Care of the Pediatric Oncology Patient

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Hematology/Oncology/Transplant
What are your fears about this population?

• They can get really sick really fast
• They might die
• Their parents are really intense
• They look sick— bald, frail, always throwing up
• They are not like other kids
What to Remember

• These kids are just like any other kids— they love to play games, they love to do art projects, they love to tease the nurses— but unlike all other kids, they get used to being sick and usually know their limits.

• Sometimes, they even like being in the hospital— we make it fun for them! It becomes part of their “normal” life.

• Parents will be suspicious of you until you prove yourself or until they begin to trust you— every new HOT nurse goes through this initiation as well! Don’t take it personally.
Common Oncology Myths
Myth: Kids feel the worst when receiving their chemotherapy.

- Oftentimes, aside from the occasional nausea and vomiting, kids actually feel okay when they are getting their chemo. They are usually up, walking and talking.

- It is not until 7-14 days AFTER their chemo that kids feel their worst. The chemo wipes out their marrow (also called myelosuppression) and leaves them feeling fatigued (low RBCs), more prone to bleeding (low platelets), and more prone to infection (low WBCs, or “neutropenic”).
Myth: Oncology patients are always in the hospital.

- Treatment protocols dictate how often a child is scheduled to be here (scheduled chemo admits, scheduled surgical resections)
  - Kids with AML are in the hospital for four cycles of chemo through chemo administration, dropping counts and nadir, and count recovery, whereas kids with ALL receive their induction chemotherapy inpatient and most of their subsequent therapy outpatient over the course of two to three years (two years for girls and three years for boys)

- Unexpected admits are usually due to fevers or side effects and symptom management
Myth: Oncology patients do not get better.

- They do get better—kids are far more resilient than adults; however, cancer is still the leading cause of death by disease for children between the ages of one and fourteen years old.
Five-year Childhood Cancer Survival Rates

- The 5-year survival rates for the most recent time period (2003-2009) for the more common childhood cancers are:
  - Acute lymphocytic leukemias: 90%
  - Acute myelogenous leukemias: 64%
  - Brain and other central nervous system tumors: 75%
  - Wilms tumors: 90%
  - Hodgkin lymphomas: 97%
  - Non-Hodgkin lymphomas: 85%
  - Rhabdomyosarcomas: 64%
  - Neuroblastomas: 79%
  - Retinoblastomas: 99%
  - Osteosarcomas: 71%
  - Ewing sarcomas: 72%

http://www.cancer.org, From American Cancer Society website
Fast Facts About Peds Onc
Fast Facts About Peds Onc

• Kids with Down syndrome are predisposed to leukemia (National Cancer Institute).
  • They have a tenfold to twentyfold increased risk of developing leukemia compared with children without Down syndrome
  • They have substantially higher survival rates and lower relapse rates
Fast Facts About Peds Onc

• Kids who have received chemotherapy and/or radiation to treat a primary malignancy are at risk for a secondary malignancy later in life (National Cancer Institute).
Fast Facts About Peds Onc

• The causes of most pediatric cancers remain a mystery and cannot be prevented (American Cancer Society).

• Parents oftentimes will need a lot of reassurance at diagnosis and through the treatment process that they did nothing to cause their child’s cancer.
Fast Facts About Peds Onc

• Childhood cancer does not discriminate, sparing no ethnic group, socio-economic class or geographic region (Centers for Disease Control).
Breaking Down the CBC
Physiology and Pathophysiology

- Chemotherapy is one of the three traditional ways of treating cancer. It works systemically, meaning all rapidly dividing cells are affected, including those in the bone marrow, mucous membranes, and hair follicles.

- A chemotherapeutic agent will cause myelosuppression. Depending on the severity of the agent, it may actually cause myeloablation (oftentimes seen in a myriad of bone marrow transplant protocols), or complete annihilation of the bone marrow.
Blood Counts

• What is the definition of normal?

