

# Paediatric **Haematology/Oncology** Ward Officer's Handbook

Texas Children's Cancer & Hematology Centers  
Global HOPE (Hematology-Oncology Programs of Excellence)

Second Edition  
(12/10/2015)



## Editors:

Jeremy S. Slone, MD, MPH  
Assistant Professor of Pediatrics  
Baylor College of Medicine  
Texas Children's Cancer & Hematology Centers

Amanda K. Slone, BSN, RN  
Project Manager & Care Coordinator  
Baylor College of Medicine  
Texas Children's Cancer & Hematology Centers

Kate Westmoreland, MD  
Pediatric Global Health Fellow  
Children's Hospital of Philadelphia

Susan Alisanski, MD, MSCI  
Global Health Corps  
Baylor College of Medicine  
Texas Children's Cancer & Hematology Centers

Parth S. Mehta, MD, MPH  
Assistant Professor of Pediatrics  
Baylor College of Medicine  
Texas Children's Cancer & Hematology Centers

# Index

	Page #
<b>Haematology</b>	
1. Blood Transfusion Therapy .....	3
2. Transfusion Reactions .....	5
3. Sickle Cell Disease .....	6
4. Epistaxis Management .....	10
5. Haemophilia .....	10
6. Von Willebrand Disease .....	12
7. Immune Thrombocytopenia (ITP).....	13
8. Thrombosis .....	14
<b>Oncology</b>	
1. Intravenous Fluids, Body Surface Area, and Central Lines .....	16
2. Neutropenia .....	16
3. Fever & Neutropenia .....	17
4. Anti-Fungal Therapy .....	18
5. Antiviral Therapy .....	19
6. <i>Pneumocystis jirovecii</i> (PJP) Prophylaxis.....	20
7. Chemotherapy Anaphylaxis Precautions.....	21
8. Oncologic Emergencies:Tumor Lysis Syndrome and Space Occupying Lesions .	21
9. Immunizations in Oncology Patients .....	24
<b>Symptom Management and Palliative Care</b>	
1. Palliative Care .....	25
2. Pain Control .....	25
3. Nausea & Vomiting .....	28
4. Constipation .....	29
5. Mucositis & Oral Hygiene .....	30
6. Anxiety .....	30
7. Malignant Wound Care.....	31
8. Dyspnea .....	32
9. Hospice/End of Life .....	32
<b>References</b>	
<b>Appendices</b>	
A – Port Access Protocol	
B – CVC Care Protocol	
C – Sickle Cell Haemoglobinopathy Roadmap	
D – Clinical Practice Guidelines for Haemophilia A	
E – Clinical Practice Guidelines for Haemophilia B	
F – Haemostasis Clinic Note	
G – Tranexamic Acid Mixing Instructions & Plan	
H – Management of Cytopenias	
I – Management of Non-Myelosuppressive Side Effects	
J – Chemotherapy & Nursing Considerations Chart	
K – Chemotherapy Preparation Guidelines	
L – Chemotherapy Plan	
M – Paediatric Haematology Oncology Formulary	
N – Daily Rounding Note	
O – Ferrimed Iron Injection Protocol	

**Disclaimer:**

*This handbook is written by pediatric hematologist-oncologists, a pediatrician, and a nurse with extensive global health experience. The purpose was to provide practical guidelines for the management of children with blood disorders and cancer. In particular, the authors use standards of care currently established for the paediatric haematology-oncology program at Princess Marina Hospital (Botswana) through a partnership with Baylor College of Medicine and the Texas Children's Cancer and Hematology Centers. Thus, portions of this handbook may not be applicable to every clinical setting and appropriate alternatives, excluded from this handbook, may be available in other settings. Every effort has been exerted to ensure that the content contained in this handout is in accordance with current recommendations and practice at the time of this publication. However, the user is urged to use best clinical judgment in applying the information contained in this handbook, especially medication dosages and intervals, based on each patient's unique clinical status and the medical setting. The user is advised to cross check the information contained in this handbook with published reference materials.*

# Haematology

## 1. Blood Transfusion Therapy

- **Infection Risk of Blood Transfusion Estimates**

- ✓ Incidence estimates taken from Transfusion 2002; 42:975-79
  - HIV 1:2,135,000
  - Hepatitis B 1:220,000
  - Hepatitis C 1:1,935,000
  - Bacterial contamination 1:2,000 platelet units

- **General Guidelines for Transfusion Therapy**

- ✓ Prior to initial transfusion, consider HIV & Hepatitis B & C screening.

- ✓ Premedication:

Used in patients with a history of prior allergic or febrile transfusion reaction

- One or more of these medications can be used:
  - Paracetamol 15 mg/kg PO (*Max dose 650 mg/dose*)
  - Antihistamine (give one of the following):
    - ♦ Chlorpheniramine (Allergex) – 1 mg (2-5 years), 2 mg (6-11 years), 4 mg (>12 years) PO
    - ♦ Promethazine 1 mg/kg/dose (for children 25 mg is usually sufficient although up to 50 mg can be given) PO/IV
  - Hydrocortisone 2 mg/kg IV (*Max dose 250mg/dose*)
    - ♦ Or alternative steroid such as dexamethasone, prednisone, or methylprednisolone (Solu-Medrol)

- **Packed Red Blood Cell (pRBC) Transfusion**

- ✓ Give pRBC transfusion if Hgb < 7 g/dL for most patients, especially acute anaemia, or if there are signs of cardiovascular compromise
- ✓ An exception to the above would be if the etiology of anemia is from iron deficiency. If the Hgb < 7 g/dL with the likely cause iron deficiency (low MCV, low reticulocyte count, high RDW, microcytic and hypochromic RBCs on peripheral blood smear) and the child is asymptomatic, oral iron therapy can be started with ferrous sulfate 3 mg/kg/dose twice a day with close monitoring in lieu of a pRBC transfusion. If oral iron is not possible, see **Appendix O** for a protocol for IM iron therapy.
- ✓ Transfuse **10-15 mL/kg pRBC IV over 2-4 hours**
  - Response varies depending on concentration of unit, but expect 1g/dL rise in haemoglobin for each 5 mL/kg transfusion given

