



Care of the Pediatric Oncology Patient

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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.



Today one in every **680** U.S. adults is a **childhood cancer survivor**

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%



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?*

Children's Hospitals and Clinics of Minnesota

RBC Parameters (Conventional Units)

Age	HGB (g/dL)	HCT (%)	RBC ($\times 10^6/\mu\text{L}$)	MCV (fl)	MCH (pg)	MCHC (%)	RDW (%)
1 day	14.5 - 22.5	45 - 67	4.00 - 6.60	95 - 121	31 - 37	29 - 37	12.0 - 18.0
1 wk	13.5 - 19.5	42 - 66	3.90 - 6.30	88 - 126	28 - 40	28 - 38	13.0 - 18.0
2 wk	12.5 - 20.5	39 - 63	3.60 - 6.20	86 - 124	28 - 40	28 - 38	13.0 - 18.0
1 mo	10.0 - 18.0	31 - 55	3.00 - 5.40	85 - 123	28 - 40	29 - 37	11.5 - 16.0
2 mo	9.0 - 14.0	28 - 42	2.70 - 4.90	77 - 115	26 - 34	29 - 37	11.5 - 16.0
3 - 6 mo	9.5 - 13.5	29 - 41	3.10 - 4.50	74 - 108	25 - 35	30 - 36	11.5 - 16.0
0.5 - 2 yr	10.5 - 13.5	33 - 49	3.70 - 5.30	70 - 86	23 - 31	30 - 36	11.5 - 16.0
2 - 6 yr	11.5 - 15.5	34 - 40	3.90 - 5.30	75 - 87	24 - 30	32 - 36	11.5 - 15.0
6 - 12 yr	11.5 - 15.5	35 - 45	4.00 - 5.20	77 - 95	25 - 33	32 - 36	11.5 - 15.0
12 - 18 yr (Male)	13.0 - 16.0	36 - 51	4.50 - 5.30	78 - 98	25 - 35	32 - 36	11.5 - 14.0
12 - 18 yr (Female)	12.0 - 16.0	33 - 51	4.10 - 5.10	78 - 102	25 - 35	32 - 36	11.5 - 14.0
>18 yr (Male)	13.5 - 17.5	37 - 53	4.50 - 5.90	80 - 100	26 - 34	32 - 36	11.5 - 13.1
>18 yr (Female)	12.0 - 16.0	33 - 51	4.00 - 5.20	80 - 100	26 - 34	32 - 36	11.5 - 13.1

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

<i>Platelets (Conventional Units)</i>		
Age	PLT ($\times 10^3/\mu\text{L}$)	MPV (fl)
All ages	150 – 450	6.5 – 10.0

- 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).

Nursing Interventions

- Thrombocytopenia
 - Physical exam (bruising, petechiae)
 - Monitor labs
 - Transfuse (lab value lower than 10, pre-procedure, PRN)



Children's Hospitals and Clinics of Minnesota

WBC and Differential (Conventional Units)

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

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.

	4/19/2014 0703	4/21/2014 0320	4/23/2014 0545	4/25/2014 0517	4/26/2014 0018	4/27/2014 0405	4/28/2014 0430	4/29/2014 0310	4/29/2014 1500
GENERAL HEMATOLOGY									
WBC 	↓ 2.0 ↓	↓ 1.7 ↓	↓ 1.9 ↓	↓ 0.7 ↓	↓ 0.8 ↓	↓ 0.2 ↓	↓ 0.1 ↓	↓ 0.1 ↓	↓ 0.1 ↓
RBC	↓ 2.78 ↓	↓ 2.58 ↓	↓ 2.47 ↓	↓ 2.33 ↓	↓ 2.76 ↓	↓ 2.71 ↓	↓ 2.84 ↓	↓ 3.11 ↓	↓ 2.72 ↓
Hemoglobin	↓ 9.6 ↓	↓ 8.7 ↓	↓ 8.3 ↓	↓ 7.6 ↓	↓ 9.1 ↓	↓ 8.5 ↓	↓ 8.8 ↓	↓ 9.5 ↓	↓ 8.3 ↓
Hematocrit	↓ 26.2 ↓	↓ 24.2 ↓	↓ 23.1 ↓	↓ 21.5 ↓	↓ 25.1 ↓	↓ 24.7 ↓	↓ 25.5 ↓	↓ 27.6 ↓	↓ 24.0 ↓
MCV	94	94	93	92	91	91	90	89	88
MCH	↑ 34.4 ↑	↑ 33.6 ↑	↑ 33.7 ↑	↑ 32.5 ↑	↑ 33.0 ↑	↑ 31.5 ↑	↑ 31.1 ↑	↑ 30.5 ↑	↑ 30.4 ↑
MCHC	↑ 36.5 ↑	↑ 35.9 ↑	↑ 36.1 ↑	↑ 35.2 ↑	↑ 36.3 ↑	↑ 34.5 ↑	↑ 34.6 ↑	↑ 34.3 ↑	↑ 34.4 ↑
Platelet Count	168	↓ 116 ↓	↓ 70 ↓	↓ 32 ↓	↓ 19 ↓	↓ 8 ↓	↓ 13 ↓	↓ 30 ↓	↓ 20 ↓