• What is the definition of normal for this population?
### RBC Parameters (Conventional Units)

<table>
<thead>
<tr>
<th>Age</th>
<th>HGB (g/dL)</th>
<th>HCT (%)</th>
<th>RBC ($\times 10^6$/μL)</th>
<th>MCV (fl)</th>
<th>MCH (pg)</th>
<th>MCHC (%)</th>
<th>RDW (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>14.5 - 22.5</td>
<td>45 - 67</td>
<td>4.00 - 6.60</td>
<td>95 - 121</td>
<td>31 - 37</td>
<td>29 - 37</td>
<td>12.0 - 18.0</td>
</tr>
<tr>
<td>1 wk</td>
<td>13.5 – 19.5</td>
<td>42 - 66</td>
<td>3.90 - 6.30</td>
<td>88 - 126</td>
<td>28 - 40</td>
<td>28 = 38</td>
<td>13.0 - 18.0</td>
</tr>
<tr>
<td>1 mo</td>
<td>10.0 – 18.0</td>
<td>31 - 55</td>
<td>3.00 – 5.40</td>
<td>85 - 123</td>
<td>28 - 40</td>
<td>29 - 37</td>
<td>11.5 - 16.0</td>
</tr>
<tr>
<td>2 mo</td>
<td>9.0 – 14.0</td>
<td>28 - 42</td>
<td>2.70 – 4.90</td>
<td>77 - 115</td>
<td>26 - 34</td>
<td>29 - 37</td>
<td>11.5 - 16.0</td>
</tr>
<tr>
<td>3 – 6 mo</td>
<td>9.5 – 13.5</td>
<td>29 - 41</td>
<td>3.10 – 4.50</td>
<td>74 - 108</td>
<td>25 - 35</td>
<td>30 - 36</td>
<td>11.5 - 16.0</td>
</tr>
<tr>
<td>0.5 – 2 yr</td>
<td>10.5 – 13.5</td>
<td>33 - 49</td>
<td>3.70 – 5.30</td>
<td>70 - 86</td>
<td>23 - 31</td>
<td>30 - 36</td>
<td>11.5 - 16.0</td>
</tr>
<tr>
<td>2 – 6 yr</td>
<td>11.5 – 15.5</td>
<td>34 - 40</td>
<td>3.90 – 5.30</td>
<td>75 - 87</td>
<td>24 - 30</td>
<td>32 - 36</td>
<td>11.5 - 15.0</td>
</tr>
<tr>
<td>6 – 12 yr</td>
<td>11.5 – 15.5</td>
<td>35 - 45</td>
<td>4.00 – 5.20</td>
<td>77 - 95</td>
<td>25 - 33</td>
<td>32 - 36</td>
<td>11.5 - 15.0</td>
</tr>
<tr>
<td>12 – 18 yr (Male)</td>
<td>13.0 – 16.0</td>
<td>36 - 51</td>
<td>4.50 – 5.30</td>
<td>78 - 98</td>
<td>25 - 35</td>
<td>32 - 36</td>
<td>11.5 - 14.0</td>
</tr>
<tr>
<td>12 – 18 yr (Female)</td>
<td>12.0 – 16.0</td>
<td>33 - 51</td>
<td>4.10 – 5.10</td>
<td>78 - 102</td>
<td>25 - 35</td>
<td>32 - 36</td>
<td>11.5 - 14.0</td>
</tr>
<tr>
<td>&gt;18 yr (Male)</td>
<td>13.5 – 17.5</td>
<td>37 - 53</td>
<td>4.50 – 5.90</td>
<td>80 - 100</td>
<td>26 – 34</td>
<td>32 - 36</td>
<td>11.5 = 13.1</td>
</tr>
<tr>
<td>&gt;18 yr (Female)</td>
<td>12.0 – 16.0</td>
<td>33 - 51</td>
<td>4.00 – 5.20</td>
<td>80 - 100</td>
<td>26 - 34</td>
<td>32 - 36</td>
<td>11.5 – 13.1</td>
</tr>
</tbody>
</table>

http://www.childrensmn.org/manuals/lab/hematology/018981.asp
What we see at CHW

- For our kids, a normal hemoglobin for them might be an average of 9. Do not be alarmed if you see a value this low. Oftentimes, we will not order PRBCs for a kid unless their hemoglobin is below 8 or they are symptomatic (irritable, tired).
Nursing Interventions