**Paediatric Haematology/Oncology Ward Officer's Handbook**

- New leukaemia patient with hyperleukocytosis (WBC >100,000) should only receive pRBC transfusion after consulting with paediatric haematologist-oncologist.
- ✓ Pre- & Post-transfusion Diuretic Therapy:
  - **Furosemide is not routinely recommended** and should be given only if the clinical condition warrants it (i.e. cardiac dysfunction or respiratory/O<sub>2</sub> issues)

● **Platelet Transfusion**

- ✓ Dosing of transfusion volume:
  - Transfuse 10 mL/kg if single donor platelets available or one 50mL pack/10kg if random donor platelet packs available (to a max of 4-6 packs)
  - Transfuse over 1 hour
- ✓ Expect increase in platelet count by 50,000/mm<sup>3</sup> with above guidelines
- ✓ If there is concern for poor response check platelet count from 60 minutes post-transfusion to assess response
- ✓ **CAUTIONS!**
  - **Contraindicated** in patients with Thrombotic Thrombocytopenic Purpura (TTP) and Heparin-Induced Thrombocytopenia (HIT)
  - No benefit in patients with Immune Thrombocytopenia (ITP) **unless there is life-threatening bleeding**, but should be only given after a bolus dose of steroids (methylprednisolone 30 mg/kg IV, max 1g/dose) **and/or** IVIG (0.8 g/kg IV). Refer to ITP section for further management.

Platelet count ( /mm <sup>3</sup> )	Transfusion Strategy
< 10,000	High risk for bleeding; transfusion likely indicated except in ITP without life-threatening bleeding (see ITP section) <b>Do not perform surgery, lumbar puncture (LP) or intramuscular (IM) injection.</b>
10,000 - 20,000	Transfusion likely needed if patient has infection, coagulopathy, splenomegaly, or bleeding. <b>Do not perform surgery, LP or IM injection.</b>
20,000 - 50,000	Transfusion for active bleeding, patients with brain tumor, or for invasive procedures (LP, central line placement). Stable patients rarely ever require transfusion.
> 50,000	Transfusion only if there is an underlying platelet dysfunction or there is significant bleeding.

● **Plasma Transfusion**

- ✓ Indications for Fresh Frozen Plasma (FFP) use:
  - Massive transfusion of pRBC (e.g. greater than patient's total blood volume within 24 hours)
  - Active bleeding or surgery in patient with prolonged Prothrombin Time (PT) and/or activated partial thromboplastin time (aPTT) secondary to factor deficiency for which specific factor replacement is not available
  - Disseminated intravascular coagulation (DIC) with bleeding
  - Haemophilia A or B without the appropriate factor concentrate available
- ✓ Dosing of Plasma
  - Give **15mL/kg IV over 1 hour**

## Paediatric Haematology/Oncology Ward Officer's Handbook

- 1 unit contains 200-250 mL
  - FFP contains 1 unit/mL of coagulation factors
    - 10-15 mL/kg will result in 25-50% rise in factor level
    - Factor V & Factor VII may be exceptions as the former is labile & the latter has a short half-life
  - If patient is actively bleeding and the FFP arrives frozen you may thaw more quickly in a bowl of warm, ideally sterile, water
  - Dried human plasma stored at room temperature (like Bioplasma FDP) is also an option
- **Cryoprecipitate**
    - ✓ Indications:
      - bleeding or invasive procedure with factor VIII deficiency or von Willebrand disease and factor concentrate not available
      - Bleeding or invasive procedure with hypofibrinogenaemia or factor XIII deficiency
      - Does not contain Factor IX so not appropriate as replacement for Haemophilia B treatment
    - ✓ Dosing:
      - Give **1 unit/5 kg IV over 1 hour** every 8-24 hours

## 2. Transfusion Reactions

- **Signs & Symptoms of Transfusion Reactions**
  - ✓ Can include any or all of the following therefore it is important to monitor for these every 20 minutes during a transfusion:
    - Chills & fever ( $>38.0^{\circ}\text{C}$ )
    - Urticaria
    - Chest/spine pain
    - Nausea or vomiting
    - Anxiety or restlessness
    - Signs of haemolysis (haemoglobinuria, shortness of breath, hypotension)
    - Signs of sepsis (hypotension, delayed capillary refill, mental status changes)
- **Management of Transfusion Reaction**
  - ✓ Stop transfusion, change IV tubing, flush line & start normal saline (NS) at 1600 mL/m<sup>2</sup>/day (maintenance rate)
  - ✓ If febrile or urticarial reaction give:
    - **Paracetamol** 15 mg/kg PO (Max dose 650 mg/dose)
    - **Hydrocortisone** 2 mg/kg IV (Max dose 250 mg/dose)
      - Note: if unavailable, then may use another steroid such as methylprednisolone or dexamethasone
    - Antihistamine (give one of the following):
      - **Chlorpheniramine (Allergex)** 1 mg (2-5 years), 2 mg (6-11 years), 4 mg (>12 years) PO
      - **Promethazine** 1 mg/kg/dose (for children 25 mg is usually sufficient though up to 50mg can be given) PO/IV
  - ✓ In patients with anaphylaxis adrenaline should be given:
    - **Adrenaline 1:10,000** - give 0.1 mL/kg IV/IO (0.01mg/kg)
    - **Adrenaline 1:1000** - give 0.01 mL/kg IV/IO
      - **Max single dose is 0.1 mg/dose**
        - ◆ Management per guidelines for anaphylaxis by **Pediatric**

**Paediatric Haematology/Oncology Ward Officer's Handbook**  
**Advanced Life Support (PALS)**

- ✓ For any reaction monitor vital signs every 2-5 minutes until patient is stable including heart rate, respiratory rate, blood pressure, & pulse oximetry (where available)
- ✓ Once patient is stable, consider transfusion of additional products unless patient experienced haemolytic reaction, in such a case, discuss with paediatric haematologist-oncologist first.
- ✓ Patients with a history of transfusion reactions can be given pre-medication with chlorpheniramine (Allergex)/promethazine, paracetamol, and/or hydrocortisone. Doses noted above.
- ✓ If patient experiences only mild urticaria, give chlorpheniramine (Allergex) and/or promethazine; if symptoms resolve, continue transfusion slowly over no more than 4 hours.