Calculating the ANC

	4/19/2014 0703	4/21/2014 0320	4/23/2014 0545
GENERAL HEMATOLOGY			
WBC	2.0 ↓	1.7 ↓	1.9 ↓
RBC	2.78 ↓	2.58 ↓	2.47 ↓
Hemoglobin	9.6 ↓	8.7 ↓	8.3 ↓
Hematocrit	26.2 ↓	24.2 ↓	23.1 ↓
MCV	94	94	93
MCH	34.4 ↑	33.6 ↑	33.7 ↑
MCHC	36.5 ↑	35.9	36.1 ↑
Platelet Count	168	116 ↓	70 ↓
Absolute Neutrophils			
% Neutrophils			
Absolute Lymphocytes			
% Lymphocytes			
Absolute Monocytes			
% Monocytes			
Absolute Eosinophils			
% Eosinophils			
Absolute Basophils			
% Basophils			
RDW	20.0 ↑	18.8 ↑	18.0 ↑
MPV	6.8	7.2	8.1
Nucleated RBC Auto...			
Segs	↑	59	56
Bands			1 ↓
Lymphocytes	↓	41	43

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

Calculating the ANC

	4/19/2014 0703	4/21/2014 0320	4/23/2014 0545
GENERAL HEMATOLOGY			
WBC	2.0	1.7	1.9
RBC	2.78	2.58	2.47
Hemoglobin	9.6	8.7	8.3
Hematocrit	26.2	24.2	23.1
MCV	94	94	93
MCH	34.4	33.6	33.7
MCHC	36.5	35.9	36.1
Platelet Count	168	116	70
Absolute Neutrophils			
% Neutrophils			
Absolute Lymphocytes			
% Lymphocytes			
Absolute Monocytes			
% Monocytes			
Absolute Eosinophils			
% Eosinophils			
Absolute Basophils			
% Basophils			
RDW	20.0	18.8	18.0
MPV	6.8	7.2	8.1
Nucleated RBC Auto...			
Segs		59	56
Bands			1
Lymphocytes		41	43

- $(56 + 1) \times 1.9 \times 10 = 1083$

Calculating the ANC


	5/8/2014 0408	5/9/2014 0925	5/11/2014 0406
GENERAL HEMATOLOGY			
WBC	0.4 ↓↓	0.4 ↓↓	0.7 ↓↓
RBC	3.08 ↓↓	2.87 ↓↓	2.71 ↓↓
Hemoglobin	9.6 ↓↓	8.8 ↓↓	8.4 ↓↓
Hematocrit	27.6 ↓↓	25.7 ↓↓	23.8 ↓↓
MCV	90	90	88
MCH	31.3	30.6	30.9
MCHC	35.0	34.2	35.1
Platelet Count	9 ↓↓	18 ↓↓	6 ↓↓
Absolute Neutrophils			0.2 ↓↓
% Neutrophils			30.2
Absolute Lymphocytes			0.4 ↓↓
% Lymphocytes			63.3
Absolute Monocytes			0.0
% Monocytes			4.8
Absolute Eosinophils			0.0
% Eosinophils			1.8
Absolute Basophils			0.0
% Basophils			0.0
RDW	13.3	12.6	12.1
MPV	12.6 ↑		12.9 ↑
Nucleated RBC Auto...			0.00
Segs			17 ↓↓
Bands			2 ↓↓
Lymphocytes			77 ↑↑
Monocytes			4
Eosinophils			
Basophils			
Reactive Lymphocytes			
Metamyelocytes			
Total Cells Counted			100

- $(17 + 2) \times 0.7 \times 10 = 133$

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.