• Anemia
  • Monitor VS
  • Clinical exam (pallor, fatigue, headache, etc.)
  • Monitor for blood loss
  • Administer products as needed (CMV negative)

• CHW Oncology guidelines are to give PRBCs for symptoms, not for a lab value, due to chronic iron overload problems that have shown up in recent research.
What we see at CHW

- Along these same lines, we see lower than normal platelet counts in our kids. Oftentimes, their transfusion parameters are for when counts dip lower than a value of **10**, unless symptomatic (bruising easily, actively bleeding, menstruating).

http://www.childrensmn.org/manuals/lab/hematology/018981.asp
Nursing Interventions

• Thrombocytopenia
  • Physical exam (bruising, petechiae)
  • Monitor labs
  • Transfuse (lab value lower than 10, pre-procedure, PRN)
## WBC and Differential (Conventional Units)

<table>
<thead>
<tr>
<th>Age</th>
<th>WBC (X$10^9$/μL)</th>
<th>Segmented Neutrophils %</th>
<th>Band Neutrophils %</th>
<th>Eosinophils %</th>
<th>Basophils %</th>
<th>Lymphocytes %</th>
<th>Monocytes %</th>
<th>NRBCs (#/100 BCs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3 days</td>
<td>9.0 – 35.0</td>
<td>32 – 62</td>
<td>0 - 18</td>
<td>0 - 2</td>
<td>0 - 1</td>
<td>19 – 29</td>
<td>5 – 7</td>
<td>0 – 2</td>
</tr>
<tr>
<td>4 - 9 days</td>
<td>5.0 – 21.0</td>
<td>19 – 49</td>
<td>0 - 15</td>
<td>0 - 2</td>
<td>0 - 1</td>
<td>26 – 36</td>
<td>5 – 7</td>
<td>0</td>
</tr>
<tr>
<td>10 - 14 days</td>
<td>5.0 – 20.0</td>
<td>14 – 34</td>
<td>0 - 14</td>
<td>0 - 2</td>
<td>0 - 1</td>
<td>36 – 45</td>
<td>6 – 10</td>
<td>0</td>
</tr>
<tr>
<td>15 - 30 days</td>
<td>5.0 – 19.5</td>
<td>15 – 35</td>
<td>0 - 12</td>
<td>0 - 2</td>
<td>0 - 1</td>
<td>43 – 53</td>
<td>7 – 11</td>
<td>0</td>
</tr>
<tr>
<td>1 - 6 mo</td>
<td>6.0 – 17.5</td>
<td>13 – 33</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>41 – 71</td>
<td>4 – 7</td>
<td>0</td>
</tr>
<tr>
<td>7 - 24 mo</td>
<td>6.0 – 17.0</td>
<td>15 – 35</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>45 – 76</td>
<td>3 – 6</td>
<td>0</td>
</tr>
<tr>
<td>25 - 60 mo</td>
<td>5.5 – 15.5</td>
<td>23 – 45</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>35 – 65</td>
<td>3 – 6</td>
<td>0</td>
</tr>
<tr>
<td>5 - 8 yr</td>
<td>5.0 – 14.5</td>
<td>32 – 54</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>28 – 48</td>
<td>3 – 6</td>
<td>0</td>
</tr>
<tr>
<td>9 -12 yrs</td>
<td>4.5 – 13.5</td>
<td>33 – 61</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>28 – 48</td>
<td>3 – 6</td>
<td>0</td>
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<td>13 - 18 yr</td>
<td>4.5 – 13.0</td>
<td>34 – 64</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>25 – 45</td>
<td>3 – 6</td>
<td>0</td>
</tr>
<tr>
<td>adult</td>
<td>4.5 – 11.0</td>
<td>35 – 66</td>
<td>0 - 11</td>
<td>0 - 3</td>
<td>0 - 1</td>
<td>24 – 44</td>
<td>3 – 6</td>
<td>0</td>
</tr>
</tbody>
</table>

http://www.childrensmn.org/manuals/lab/hematology/018981.asp
Nursing Interventions