### **3. Sickle Cell Disease** (See Appendix C for haemoglobinopathy roadmap)

#### ❖ **Penicillin Prophylaxis:**

- Patients should be receiving penicillin (PCN) prophylaxis
  - ✓ Penicillin VK 125 mg PO twice daily for age birth – 2 years
  - ✓ Penicillin VK 250 mg PO twice daily for > 3 years
  - ✓ Can substitute amoxicillin if PCN unavailable
- Discontinuing PCN prophylaxis can be considered for patients age 5 years & older who meet **BOTH** of these criteria:
  - ✓ Patient without prior history of documented pneumococcal infection
  - ✓ Patients who have received 1 dose of PPSV23 (pneumococcal 23) and appropriate PCV13 doses.

#### ❖ **Diagnostics:**

- Ideally, haemoglobin (Hgb) electrophoresis should be sent after 6-12 months of age as long as there has not been an RBC transfusion in the previous 3 months.

#### ❖ **Folic Acid Supplementation:**

- Patients with chronic haemolysis, as with sickle cell disease, benefit from folic acid supplementation:
  - ✓ For ALL sickle cell patients give:
    - 0.5 mg PO daily (age < 2 years age)
    - 1 mg PO daily (age > 2 years age)
- In the resource-limited setting, folic acid is often only available as 5 mg tablets, in this case, give 5 mg for age > 2 years as folate is relatively benign
  - ✓ 5 mg tablet can be crushed into a suspension made for infants:
    - 5 mg folic acid in 10 mL liquid (1 mL equals 0.5 mg folic acid)

#### ❖ **Hydroxyurea:**

- Mechanism: increases fetal haemoglobin
- Indications: frequent vaso-occlusive episodes, acute chest syndrome, chronic hypoxia, low Hgb F, history of stroke, & signs of haemolysis
- Consult with paediatric haematologist-oncologist for appropriate work-up before initiating a patient on hydroxyurea

### **3A. Sickle Cell Disease with Fever**

- **Common pathogens (encapsulated bacteria)**
  - ✓ *S. pneumoniae*
  - ✓ *H. influenzae* type b
  - ✓ *E. coli*
  - ✓ Salmonella
  - ✓ *Mycoplasma pneumoniae* and *hominis*
  - ✓ *Chlamydomphila pneumoniae*
  - ✓ *Strep pyogenes*
  - ✓ *Staph aureus*
  - ✓ *Neisseria meningitidis*
  
- **Diagnostics**
  - ✓ Full blood count with differential & reticulocyte count
  - ✓ Type and cross match
  - ✓ Total bilirubin and/or LDH
  - ✓ Blood culture
  - ✓ CXR
  - ✓ When clinically indicated - blood chemistries, urinalysis, urine culture, lumbar puncture
  
- **Management/Treatment**
  - ✓ **Admit** for intravenous antibiotics if *any* of the following is found:
    - Age < 1 year
    - T > 40°C
    - Toxic or ill-appearing patient
    - Any infiltrate on CXR
    - Pulse oximetry reading < 92% on room air
    - History of bacteremia or pneumonia
    - Hgb < 6 g/dL or reticulocyte count < 4%
    - WBC < 5,000/mm<sup>3</sup> or > 30,000/mm<sup>3</sup>
    - Platelet count < 100,000/mm<sup>3</sup>
  
  - ❖ **Rx for Non-toxic patient**
    - Start gram-negative rods coverage with an intravenous cephalosporin such as ceftriaxone **OR** cefotaxime for 7-10 days:
      - ceftriaxone – 75 mg/kg/day IV Q 24 hours (max: 4 gm/day)
      - cefotaxime –
        - ♦ Neonates:
          - ◇ 0-4 weeks: <1200 g: 50 mg/kg/dose every 12 hours
        - ♦ Postnatal age ≤7 days:
          - ◇ 1200-2000 g: 50 mg/kg/dose every 12 hours
          - ◇ >2000 g: 100-150 mg/kg/DAY divided every 8-12 hours
        - ♦ Postnatal age >7 days:
          - ◇ 1200-2000 g: 50 mg/kg/dose every 8 hours
          - ◇ >2000 g: 150-200 mg/kg/DAY divided every 6-8 hours
        - ♦ Infants and Children 1 month to 12 years (<50 kg):
          - ◇ 33-75 mg/kg/dose every 8 hours
          - ◇ Meningitis: 75 mg/kg/dose every 6 hours (maximum: 2 gram/dose or 12 gram/DAY)
        - ♦ Children >12 years (≥50 kg) and Adults:
          - ◇ Moderate to severe infection: 1-2 gram every 6-8 hours
          - ◇ Life-threatening infection: 2 gram/dose every 4 hours (maximum: 2 gram/dose or 12 gram/DAY)

- ✓ **Rx for Toxic patient, Add:**
  - Vancomycin 10-15 mg/kg/dose IV every 8 hour (max: 500 mg/dose, 2 gm/day)
- ✓ **Patient with chest syndrome/pneumonia**
  - Add Erythromycin IV 50mg/kg/day divided Q6 hours (max 2g/day)
  - Azithromycin can be used where available
- ✓ **Patients who do not require admission:**
  - Minimum phone follow-up within 24 hours to check culture results & clinical condition then consider one of the following:
    - Ceftriaxone 50 mg/kg IV/IM x 1 prior to discharge
    - Augmentin 80-90mg/kg/day divided twice daily PO for 10 days
    - Erythromycin 50 mg/kg/day divided 4 times daily for 3 days for patients allergic to cephalosporin (Max 4g per day oral)
- ✓ **If blood culture positive**, then adjust treatment based on culture & sensitivity.