Segs			17	↓
Bands			2	↓
Lymphocytes			77	↑



ANC Calculation Errors

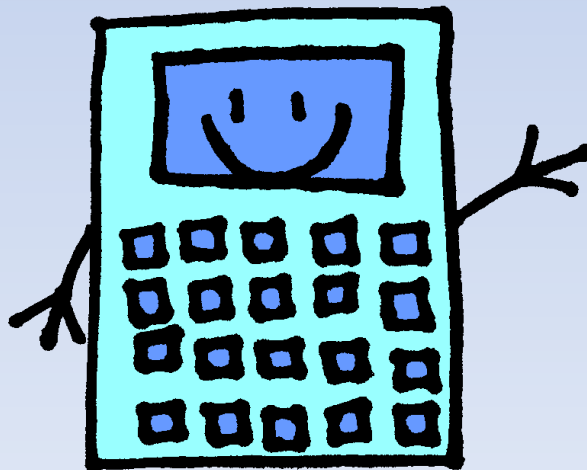
- Most common errors when calculating the ANC:
 - Even if the patient has a WBC count of 2.0, but they do not have neutrophils (segs + bands = 0), then the ANC is still 0.

4/19/2014 0703	
GENERAL HEMATOLOGY	
WBC	2.0 ↓
RBC	2.78 ↓
Hemoglobin	9.6 ↓
Hematocrit	26.2 ↓
MCV	94
MCH	34.4 ↓
MCHC	36.5 ↓
Platelet Count	168
Absolute Neutrophils	
% Neutrophils	
Absolute Lymphocytes	
% Lymphocytes	
Absolute Monocytes	
% Monocytes	
Absolute Eosinophils	
% Eosinophils	
Absolute Basophils	
% Basophils	
RDW	20.0 ↓
MPV	6.8
Nucleated RBC Auto...	
Segs	
Bands	
Lymphocytes	
Monocytes	
Eosinophils	
Basophils	
Reactive Lymphocytes	
Metamyelocytes	
Total Cells Counted	

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 $T \geq 38.3$. 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