• Neutropenia
  • Risk for infection – most dangerous time!
  • Close monitoring of changes in clinical status (VS)
  • Monitor changes in mucosa (GI tract)
  • Prophylactic medications (Viral, Fungal, Bacterial)
Neutropenia

- Neutropenia is defined as an absolute neutrophil count (ANC) of less than 1,000. A neutrophil is a type of WBC that specifically functions to fight infections. It is the first line of defense.

- Severe neutropenia is characterized as an ANC of less than 500.

- In the oncology population, a person may be neutropenic:
  - Upon diagnosis
  - 7-14 days after chemotherapy
  - With an infection
  - After radiation
What we see at CHW

• It is common for our HOT kids to be febrile at home and then present to the EDTC with a temperature within normal limits. These kids will still be admitted and started on a course of antibiotics if their counts are low.

• These kids will usually not get chemotherapy until their counts recover.
Bottom Line...

• Remember, chemotherapy works systemically, so it damages rapidly dividing cells (both malignant and nonmalignant cells).

• Bottom line: Neutropenia is often acquired after cytotoxic agents, therefore the focus is not on eradicating it, but rather on monitoring and managing it.
Nadir

- WBCs continue to drift down within the 7-14 days immediately following chemotherapy. When a WBC reaches a significant low, it is referred to as the patient’s nadir. **Nadir** commonly refers to the lowest point that an individual's blood cell count.
Calculating the ANC

- \((\text{Segs} + \text{Bands}) \times \text{WBC} \times 10\)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL HEMATOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC</td>
<td>2.0</td>
<td>1.7</td>
<td>1.9</td>
</tr>
<tr>
<td>RBC</td>
<td>2.70</td>
<td>2.50</td>
<td>2.47</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>9.6</td>
<td>8.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>26.2</td>
<td>24.2</td>
<td>23.1</td>
</tr>
<tr>
<td>MCV</td>
<td>34</td>
<td>34</td>
<td>33</td>
</tr>
<tr>
<td>MCH</td>
<td>34.4</td>
<td>33.6</td>
<td>33.7</td>
</tr>
<tr>
<td>MCHC</td>
<td>36.5</td>
<td>35.9</td>
<td>36.1</td>
</tr>
<tr>
<td>Platelet Count</td>
<td>168</td>
<td>116</td>
<td>70</td>
</tr>
<tr>
<td>Absolute Neutrophils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Neutrophils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute Lymphocytes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Lymphocytes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute Monocytes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Monocytes</td>
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<td></td>
</tr>
<tr>
<td>Absolute Eosinophils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Eosinophils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute Basophils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Basophils</td>
<td></td>
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<tr>
<td>RDW</td>
<td>20.0</td>
<td>18.0</td>
<td>18.0</td>
</tr>
<tr>
<td>MPV</td>
<td>6.8</td>
<td>7.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Nucleated RBC Auto...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segs</td>
<td></td>
<td>59</td>
<td>56</td>
</tr>
<tr>
<td>Bands</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td></td>
<td>41</td>
<td>43</td>
</tr>
</tbody>
</table>
Calculating the ANC

\[ (56 + 1) \times 1.9 \times 10 = 1083 \]
Calculating the ANC

\[(17 + 2) \times 0.7 \times 10 = 133\]
ANC Calculation Errors

• Most common errors when calculating the ANC:

  • Do not accidentally use the lymphocyte count in place of the band count— it will most likely be a falsely elevated value.

