloths—Chlorhexidine Bath
- Pre-construction Planning
- Preoperative antibiotics

Benefits balanced 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/pop/prevention-addiction/prevention-infection-general

https://www.ons.org/practice-resources/pop/prevention-addiction/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)


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, Silver Impregnated dressing, Staff Training, Taurolidine Catheter Lock, Urokinase IV Catheter Flush

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

Effectiveness Unlikely

- Restriction of fresh fruits and veggies
  - Basic food safety principles are prudent – avoiding uncooked or unwashed foods
- Colony stimulating factors by IV rather than SQ route


Not Recommended For Practice

- Extended post-op antibiotics
- Live attenuated vaccines
  - Flumist (intranasal attenuated influenza vaccine)
  - Varicella (chicken pox) vaccine, oral polio vaccine, & MMR vaccine
- Implantable Gentamycin sponges

https://www.ons.org/practice-resources/pep/prevention-infection/prevention-infection-general
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
  - Fever or other signs/symptoms of infection
  - Be specific about whom and when to call
- Give specific oral & written instructions
- Follow up - daily phone calls, clinic visits


Febrile Neutropenia

ALWAYS A MEDICAL EMERGENCY

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


Febrile Neutropenia: Definition

- Febrile neutropenia
  - Single temperature $\geq$ 38.3°C orally or $\geq$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


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

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!!!

Vaccination:

- Be reviewed prior to administration.

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.\(^{1,2}\) 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.\(^{1,2}\) Pneumococcal, meningococcal, and Hib vaccines should be administered at least 2 weeks before elective splenectomy.\(^{1,2}\)

Influenza infections cause significant morbidity and mortality in cancer patients.\(^{1,2}\)

Flu:

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 smallpox.

Vaccinations in Ca pts re: NCCN

Ideally: vacc 2 weeks prior to chemo.

Same day admin not advised.

INACTIVATED flu shot not nasal (live).

Bone pain and GCSF

Cause: unknown.

Histamine release is involved in the inflammatory response.

1 case report and 1 retrospective chart review using Claritin (loratidine).

Current Amgen study: naprosyn vs loratidine.
Thrombocytopenia

- Decrease in circulation platelets below 100,000/mm³
- Normal platelet count 150,000 – 400,000/mm³
- 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/mm³</td>
<td>1</td>
<td>No significant risk</td>
</tr>
<tr>
<td>&lt;75,000 – 50,000/mm³</td>
<td>2</td>
<td>Minimal risk</td>
</tr>
<tr>
<td>&lt; 50,000 – 25,000/mm³</td>
<td>3</td>
<td>Moderate risk</td>
</tr>
<tr>
<td>&lt; 25,000/mm³</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 transfusions**
  - Active bleeding with thrombocytopenia

- **Platelet thresholds:** keep at
  - 10,000: majority of patients
  - 20,000
    - minor procedures
    - bladder tumors, necrotic tumors, or highly vascular tumors likely to bleed
  - 40,000 – 50,000: patients undergoing invasive procedures

- **Mesna for prevention of hemorrhagic cystitis**

---

**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**

- Desmopressin
- Tranexamic acid
- Aminocaproic Acid
- Platelet growth factors (Neumega)
- Gonadotropin releasing hormone agents
- Lansoprazole
- Recombinant factor VII
- Rectal steroid administration
- Transanal drainage

**Menstrual bleeding:**

- Hormonal methods are effective in preventing menstruation; however few studies specify patients with cancer
- interventions to prevent or attenuate
depo-provera & lutron better than nothing but not statistically significant b/t these two, also small populations
- Oral contraceptives, progesterone: no dosing recommendations were made
Prohemostatic Interventions


Effectiveness Unlikely or Not Recommended For Practice

- No interventions as of May 2008

- Beware of herbal remedies

Procedures to attenuate bleeding

- Endoscopic: stents, band ligation
- Endovascular embolization
- Ultrasound surgical instruments: scissors

Procedures to attenuate bleeding

Wound Care Interventions
- Keep dressing material clean and dry
- Nonadherent or amorphous dressings or moist wound products
- Manage爱你 to bleeding site
- Direct pressure for 5-15 minutes, when bleeding occurs
- Pack wounds or without pressure (on nose, vagina, or rectum)
- Minimize the frequency of dressing changes to prevent trauma

Hemostasis Interventions
- Gauze saturated with topical vasoconstrictors (epinephrine or control product bleeding) or other antifibrinolytic agents
- Packing materials containing hemostatic agents (acrylate in vagina or rectum)
- Suture the area, including the use of thromboplasts, absorbable gelatin (in nose, rectum, or vagina), fibrin sealant, collagen, or aluminum
- Vasoconstrictive or counteracting agents (epinephrine, silver nitrate, formaldehyde, or alclam)

Figure 5. Recommendations to Prevent Wound and Orificial Bleeding

Note: Based on information from Gabay, 2006; Penria & Phan, 2004; Seaman, 2006.