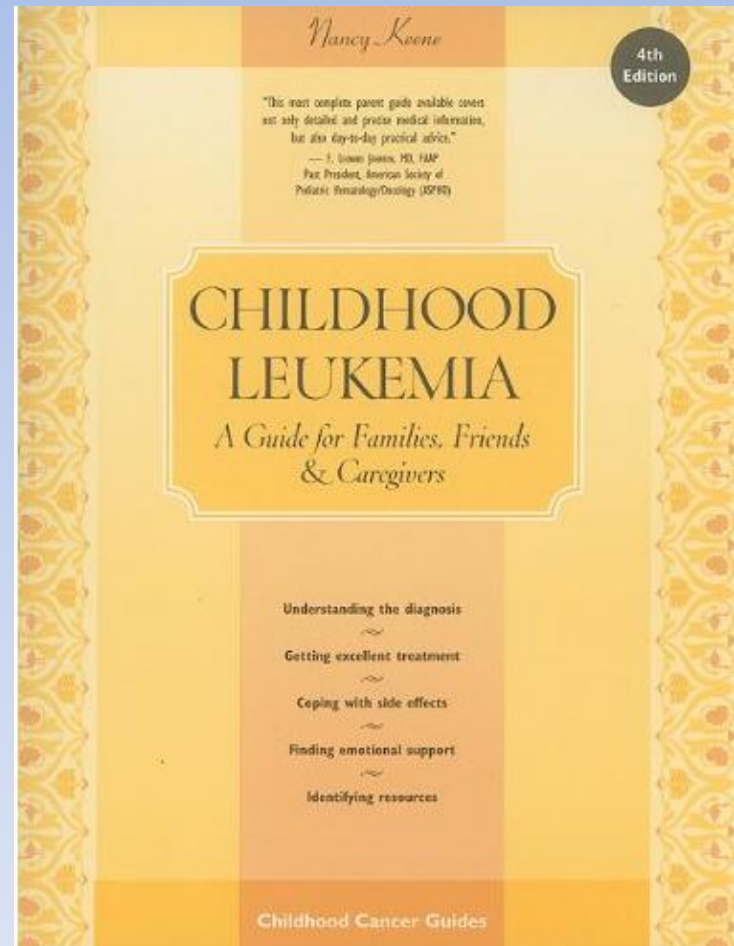
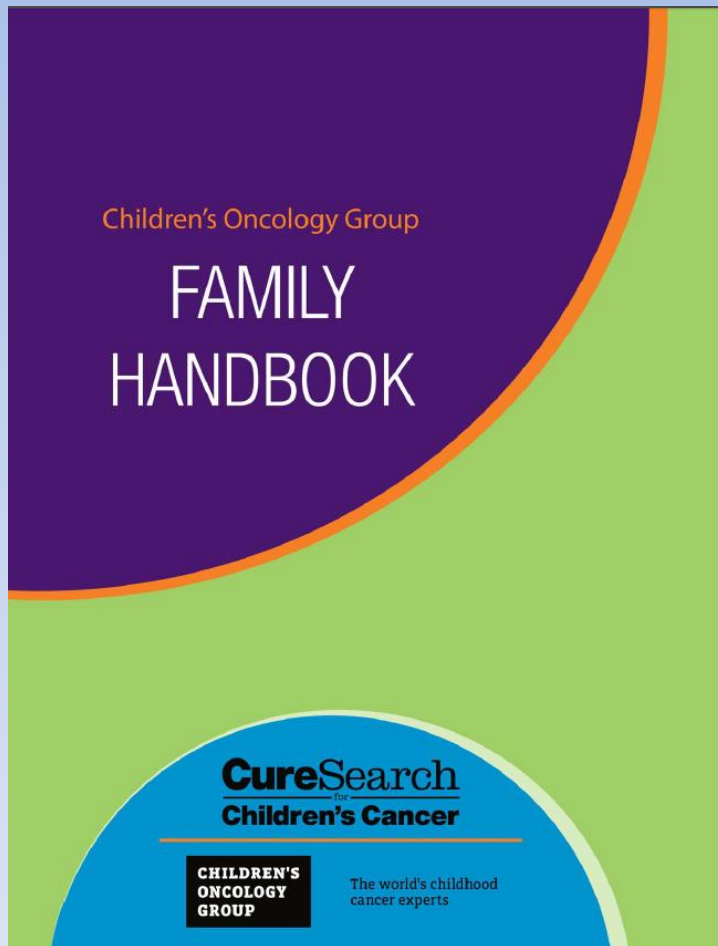


Resources from Children's Hospital of Wisconsin For Patients and Parents

- 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



When to Call Your Child's Doctor: Oncology

EAST 5 Inpatient Unit Phone Number: 414-266-3050

MACC Fund Center for Cancer and Blood Disorders Phone Number: 414-266-2420

Use the MACC Fund Center for Cancer and Blood Disorders number Monday through Friday, 8:00am – 5:30pm to schedule appointments or call when your child is ill.

After 5:30pm, on the weekend, or holidays call the EAST 5 Unit.

- Most important teaching sheet to send home!
- Where to find it: on the Intranet under “Teaching Materials,” “Oncology,” “When to Call the Doctor: Oncology”

Call 911 or Emergency Services immediately if your child:

- Is not breathing or has severe difficulty breathing.
- Has no heartbeat.
- Has skin or lips that look blue.
- Is having a seizure and you have not been told that these can be managed at home.
- Does not wake up after you have attempted to awaken them (loss of consciousness).

Call your health care team immediately if your child has:

- Fever of 38.3°C (Centigrade) or 101°F (Fahrenheit) or higher.

Do not wait to see if the fever goes up again before you call. It is important to let your health care team know every time your child has a fever.

- Shaking chills.
- Increased bruising.
- Bleeding that does not stop after 5 to 10 minutes or pressure.
- Change in level of consciousness.
- Severe headache.
- New weakness.
- Vision changes.
- Trouble breathing.
- Uncontrolled pain or irritability.
- Burning, pain, or blood with urination.
- Unable to drink fluids.
- New onset or uncontrolled nausea/vomiting.
- Repeated diarrhea.
- No stool in 3 days.
- Break in CVL.
- New or changing rash.
- Exposure to chicken pox or shingles.