<table>
<thead>
<tr>
<th>Segs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bands</td>
<td>2</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>77</td>
</tr>
</tbody>
</table>
ANC Calculation Errors

• Most common errors when calculating the ANC:
  
  • Even if the patient has a WBC count of 2.0, but they do not have neutrophils (segs + bands = 0), then the ANC is still 0.

  ANC = 0
What we see at CHW

• Parents’ lives revolve around their child’s CBC.
• Helpful tip: Calculate the ANC before you even enter their room in the morning— they will ask you what it is.
Nursing Interventions

- When a patient has an ANC of less than 500, follow the CHW Policies and Procedures.
  - Institute “Immunocompromised Precautions”
  - No flowers
  - No fans
  - No sick contacts (ever for this population, but especially when neutropenic)
Neutropenic Precautions

Immunocompromised High Risk Precautions

• Indications for Immunocompromised High Risk Precautions.
  
  • Recommended only for allogeneic hematopoietic stem cell transplant (HSCT) patients or patients with a predictive ANC <100 for more than 5 days since they require a Protective Environment room to reduce exposure to environmental fungi (e.g., Aspergillus sp).
Neutropenic Precautions

• Do not allow fresh or dried flowers, or potted plants in patient-care areas for *immunosuppressed patients* (i.e., oncology, transplant, burn).

• **Note: Fans are prohibited in the following situations: **Immunosuppressed patients.
Visiting Policy

VISITORS

• If signs and symptoms of infection are noted in a visitor, visitation should be discouraged. If necessary, appropriate barrier precautions will be utilized. Visiting children should be screened for recent exposure or symptoms of highly contagious infectious diseases.
What does this mean for you?

• It is your responsibility as an employee, whether nurse, care partner, provider, HUC, or ancillary staff, that you prohibit *anyone* with cold or flu symptoms, from entering these patients’ rooms. This includes parents!

• HOT parents are usually pretty good about this hard rule. When they are sick, they stay home.
Nursing Management

Fevers
Nausea/Vomiting
Mucositis
Our Oncology Exceptions

• No rectal temps.
• **No ibuprofen or acetaminophen** without permission by an oncology provider.
• **Fevers** are considered a temperature of 38.3 C or greater for oncology kids.
• Fevers mean cultures from every lumen! Cultures mean antibiotics.
When your patient has a fever...

- Patients, especially when febrile, should receive antibiotics within one hour of ordering so alert pharmacy.
- Cefepime is most commonly given antibiotic - our frontline broad spectrum drug of choice.
- Complete vital signs every 5 minutes with the start of antibiotics (this is best practice—blood VS are what we typically are doing on HOT).
- **The start of antibiotics is a common time for patients to go septic!!!!**
When your patient has a fever...

- Patient should also be on a continuous pulse ox monitor with continuous HRs. The BP may drop with an increase in HR. If BP is falling, fluid boluses are given, PRBCs may be transfused, and/or patient may be transferred to PICU.
- Cultures are drawn from all lumens for each culture and done q 24 hours for T>=38.3. Know when cultures were last drawn and pass it on in report.
Side Effect Management

• Management of Nausea/Vomiting: Anti-emetics
  • Antiemetics are considered pre-meds for chemo!
  • Ondansetron (Zofran) - gold standard
  • Hydroxyzine (Vistaril) typically second line of defense, alternate with Zofran)
    • Since Hydroxyzine and Diphenhydramine (Benadryl) are in the same medication class, do not give them both within less than 4 hours of one another. Oftentimes, Benadryl may be a pre-med for blood, so keeping its last administration on your radar is important if patient has Hydroxyzine ordered

• Prevention is best management—stay ahead of the curve!
Side Effect Management

• **Management of Mucositis:**
• Chemo kills rapidly-dividing cells, including those epithelial cells that make up the mucous membranes that line the GI tract from mouth down through anus. When these cells are killed by chemo, they slough off, causing intense pain.
• Management: hydration, nutrition, pain control
• These kids are normally on PCAs for acute pain management and may be started on TPN
• Prevention- daily oral hygiene, Biotene QID
Interdisciplinary Management

- Interdisciplinary collaboration of physicians, nurses, pharmacists, Child Life specialists, chaplains, social workers, case managers, care partners, and art and music therapists for these patients
Resources from Children’s Hospital of Wisconsin
For Patients and Parents

- Children’s Oncology Group (COG) New Diagnosis Binder
- Leukemia, Lymphoma, or Brain Tumor Childhood Cancer Guide Books
- Teaching sheets from the Intranet
For New Diagnoses
Most important teaching sheet to send home!