### 3B. Sickle Cell Vaso-occlusive Crisis

- **Pain crisis**
  - ✓ Diagnostics
    - Full blood count with differential & reticulocyte count (anaemia and reticulocytosis typical)
    - Peripheral blood smear: sickled red blood cells, red blood cell fragments, Howell-Jolly bodies (splenic infarction)
    - Total bilirubin and LDH (unconjugated hyperbilirubinaemia and elevated LDH due to haemolysis)
  - ✓ Management
    - Pain control with opioid analgesic (see **Pain Control** section)
    - Hydration: 2000 mL/m<sup>2</sup>/day (1.25x maintenance IV + PO intake) if no cardiopulmonary compromise
    - Rest and heat to the area of pain; avoid cold as this can worsen pain
    - Remember patients with SSD are also at increased risk for avascular necrosis of the femoral and humeral head
    - Also remember dactylitis is painful swelling in the hands and feet and common in children <5 years
- **Priapism**

Definition: *painful* erection lasting >30 min

  - ✓ Diagnostics
    - Full blood count with differential & reticulocyte count
  - ✓ Management
    - Pain control with opioid analgesics (see **Pain Control** section)
    - Hydration: 2000 mL/m<sup>2</sup>/day (1.25x maintenance) if no cardiopulmonary compromise
    - Consult urology immediately for aspiration & irrigation if 4 hours since onset
    - Transfusion only if no detumescence within 12 hours
    - *There is no indication for oxygen therapy in such cases*
- **Splenic sequestration**
  - ✓ Splenic pooling of large amounts of blood and platelets
  - ✓ Diagnostics
    - Full blood count with differential & reticulocyte count

- Type & cross
- ✓ Management
  - Hydration: 1600 mL/m<sup>2</sup>/day (maintenance rate)
  - Transfusion with pRBC urgently with goal back to baseline Hgb
    - Generally transfuse with 5 mL/kg as patient at risk of auto-transfusion (sequestered blood leaving the spleen)
  - *Avoid aggressive splenic palpation* to prevent splenic rupture
  - Consider splenectomy to prevent recurrence

- **Aplastic crisis**

Severe anaemia primarily caused by parvovirus B19 or other virus

- ✓ Diagnostics
  - Full blood count with differential & reticulocyte count
  - Type & cross
- ✓ Management
  - Hydration: maintenance PO fluids (rate as above) or IV fluids if not able to take PO
  - Transfusion with pRBC as clinically indicated if symptomatic or if Hgb falls 2 g/dL or more from baseline

- **Acute Chest Syndrome/Pneumonia**

- ✓ Diagnostics
  - Full blood count with differential & reticulocyte count
  - Type & cross
  - Total bilirubin and/or LDH
  - Chemistries
  - Blood culture
  - Pulse oximetry
  - CXR AP and lateral
    - Note: 60% of children with acute chest syndrome will have an infiltrate on CXR but a normal pulmonary exam
- ✓ Management
  - Hydration: IV fluids at  $\frac{3}{4}$  maintenance maximum depending on oral intake. Can decrease or discontinue IV fluids if taking enough PO fluids to meet daily maintenance goal (1600 mL/m<sup>2</sup>/day).
    - Over-hydration can lead to pulmonary oedema and worsen acute chest syndrome
  - Pain management: Be cautious with narcotics but do not withhold. Balance between pain control & sedation as either may lead to respiratory distress. Narcotics can lead to hypoventilation and worsen acute chest syndrome.
  - Respiratory care:
    - Oxygen therapy with pulse oximetry monitoring
    - Salbutamol inhaler/nebulized every 4 hours
    - Incentive spirometry 10 puffs every 2 hours while awake (may also have the child blow bubbles or a pin wheel). Ambulation encouraged.
  - pRBC: 10-15 mL/kg pRBC transfusion if significant anaemia (Hgb <5g/dL or if Hgb drops <2g/dL from baseline), significant hypoxia, or worsening respiratory status
    - See **Section 3D** regarding risk of over-transfusion
  - Exchange transfusion may be considered; however it is rarely available in resource-limited setting
  - Antibiotics for pneumonia:
    - Cefotaxime + Vancomycin + Erythromycin (dosage as per **Section 3A**)

- **Stroke**

Occurs in 10-15% of children with sickle cell disease

- ✓ Diagnostics

- Full blood count with differential & reticulocyte count
- Type & cross
- Quantitative D-dimer if available
- Emergent CT or MRI/MRA (where available)
  - Contrast may exacerbate sickling. Discuss using contrast with paediatric haematologist-oncologist on call.

- ✓ Management

- Exchange transfusion is standard management where available
- If not available, simple transfusion can be considered.
  - See **Section 8 “Thrombosis”** for more.

### 3C. Pre-operative Preparation of Sickle Cell Patients

- Diagnostics

- ✓ Full blood count
- ✓ Type & cross

- Patients ought to receive simple transfusions to reduce Hgb S and to achieve Hgb of 10 g/dL

- ✓ Hydration IV + PO = 1.25 x maintenance the night before surgery

### 3D. Transfusion Therapy in Sickle Cell Disease

- Sickle cell patients ***should not be transfused to Hgb > 10 g/dL or Hct > 30%*** as this results in increased risk for stroke & vaso-occlusion
- Where available, full RBC phenotyping should be performed prior to initial transfusion and routine extended matching for minor RBC antigens, such as Rh and Kell, is recommended prior to all subsequent transfusions

## 4. Epistaxis Management

- Epistaxis Management

- ✓ Place patient ideally in the **sitting position**. Do not let the child lie down flat and ensure the head is above the heart.
- ✓ **Flex neck** anteriorly with chin touching the chest
- ✓ With thumb and index finger **pinch the soft parts of the nose on the lower half** of the nose and hold pressure for **20 minutes continuously** to allow for clot formation to occur
- ✓ Advise the patient to not blow their nose for at least 12 hours
- ✓ Nasal packing may be placed if source of bleeding not well visualized or bleeding is profuse
- ✓ Transfuse platelets if platelet count < 50,000

## 5. Haemophilia

Most common is Haemophilia A (Factor VIII deficiency) and Haemophilia B (factor IX deficiency)

- 80% with haemophilia A and 20% with haemophilia B
- X-linked recessive, 30% are *de novo* with no family history