Special reminders

Do not give your child acetaminophen (Tylenol®), aspirin, ibuprofen (Advil® or Motrin®), any over-the-counter medicines (cold/cough medicines) or herbal products unless you have talked with your doctor or nurse first.

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.

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 Calstat® (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)

Understanding the CBC
(Complete Blood Count)

What is a CBC?

A CBC is a complete blood count. It measures the types and numbers of all the cells in your child's blood. The results of the CBC help the doctor decide the best treatment for your child's illness.

How is it done?

A blood sample is needed. Getting a blood sample is sometimes referred to as drawing blood or a blood draw. There are three different ways to get the sample:

1. A needle and syringe may be used to take a very small amount of blood from your child's arm. Infants may have the blood taken from their heel.
2. An instrument may be used to prick the end of one of your child's fingers so that a blood drop forms. Tubes will be filled by gently squeezing your child's finger.
3. If your child has a central venous line (CVL), a port or a PICC line, a small amount of blood may be taken from the line.

The CBC blood draw takes about five minutes. Talk to your child's doctor or nurse if you have a question about the method used for your child.

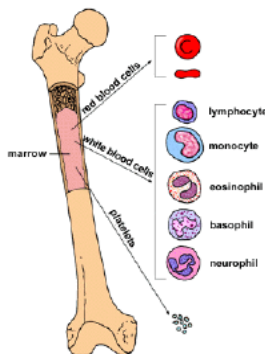
What are the results?

The first part of the CBC is ready in about 30 minutes. The rest of the results are ready in about two hours. The normal range depends on age. Different laboratories may have different normal ranges. Results must always be compared to the normal range listed for the laboratory that analyzed the sample. **There are three major types of blood cells:**

1. **Red cells** carry oxygen to the tissues in the body. Hemoglobin is the oxygen-carrying protein in all red cells. The results of the blood sample will show the number of red cells and the amount of hemoglobin.
2. **Platelets** help the blood to clot. If the platelet count is low, there might be bruising or bleeding somewhere in the body.
3. **White cells** fight infection in the body. Below is a list of the different kinds of white cells. They all work together to fight infection, but have different jobs.

Types of white cells:

- **POLYS or SEGS** are mature white cells that fight bacterial infections.
- **BANDS** are immature POLYS. They cannot fight infection as well as POLYS, but they do help.
- **LYMPHS** fight viral infections.



White blood cells (continued)

- **MONOS** have an important part in preventing infection. During an infection or during chemotherapy, radiation, or bone marrow transplants, the bone marrow may be inactive. When the bone marrow becomes active again, one of the first signs is an increase in monos in your child's blood.
- **EOS** are involved in allergic reactions.
- **BLASTS** are very immature cells that are not normally found in blood. If blasts are in the blood, they are a sign of serious illness.
- **BASOS** will increase with some illnesses.
- **ABSOLUTE NEUTROPHIL COUNT (ANC)** tells the doctor how much risk your child has to get an infection.

Figuring the ANC (Absolute Neutrophil Count)

The ANC is the real number of white blood cells (WBC) your child has to fight an infection. To figure out the ANC, you need the results of your child's complete blood count (CBC).

- The formula is: $ANC = \text{Total WBC} \times (\text{segs} + \text{bands})$
- Multiply the total number of WBC's by the number of segs plus bands.
 - Example: Your child's WBC is 4. This means 4,000. Your child has 20% segs (0.20) and 10% bands (0.10). Calculate the ANC as follows:

$$ANC = 4,000 \times (.20 + .10)$$

$$ANC = 4,000 \times (.30)$$

$$ANC = 1,200$$

Blood counts

Directions: Use this form to keep a record of each of your child's blood counts.

Date	HGB	Platelets	WBC	SEGS	BANDS	ANC	Comments (for example, "Received blood transfusion, started new medicine"):

ALERT: Call your child's doctor, nurse, or clinic if you have any questions or concerns or if your child has:

- A temperature over 101° F (38.3° C).
- Signs of bleeding or bruising.
- Signs of low hemoglobin such as feeling very tired, sleepy or dizzy.
- Headaches, a fast heartbeat or looks pale.
- 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.