Where to find it: on the Intranet under “Teaching Materials,” “Oncology,” “When to Call the Doctor: Oncology”
Oncology and Transplant Services Infection Control

"Anyone with a fever, runny nose, cough, vomiting, or diarrhea should not care for or visit patients."

Hand hygiene

- Use Calista® (alcohol-based) hand rub.
- Wash hands with soap and warm water for 1 minute.

Hand hygiene should be done:

- Each time you go into the patient room.
- Each time you leave the patient room.
- After eating.
- After personal hygiene.
- After diaper changes.
- Before mouth care or other patient hygiene.
- When handling patient food.

Visitors

All visitors must be screened upon entrance to the East 5 Unit. A designated healthcare worker will screen for infectious disease/illness. This is for the safety of all patients.

Patient visitors are limited to:

- Healthy adults: Any adult with a fever, cold, cough, vomiting, or diarrhea will not be allowed to visit.
- Siblings: Siblings must be healthy without fever, cold, cough, vomiting, or diarrhea. Siblings should be screened by a healthcare worker to determine eligibility for visiting. Screen should include exposure to chickenpox.
- Siblings of patients in isolation (Contact, Contact/Droplet, Droplet, Airborne) will not be allowed in East 5 common areas. They will have to stay in the patient room.
- Siblings are not allowed in the East 5 Unit Playroom.

Eating and drinking

- Eating and drinking is allowed in patient rooms.
- Food should be disposed of in a timely manner.
- Food and drinks should be disposed of in the garbage cans outside patient rooms.

Bathroom use

Parents may use their child’s bathroom, including the shower as long as it is kept clean.

Doors

All four doors must be kept shut at all times (for patients in anterooms). Open and close doors one at a time.

Items from home

- Any item from home (clothing, bedding, and pillows) must be washed and dried before bringing into the patient room.
- Other items (taps, CDs, DVDs, computer games, books, art supplies, etc.) must be cleaned with Cavicide before bringing into the patient room.
- Live flowers and plants are not allowed in patient rooms.
- Latex balloons are not allowed in the hospital.

ALERT: Ask your child’s doctor, nurse, or clinic if you have any questions or concerns or if your child has special health care needs that were not covered by this information.

This teaching sheet is meant to help you care for your child. It does not take the place of medical care. Talk with your healthcare provider for diagnosis, treatment, and follow-up.

(found under “Oncology” on the Intranet)
This is higher level, and may also serve as a resource for you as caregivers too (found under “CBC” on the Intranet)
Resources from Children’s Hospital of Wisconsin For You!

- Oncology JIT from the Intranet
- HOT APN
- Your UB-APN
- HOT Charge Nurse
- HOT Unit x 6-3050
Clinical Resource Contact Information

Inpatient

East 5 Charge RN  Oncology PNP  Pager 607-7268
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Outpatient

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Important General Information

Neutropenia is the reduction of circulating neutrophils.

Fever in the neutropenic child of 38.3 is usually the cut off for blood culture & admission. Call MD with fevers or if patient is having chills even without fever. Labs and clinical symptoms are both considered in the assessment of a febrile patient.

ANC (Absolute Neutrophil Count) Multiply WBC x (segs + bands) x 10  ANC of <500 = the highest risk

Common Infections

Sepsis & Bacteremia
CVLs are a portal of entry. With few or no WBCs, patients cannot generate a normal inflammatory response. CVL site may be infected even without redness or pus. Pain at the site and/or fever may be the only signs of an infection. These patients can become very ill quickly. Monitor them closely, especially after antibiotics are given.