### ❖ Diagnostic Testing

- **Prolonged PTT** with a normal PT and normal platelet count is suggestive

- Confirm with a factor VIII or Factor IX level:

Severity	Factor Level
Severe	<1%
Moderate	1-4%
Mild	5-25%

**\*Note:** normal factor level ranges from 50-200%

- In children <5 years, it is recommended to give weekly factor **prophylaxis** to prevent bleeds as they are at high risk for injury. May also do this for older patients if they are having frequent bleeding.
  - Haemophilia A: 50 units/kg every week or more often depending on the clinical situation
  - Haemophilia B: 100 units/kg every week or more often depending on the clinical situation

- **Inhibitor Screen**

Where available, screening for inhibitor should be performed:

- Mixing Study is a qualitative inhibitor screen
- Bethesda assay is the gold standard
  - If screen positive, defined as > 5 Bethesda Units, recombinant and concentrate products will not be sufficient even at high doses
    - Where available Factor VIIa, Anti-Inhibitor Coagulant Complex, Factor IX Complex Concentrate or Porcine Factor VIII should be considered

❖ **TREATMENT OF BLEEDING IN HAEMOPHILIA (See also APPENDICES D & E)**

Patients with haemophilia can have spontaneous bleeding and/or excessive bleeding with trauma, it is **imperative to treat haemophilia patients with factor within 30 minutes of presentation first and then** consider diagnostic testing.

- **FACTOR REPLACEMENT**

- **Factor VIII deficiency (Haemophilia A)**
  - 1 unit/kg increases Factor VIII activity by 2%
  - Give **30 units/kg of factor VIII** for an acute mild bleed
  - Give **50 units/kg of factor VIII** for an acute major bleed
  - After initial dose, discuss treatment plan with paediatric haematologist-oncologist. Half-life of factor VIII is 8-12 hours. Major bleed will likely need q 8-12 hour dosing.
- **Factor IX deficiency (Haemophilia B)**
  - 1 unit/kg increases Factor IX activity by 1%
  - Give **50 units/kg of factor IX** for an acute minor bleed
  - Give **100 units/kg of factor IX** for an acute major bleed
  - After initial dose, discuss treatment plan with paediatric haematologist-oncologist. Half-life of factor IX is 18-24 hours. Major bleed will likely need at least q 24 hour dosing.

## Paediatric Haematology/Oncology Ward Officer's Handbook

- *Note: If using recombinant Factor IX, the dose must be increased by factor of 1.2 (For example, dose of 100 U/Kg will be 120 U/Kg for recombinant factor)*
- It is important to **round up** both Factor VIII and Factor IX to a unit vial dose whenever possible to avoid waste
  - *For example, if unit vial is 500 units & patient's dose is 400 units, order 500 units Factor VIII*
- Where Factor VIII or Factor IX is unavailable or not immediately available in emergency situations give one of the following:
  - **Plasma (FFP)** at 10-20 mL/kg IV Q day to run over 1 hour
  - **Factor VIIa (NovoSeven)** 90mcg/kg IV Q8 hours
- **SUPPORTIVE CARE:**
  - Ice for 20 min to both haemarthrosis and soft tissue bleeds
  - Immobilize haemarthrosis for 48 hours
  - Head trauma should have an emergent CT scan after first dose of factor given even if there are no neurologic signs
  - For mucosal bleeding and dental extraction, may also add tranexamic acid (IV or PO)
    - 25 mg/kg/dose PO (max dose 1.5 g/dose)
    - 10 mg/kg/dose IV every 8 hours for 2-8 days.
    - See **Appendix G** for the "Tranexamic Acid Mixing Instructions & Plan"
- See **Appendix F** for "Haemostasis Clinic Note" for outpatient visits.

## 6. Von Willebrand Disease

Most common inherited disorder of bleeding and patients commonly have mucocutaneous bleeding, especially epistaxis. Heavy menses in adolescent females and older females in the family is common. It is important to **ask specifically** about number of days & amount of bleeding as many women & adolescents will think their heavy menses are "normal".

- **Diagnostics**
  - ✓ FBC (may see thrombocytopenia)
  - ✓ Factor VIII (may be decreased because it is carried in circulation by vWF)
  - ✓ PTT (may be prolonged due to decreased factor VIII)
  - ✓ vWF antigen
  - ✓ Ristocetin cofactor activity
  - ✓ VWF multimers (if available)
- **Treatment**
  - ✓ **Desmopressin Acetate (DDAVP)** can be given for patients who are sensitive (contraindicated in Type 2B vWD)
    - Avoid in patients less than 2 years old or less than 10 kg
    - Potential side effects: headache, flushing, tachyphylaxis, fluid retention, hyponatremia
  - **Dosing: (IV or Intranasal)**
    - **IV** 0.3 micrograms/kg (max 20mcg) in 50mL of NS and infused over 15-30 minutes; repeat dose may be given at 8-12 hours if clinically indicated, subsequent doses given daily for 1-3 days.

## Paediatric Haematology/Oncology Ward Officer's Handbook

- **Intranasal** puffs Q 12-24 hours (max 3 doses)
  - ♦ < 50 kg: 150 mcg (1 puff of 150 mcg/puff concentration or 15 puffs of 10 mcg/puff concentration)
  - ♦ > 50 kg: 300mcg (2 puffs of 150 mcg/puff concentration or 30 puffs of 10 mcg/puff concentration)
- **Limit fluid intake to 75% of maintenance for the 24 hours after a dose**
- ✓ **Cryoprecipitate** (if available) 1 unit/5 kg body weight can be given in emergency settings where available and can be repeated every 8, 12, or 24 hours depending on the severity of bleeding
- ✓ **FFP does not contain vWF** to any level that will be therapeutic and is **not indicated for vWD**

## 7. Immune Thrombocytopenia (ITP)

Mechanism: Shortened platelet survival due to platelet **autoantibody** production