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		Phone: x 6-3050
Lauren Ranallo	HOT Services APN	Pager 907-8898
Amy Newman	Oncology PNP	Pager 907-7258
Molly Brickler	Oncology PNP	Pager 907-9225
Allison Grady	Oncology PNP	Pager 907-3321
Tonya Ureda	Oncology/BMT PNP	Pager 907-0397
Kristen Tews	Oncology PA	Pager 907-7876
Attending Physician	Oncology	Phone: x 6-3050 to verify coverage for patient

Outpatient

Susie Burke	Oncology PNP	Pager 907-7527
Becky Rusch	Oncology PNP	Pager 907-2588
Meghan Belongia	Oncology PNP	Pager 907-0653
Chris Schulta	Oncology PNP	Pager 907-7339
Cheryl Amus	Oncology PNP	Pager 907-7467
Deb Schmidt	Oncology/Survivorship PNP	Pager 907-3175

General Nursing Care Guidelines for All Patients

- **No rectal temps or rectal meds** due to low platelet counts, reduced ability to fight infections, and disruption of skin/mucosal surfaces.
- **No ibuprofen/ketorolac** without approval from MD/HOT APN as these meds decrease platelet functioning. **No Tylenol** unless given permission by provider. Morphine is commonly used for pain.
- Vital signs are assessed q 4 hours if patient is febrile and/or neutropenic. Patients in for chemo are assessed q 8 hour, if afebrile.
- Patients should receive antibiotics within one hour of ordering so alert pharmacy. Cefepime is most commonly given. Vancomycin and Tobramycin are added if the patient is ill-appearing. Complete vital signs every 3-5 minutes with the start of antibiotics. 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.
- Expect an order for scheduled antibiotics and ask if there is not one ordered. Alternate lumens for antibiotics with a positive culture if provider specifies in order.
- Blood cultures should already be drawn if the patient came through EDTC or clinic. 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.
- GCSF (Granulocyte Colony Stimulating Factor) (Filgrastim) may be given to some patients to stimulate early release of neutrophils from the bone marrow. It is ordered SQ or IV.
- Admissions can come from the oncology clinic, EDTC, or as direct admissions.

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 RLQ pain and fever.

(GI) Mucositis & Esophagitis

Can range from small oral ulcers to mucosal sloughing of mouth and anus. Careful oral hygiene with Biotene® or Chlorhexidine® is critical.

- Assess mouth regularly for mucosa integrity, Herpes, or Candida. Ask about pain with stooling and assess for rectal fissures. Document status in Epic.
- 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 parents/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 I>O or increased spec. gravity. (>1.010) or + heme. after Cytosan (cyclophosphamide), Ifosphamide, 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 q 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 spec. 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 Granisetron 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.

Fred's



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.

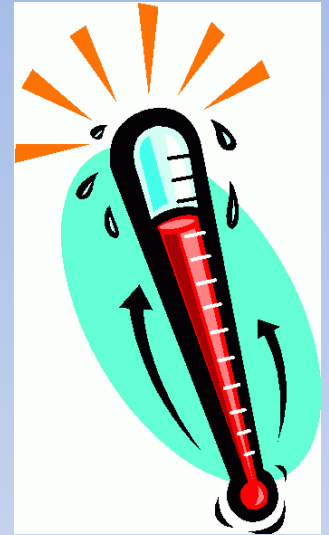


So what do we know?

- 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



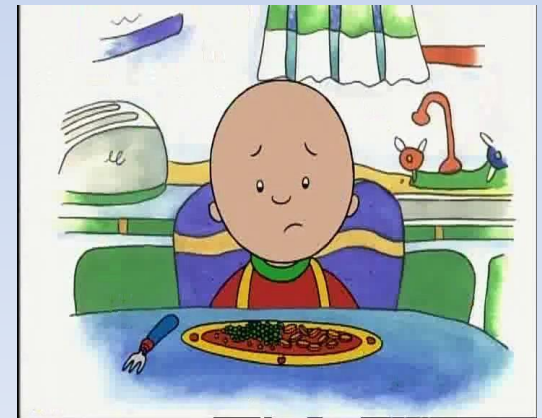
Nursing Interventions

- 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?