Pneumonia
May be viral or bacterial. Most patients are on Bactrim two consecutive days a week as PCP prophylaxis.

Intra-abdominal Infections
Potential for diarrhea, C diff, pancreatitis, or typhilitis (neutropenic enterocolitis), which manifests in RLC pain and fever.

GI Mucositis & Esophagitis
Can range from small oral ulcers to mucosal sloughing of mouth and anus. Careful oral hygiene with Biorestat® or Chlorhexidine is critical.
- Do frequent pain assessments and give IV narcotics for pain control as needed.

Blood and Platelet Transfusions: Refer to the P & P.

Blood Consent must be signed prior to transfusion. Most patients have a signed annual blood consent. It can be found in Epic under Document List or under Chart Review/Media Tab.
- Ask the parent/patient if premeds (Tylenol and Benadryl) are given or look in the right side bar under “Blood Attributes” in Epic.
- Decision to transfuse blood products is based on the consideration of clinical symptoms and the consideration of counts.

Platelets
Platelets are run on a pump or may be pushed through platelet infusion tubing over 10-15 minutes if volume-reduced. The decision is based on the volume of platelets and the patient’s ability to tolerate. Volume reduced platelets can generally be pushed. Refer to the P&P for administration and monitoring parameters.
When platelets are ordered to give "when product is ready", they are usually available from Blood Bank in about 1½ - 2 hours. The Blood Bank will call when they are ready and let you know when they expire. Enter a transport order in Epic and the Blood Bank will tube them up.

Packed Red Blood Cells (PRBC)
A type and screen may first be ordered or they may have blood on hand. Blood Bank will always know what products are on hand. Once the lab has the specimen, it will take 1-2 hours to be ready. Volume ordered is usually 10-15 ml/kg. Check that orders are within these limits. Refer to the P&P for administration and monitoring parameters. The blood bank will call when they are ready & let you know when they expire. Enter a transport order in Epic & the Blood Bank will tube them up.

Chemotherapy Nursing: Refer to the P&P.

All chemotherapy patients have a red chart with a master copy of the protocol. Orders are written from the protocol. Red charts are kept in the Oncology clinic or on East 5. The E5 Charge RN can access them as needed.

- RN staff double checks the orders (per P & P).
- Review all medications as ordered so that chemotherapy is given only by chemotherapy certified staff.
- Standard PPE should be worn for at least 48 hours post chemotherapy when handling any body fluids or contaminated materials. Hang a Cytotoxic Precaution sign for each room. Each unit has these supplies and extras are obtained through Distribution.
- It is very important to check urine with most chemotherapy. Watch for I/O orders. Urine is checked for volume, specific gravity, pH and presence of heme per protocol.
- Diaper changes are at a minimum of q 4 hours.

Specific medication guidelines
- Chemotherapy can be delivered by oral, subcutaneous, IM, IV, Intrathecal (into CSF via spinal tap).
- Note that Oral 6MP (Mercaptopurine) or oral 6TG (Thioguanine) are chemotherapy medications and need to be checked against the protocol and orders in Epic by two chemotherapy certified RNs, before administration.
- Lasix is often given for hemo or increased specific gravity (> 1.010) or heme, after Cytoscan (cyclophosphamide), Ifosfamide, or Cisplatin. Urines should be checked per protocol.
- Admissions for Methotrexate (MTX) are common. These are 4-hour or 24-hour infusions. Typically, patients getting 4-hour MTX infusions are seen outpatient. MTX levels are to be drawn at the end of the infusion and 24 hours from the start time as ordered. Enter a timed nurse draw in Epic for the times the labs are due. All labs for the day can be drawn at that time. While MTX is running and until post hydration is complete, urine needs to be checked for pH and specific gravity per protocol. PRN bicarbonate orders are often written to be given for low urine pH. MTX can cause nephrotoxicity.
- Zofran will precipitate with bicarbonate fluids that run with MTX. You must turn fluids off, set up a syringe pump. Flush well before and after Zofran is administered.