Self-limiting: Resolves in 80% of patients within 6 weeks to 6 months

### • Diagnosis of ITP

- ✓ History/evidence of mucocutaneous bleeding, petechiae, & bruising but *otherwise well appearing*
- ✓ History of previous viral infection in the last 2-3 weeks (often, but not always) or recent live virus vaccination administration
- ✓ Isolated thrombocytopenia
  - Typically <20,000/mm<sup>3</sup>
  - Smear Results *consistent* with ITP:
    - Platelet size normal or large in size
    - Occasional giant platelets seen
    - Normal RBC & WBC morphology
    - In the resource-limited setting, microcytic, hypochromic red cells due to underlying iron deficiency anaemia is common
    - Occasional activated lymphocytes can also be seen
  - Absence of tumor lysis (normal potassium, phosphorous, uric acid, LDH)
- ✓ ITP is a **diagnosis of exclusion** so a thorough history and physical exam and work up needs to be taken. **You must rule out leukaemia.** ***If the following features are present then you need to think about a diagnosis other than ITP.***
  - Family history of low platelets or bleeding disorder
  - Medication exposure including antibiotics, anticonvulsants, heparin, anti-arrhythmia medications, sulfa drugs, aspirin
  - Haemarthrosis or significant bleeding
  - Evidence of active infection or fever
  - Arthralgia
  - Weight loss, bone pain
  - Hepatomegaly, splenomegaly, lymphadenopathy
  - Dysmorphic features, skeletal abnormalities, growth delay, failure to thrive
  - Abdominal pain, bloody diarrhea, renal failure, haemolytic anaemia in addition to thrombocytopenia then think HUS/TTP
  - HIV risk – exposure or HIV + status (although ITP is *common* with HIV)

### • Treatment Recommendations

- ✓ **Platelet transfusions are NOT routinely indicated in ITP** as the auto-antibodies will also consume the donor platelets. They are only indicated if there is life-threatening

bleeding and steroids and/or IVIG are given FIRST before giving the platelet transfusion.

- Rule-out TTP prior to platelet therapy as this condition can be worsened by platelet transfusion
- ✓ Council the family: No contact sports or rough play (until platelet count >50), wear helmet and seat belt, no IM injections, no NSAIDS, monitor for excessive menstrual bleeding
- ✓ **May consider observation if:**
  - No mucosal bleeding or only mild petechiae on exam
- ✓ **Give prednisone 1 mg/kg (max 60mg/day) BID x 5 days:**
  - If <5 years AND platelets <20,000 (WITHOUT CONCERN FOR LEUKAEMIA)
  - If platelets < 50,000 and any bleeding present (especially mucocutaneous bleeding -nose/mouth)
  - **Alternatives:**
    - Option A - Prednisone 1/mg/kg (max 60 mg/kg) BID x 2 weeks followed by a wean by 25% every two weeks
    - Option B - IVIG 0.8 g/kg/dose (if <50 kg) or 0.5 g/kg/dose (if >50 kg) IV slowly over 4-6 hours.
      - ◆ Round up to vial size. Do not waste IVIG!
      - ◆ Two doses (over two days) may be necessary if bleeding continues after one dose
      - ◆ **Adverse reaction to IVIG** includes: headache, fever, nausea, & flushing which can be treated by slowing infusion and/or giving:
        - ◇ Paracetamol 15 mg/kg PO (Max dose 650 mg/dose)
        - ◇ Hydrocortisone 2 mg/kg IV (Max dose 250 mg/dose)
          - ◆ Note: if unavailable, then may use another steroid such as methylprednisolone or dexamethasone
        - ◇ Antihistamine - give one of the following:
          - ◆ Chlorpheniramine (Allergex) 1 mg (2-5 years), 2 mg (6-11 years), 4 mg (>12 years) PO
          - ◆ Promethazine as anti-histamine 1 mg/kg/dose (for children 25 mg is usually sufficient though up to 50mg can be given) PO
      - ◆ Patients with IgA deficiency should not receive standard IVIG preparations
- ✓ **Give methylprednisolone 30mg/kg once daily (max 1g/dose) x 3 days IV and/or IVIG 0.8 g/kg/dose (if <50 kg) or 0.5 g/kg/dose (if >50 kg) IV x 1 over 4-6 hours and/or post-steroid/IVIG platelet transfusion if:**
  - Life-threatening bleeding – unexplained headache, neurological changes, or head trauma.
  - Ranitidine is recommended for GI prophylaxis when treating with corticosteroids

## 8. Thrombosis

- Management of thromboembolism
  - ✓ **Thrombolysis:** Streptokinase, urokinase or tPA should be considered only with consultation with paediatric haematologist-oncologist or neurologist.
  - ✓ **A thrombophilia evaluation** should be done in consultation with a haematologist
  - ✓ **Anticoagulation:** (Discuss with paediatric haematologist-oncologist regarding which of the following is the best for your patient)

### **Paediatric Haematology/Oncology Ward Officer's Handbook**

- Enoxaparin [(Clexane/Lovenox) low molecular weight heparin] – 1-1.25 mg/kg Q12 hrs. If only 40 mg, 60 mg, and 100 mg pre-filled syringes are available:
  - <10 kg – Give ½ of prefilled 40 mg syringe every day
  - 10-40 kg – Give ½ of prefilled 40 mg syringe every 12 hours
  - 40-60 kg – Give 40 mg prefilled syringe every 12 hours
  - 60 kg – Give 60 mg prefilled syringe every 12 hours
- Unfractionated heparin (75 units/kg load followed by 20 units/kg/hr)
  - Protocols are emerging for subcutaneous unfractionated heparin that can be considered in a resource-limited setting
- Aspirin: 5 mg/kg/day
- Warfarin (Coumadin) – Consult with paediatric haematologist-oncologist.