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 orValsalva maneuver
- Soft toothbrushes
- Monitor pad count (menstrual bleeding) and amount of saturation

ITP: Idiopathic thrombocytopenic purpura

- is 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

Anemia

- Symptom of abnormally low red blood cells (RBC's), quality of hemoglobin (Hgb), and/or volume of packed cells

<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>
</tbody>
</table>
| < 6.5            | 4     | Life threatening   

Adapted from the Common Toxicity Criteria for adverse events. Available at:

Patient/Caregiver Teaching

- Avoid drugs that increase risk of bleeding
- Report to health care team bruising or bleeding
- 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

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)
    - Phenytoin (Dilantin)
    - Phenobarbital (Luminal)

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>

Assessment of Anemia

- Central nervous system
  - Debilitating fatigue
  - Dizziness, vertigo
  - Depression
  - Impaired Cognitive Dysfunction

- GI Symptoms
  - Anorexia
  - Nausea

- Vascular System
  - Low skin temperature
  - Pallid skin, mucosa

- Immune system
  - Impaired T-Cell and macrophage function

- Cardiorespiratory system
  - Exertional dyspnea
  - Tachycardia, palpitations
  - Cardiac enlargement
  - Increased pulse pressure, systolic ejection murmur

- Genital tract
  - Menstrual problems
  - Loss of libido
Nursing Assessment:
Subjective Symptoms

- Vary depending on the rapidity of onset, patient age, degree of anemia, & co-morbid illnesses
- Subjective symptoms include:
  - Weakness, dizziness, fatigue, decreased sexual desire
  - Dyspnea on exertion
  - Anorexia, headache
  - Difficulty concentrating, drowsiness in the elderly


Signs of Anemia

- Vary depending on the individual and degree of anemia
- Objective symptoms include:
  - Tachycardia, angina, palpitations, systolic ejection murmur
  - S3 or S4 gallop heart rhythms
  - Amenorrhea, impotence
  - Pallor

Nursing Assessment

- Monitor for complications related to anemia
  - Evidence of inadequate oxygenation
    - Pallor, ↓ capillary refill, prolonged redness
  - Postural BP's
  - 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.

<table>
<thead>
<tr>
<th>NO FATIGUE</th>
<th>MILD FATIGUE</th>
<th>MODERATE FATIGUE</th>
<th>EXTREME FATIGUE</th>
<th>THE WORST FATIGUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Likely to be Effective

- Cognitive behavioral interventions for sleep
- Energy conservation and activity management
- Ginseng
- Management of concurrent symptoms
- Massage/aromatherapy massage
- Mindfulness-based stress reduction
- Multicomponent rehabilitative intervention
- Psychoeducational interventions
- Yoga

Benefits balanced with harms

- Corticosteroids, systemic
- Correction of Anemia with Erythropoeitin Stimulating Agents’s

Effectiveness not established

- Medications: Bupropion, carnitine, Co-Q 10, dexamphetamine, donepezil, herbal medicine, melatonin, methylphenidate, mistletoe extract, modafinil, MS20 soybean extract, MVI supps, omega 3, paroxetine, progestins, sertraline, testosterone replacement, thalidomide, thyrotopin releasing hormone, valerian, venlafaxine, vitamin c, withania somnifera
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

Effectiveness not established
- Acupressure, acupuncture, acustimulation, animal assisted therapy, art therapy, ATP, Body-Mind-Spirit Therapy, Group cognitive therapy, cranial stimulation, EEG biofeedback, expressive writing/journaling, Guarana, Guided imagery, hapto-therapy, healing touch, hypnosis, light therapy, meditation, mind-body medicine, maxibustion, music therapy, natural environment intervention, oral nutritional interventions, PG2, polarity therapy, progressive muscle relaxation, psychotherapy, reflexology, Reiki, relaxation and visual imagery, relaxation therapy, tai chi, targeted anti-cytokine therapy, virtual reality

What I tell my patients:
- Fatigue is the best indicator that you need to MOVE
- 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 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

- ONS PEP Cards...on line versions

Thank You