- Leucovorin is a rescue medication for MTX and not a chemotherapy medication. It is important that it is given at the ordered times and is scheduled according to the MTX start time. Alert pharmacy of the MTX start time for proper scheduling. This needs to be checked against the protocol and orders in Epic by two chemotherapy certified RNs, before administration.

Anti-emetics: Zofran or Granistron are usually the first medications used for nausea and should be scheduled around the clock. If patient is still nauseated, Vistaril can be ordered, then small Ativan doses. Zofran and Vistaril can be staggered so the patient receives anti-emetics every couple of hours.
Case Study

- Fred, a five-year old male
- Wt is 20 kg
- History of acute lymphoblastic leukemia (ALL), diagnosed three months ago
- 8 days out from his most recent round of chemotherapy
- No other significant medical history
Case Study

- Fred presents to the ER at 1700, accompanied by his mom, with a temperature of 101.4 F/38.6 C. He is eight days status-post his last round of chemotherapy. Mom has been monitoring his temperature at home every eight hours. His temperature at 1500 was 100.4 F/38 C. Mom retook his temperature at 1600 and it was 101 F/38.3 C. She called the doctor, who recommended going to the ER for inpatient admission. Before Mom brought him in, the last temperature she had gotten was the one at 1700.
Case Study

• Upon exam, Fred is still febrile at 102 F/38.9 C. He is tachycardic with a heart rate of 132 and a blood pressure of 108/62.
So what do we know?

• Fred’s temperature is continuing to rise
• Fred is 8 days out from his last round of chemo

So what is most likely going on?

• Myelosuppression secondary to chemotherapy
• Increased susceptibility to an infection with low white blood cell counts, particularly low neutrophil counts
What can we expect for Fred?

- As the nurse, you may have suspicions for the following:
  - Bacterial infection secondary to myelosuppression
  - Fungal infection secondary to myelosuppression
  - Viral infection secondary to myelosuppression
  - Inflammation

- ...and prepare to see the following orders:
  - Blood cultures from each lumen of any indwelling line
  - Cefepime—our gold standard for the broad-spectrum antibiotic in the HOT population
Nursing Interventions

• Paying close attention to and tracking daily CBCs (it is normal for counts to fluctuate before the final climb)
• Getting CBCs with differentials once the WBCs start coming in
• Treating infections, presumed infections, fevers for no reason (and/or treating line infections– do the benefits outweigh the risks for keeping an infected line in or did a course of IV therapy fix the problem at hand?)
Nursing Interventions

• An oncology nurse is able to help identify their patients who are likely to become more immunocompromised

  • 7-14 days out from most recent round of chemo
    • Certain chemos are myeloablative, meaning they annihilate the bone marrow
  • Open wounds
  • Active infections
  • Grade 3 or 4 mucositis or history of mucositis
  • Poor nutritional status
Treatments for Infection and Neutropenia

- Antibiotics
- Antifungals
- Antivirals
- PCP Prophylaxis
- G-CSF or GM-CSF, depending on whether or not it is appropriate for the type of cancer
- Comfort measures
  - Tylenol
  - Ice packs
- Rest
- Time
Patient Education/Nursing Interventions

• Early recognition and action!
• Handwashing
• Monitor temperature regularly, particularly beginning 7 days after last chemo treatment
• Distribute easy-to-understand written instructions with clear phone number to call for help
• Policies and procedures explaining how to triage febrile neutropenic patients in the emergency room
• Daily CBCs
• Avoidance of ill contacts
Finally...

• After ten days, fevers subside, counts recover, and Fred is finally feeling better and ready to go home!
Key Takeaways

- You already have your nursing skills set. Apply it to this population as well. If a patient is desatting, stop and think: what would you do for any other patient who is desatting? Who would you normally notify?
Key Takeaways

• We need you and we are excited to partner with you!
• Ask questions—HOT is here to support you.
• Have fun—these are amazing people that you will meet in your lifetime.
Questions?