# Oncology

## 1. Intravenous Fluids, Body Surface Area, and Central lines

### • Intravenous Fluids

- ✓ See patient's **Chemotherapy Plan** (example in Appendix L) for further information on pre- and post-hydration rates as well as labs for admission, anti-emetics to pre-order, etc. Protocols differ slightly.
- ✓ Maintenance IV Fluid Rate
  - 1600 mL/m<sup>2</sup>/day = 67 mL/m<sup>2</sup>/hr
  - Or "4-2-1 Rule": 4 mL/kg/hr for first 0-10 kg + 2 mL/kg/hr for next 10 kg + 1 mL/kg/hr for every kg thereafter

### ✓ Body Surface Area Formula

$$\text{BSA (m}^2\text{)} = \sqrt{\frac{\text{weight [kg]} \times \text{height [cm]}}{3600}}$$

### • Hyper-hydration

- ✓ For chemotherapy, to prevent or treat tumor lysis syndrome, hyperleukocytosis:
  - 3000 mL/m<sup>2</sup>/day which = 125 mL/m<sup>2</sup>/hr (at least 2 times maintenance)
- ✓ The length of time for hydration varies by protocol for pre/post chemotherapy hydration. Refer to the patient's individual Chemotherapy Plan or Roadmap.

### • Central Lines

While frequently unavailable in the resource-limited setting, these do come into use at times & sterile technique **must** be used in handling them

- ✓ Hickman/Broviac (See Appendix B for CVC protocol)
- ✓ Port-a-Cath (See Appendix A for Port Access Protocol)
  - ❖ Tips to Remember: When central lines are in use, it is **imperative** to have anti-pseudomonal antibiotics available such as piperacillin/tazobactam or gentamicin, especially if these patients are to receive chemotherapy as pseudomonal line infections are more common & life-threatening.
  - ❖ These antibiotics should also provide coverage of *S. viridans*, therefore ciprofloxacin, while providing *Pseudomonas* coverage, is **not** a suitable substitute.
  - ❖ Central lines should only be used if adequate skill in caring for them is available, otherwise they present a greater risk than benefit.

## 2. Neutropenia

Neutropenia is defined as a decrease in **Absolute Neutrophil Count (ANC)**:

$$\text{ANC} = \text{total WBC} \times (\% \text{ neutrophils} + \% \text{ bands})$$

ANC < 1500	Mild Neutropenia
ANC < 1000	Moderate Neutropenia
ANC < 500	Severe Neutropenia

Patients with neutropenia are at higher risk for serious infection and therefore:

- **No suppositories or enemas without oncologist approval**
- **No rectal temperature or exam**
- **No incision & drainage of lesions without oncologist approval**
- **No NG tube, urine catheter, or LP without oncologist approval**
- **Prior to blood work or IV, area should be prepped with **betadine****

### 3. Fever & Neutropenia

#### • Assessment

Patients should be assessed immediately upon arrival to the clinic/emergency center and antibiotic therapy instituted **immediately** after obtaining blood work.

#### • Work Up

- ✓ Complete physical exam (including visual perianal exam remembering that physical signs of infection may be subtle in the neutropenic patient).
- ✓ Full Blood Count (FBC)
- ✓ Type & Cross
- ✓ Blood Culture (before giving antibiotics)
- ✓ Place IV cannula

Obtain according to the presence of symptoms other than fever:

- ✓ Renal Function Tests (RFT)
- ✓ Urinalysis (UA) / Urine culture
- ✓ Chest x-ray (CXR)
- ✓ Stool & throat cultures

#### • Therapy

- ✓ Start **gram-negative rods coverage** with an intravenous cephalosporin such as ceftriaxone **or** cefotaxime
  - ceftriaxone – 75 mg/kg/day IV Q 24 hours (max: 2 g/day)
  - cefotaxime –
    - Neonates:
      - 0-4 weeks: <1200 g: 50 mg/kg/dose every 12 hours
    - Postnatal age ≤7 days:
      - 1200-2000 g: 50 mg/kg/dose every 12 hours
      - >2000 g: 100-150 mg/kg/DAY divided every 8-12 hours
    - Postnatal age >7 days:
      - 1200-2000 g: 50 mg/kg/dose every 8 hours
      - >2000 g: 150-200 mg/kg/DAY divided every 6-8 hours
    - Infants and Children 1 month to 12 years (<50 kg):
      - 33-75 mg/kg/dose every 8 hours
      - Meningitis: 75 mg/kg/dose every 6 hours (maximum: 2 gram/dose or 12 gram/DAY)
    - Children >12 years (≥50 kg) and Adults:
      - Moderate to severe infection: 1-2 gram every 6-8 hours
      - Life-threatening infection: 2 gram/dose every 4 hours (maximum: 2 gram/dose or 12 gram/DAY)
    - A typical course would be 10-14 days but should be determined based on the patient's fever curve, blood culture, absolute neutrophil counts, presence of indwelling intravenous catheter and other clinical factors.
- ✓ Also start a fluoroquinolone (levofloxacin) **or** aminoglycoside (gentamicin) to **cover pseudomonas**

- Levofloxacin:
  - 6 mo - 4 years: 8-10 mg/kg/dose IV Q 12 hours (max: 750 mg/dose)
  - > 4 years old: 8-10 mg/kg/dose IV once *daily* (max: 750 mg/day)
- gentamicin – 7.5 mg/kg/dose IV Q 24 hours; (max: 360 mg/dose)
- ✓ If **septic** at presentation or still **febrile for >24 hours** despite cefotaxime and gentamicin, then **add gram positive bacterial coverage** like vancomycin.
  - Vancomycin: 10 to 15 mg/kg/dose IV Q 8 hours (max: 500 mg/dose; 2 g/day)
- ✓ If available and absolute neutrophil count (ANC) <500, **consider G-CSF (Neupogen)** at 5 micrograms/kg/day IV or subcutaneously for at least 5 days or preferably until the ANC is >1000 on 2 consecutive days.
- **Other Considerations**
  - ✓ When using aminoglycosides and/or Vancomycin:
    - Monitor urea & creatinine at initiation
      - Then twice weekly (as these agents are nephrotoxic).
    - Where available, drugs levels can be obtained if therapy will continue for more than 3 days with either agent.
    - Ideally maintain at least ½ maintenance fluids while on these nephrotoxic medications to protect renal function
  - ✓ If the patient has an acute abdomen then add anaerobic coverage with one of the following:
    - Clindamycin 40mg/kg/day IV Q 6-8 hours
    - Metronidazole 30mg/kg/day IV Q6 hours (max: 500mg/dose)
    - \*Note: if having GI symptoms (oral sores, vomiting, diarrhea, or abdominal pain) then you may consider adding as well.
  - ✓ If the patient has a positive blood culture:
    - Daily cultures should be ordered until negative
  - ✓ Rotate lumens for antibiotic infusion in patients with central lines.
  - ✓ Where indwelling central lines (e.g. Broviac or Port-a-Cath) are available & used, ready access to anti-pseudomonal antibiotics must be assured. When they present with fever and you are starting antibiotics, add an anti-pseudomonal antibiotics.
    - These agents include:
      - piperacillin/tazobactam
      - ticarcillin/clavulanic acid
      - gentamicin
    - Without these medications, surgically placed central lines should be used only with due regard to the risk incurred.

#### 4. Anti-Fungal Therapy

- Consider in the persistently febrile patient with negative cultures, or the patient with febrile neutropenia for greater than five days.
  - ✓ **Nystatin**
    - Used for thrush
      - *Infants*: 1 mL of 100,000 units/mL solution applied to each side of the mouth four times per day
      - *Children and adults*: 5 mL PO four times per day swish and swallow

✓ **Fluconazole**

- Used for prophylaxis in AML and for the treatment of candidiasis
- Monitor liver function tests (AST/ALT q 2-3 weeks)
  - *Children (>14 days)*
    - ♦ Prophylactic dose: 6 mg/kg/day once daily rounded to 25 mg increments. (Max: 200 mg/day)
    - ♦ Treatment dose- see table below Max: 400 mg/day unless systemic infection then max dose is 600mg/day
      - ✧ In general, treat for 2 weeks after resolution of symptoms/clearance from blood culture.

Fluconazole Indication	Day One	Daily Therapy	Minimum Duration
Oropharyngeal Candidiasis	6 mg/kg	3 mg/kg	14 days
Esophageal Candidiasis	6 mg/kg	3 mg/kg (in some cases, 12mg/kg/day is needed)	21 days
Systemic Candidiasis	12 mg/kg		28 days

✓ **Amphotericin B**

- Follow urea/creatinine daily initially until full dose reached, then 3 x per week
- Follow serum K+ daily, if possible
- Follow Mg twice/week; more frequently if hypokalemia or hypomagnesaemia
- Amphotericin B Dosing:
  - **0.25 mg/kg/day for the first dose** infused over 2-6 hours
  - Escalate up to **0.5-1 mg/kg/day** as indicated by the clinical situation
  - Duration of therapy varies but usual is 4-12 weeks.
- May bolus NS 10 mL/kg (Max. 500 mL IV) over 1-2 hours prior to administering amphotericin B to minimize renal toxicity
- To prevent a drug reaction, pre-medicate with:
  - Paracetamol 15 mg/kg PO (*Max dose 650 mg/dose*)
  - Antihistamine: Chlorpheniramine (Allergex) 1 mg (2-5 years), 2 mg (6-11 yrs.), 4 mg (>12 years) PO / or Promethazine 1 mg/kg/dose (for children 25 mg is usually sufficient though up to 50mg can be given) IV/PO every 6 hours as needed
  - Hydrocortisone 2 mg/kg IV (*Max dose 250 mg/dose*).
    - ♦ *Note: if unavailable then may use another steroid such as methylprednisolone or dexamethasone*
- To treat rigors with chills:
  - Meperidine (Pethidine, Demerol) 0.5 mg/kg (Max Dose: 100 mg) to pre-medicate in the future.

**5. Antiviral Therapy**

- Diagnosis made using cultures or polymerase chain reaction (PCR) or antigenaemia where available. Herpes simplex virus (HSV) and varicella zoster virus (VZV) can be diagnosed clinically. Once diagnosed, stop chemotherapy and start acyclovir.

✓ **Acyclovir:**

- Baseline chemistries prior to therapy, then monitor urea/creatinine twice weekly
- Maintain adequate hydration with maintenance IV fluid rate
- Adjust dose for renal impairment
- Initiate within 72 hours of lesions/rash (the earlier the better)!

**Oral Acyclovir Dosing:**

- HSV or shingles (afebrile, well appearing):
  - Shingles or mucocutaneous HSV: 20 mg/kg/dose PO (max 800 mg/dose) q 8 hours PO x 7-14 days **or** >12 years 400-800 mg/dose 4-5 times per day for 5-10 days
  - HSV (genital) adolescents: 400 mg PO three times daily for 5-14 days.

**Intravenous Acyclovir Dosing:**

- HSV or shingles (febrile, sick/toxic patient): 10 mg/kg/dose IV q 8 hours x 7-10 days
  - Varicella (immunocompromised): 10 mg/kg/dose IV q 8 hours x 7-10 days or no new lesions for 48 hours. Higher doses of up to 15 mg/kg have been used for life threatening illness. Best to initiate within 24 hours of rash, even if it is beyond 24 hours still initiate because of high mortality and complications in immunocompromised host.
- Patients with symptomatic primary CMV infection should be treated with ganciclovir 10 mg/kg/day IV q 12 hours for 2-4 weeks

**6. *Pneumocystis jirovecii* Prophylaxis (formerly PCP prophylaxis)**

❖ **All patients on chemotherapy** should receive PJP prophylaxis that continues **until 6 months** after completion of chemotherapy.

✓ **TMP/SMX:** (See chart below)

**Trimethoprim/sulfamethoxazole (TMP/SMX)**

Can be given once daily every day or twice daily three times per week using the dosing below:

BSA (m <sup>2</sup> )	Regular Strength Tab 80/400	Liquid (mL) 40/200 per 5 mL
<0.3	N/A	2.5
0.3 – 0.79	0.5	5
0.8 – 1.39	1	10
1.40 – 1.89	1.5	15
>1.9	2	20

❖ Intolerance to TMP/SMX can occur. In such cases use either dapsone or pentamidine, where available, as per the dosing schedule below:

✓ **Daily Dapsone:** 2 mg/kg PO every AM (Max:100 mg/dose)

- **OR -**

- ✓ **Weekly Dapsone:** 4 mg/kg (Max: 200 mg/dose) by mouth *once per week*
  - **OR -**
- ✓ **Pentamidine:** given once monthly either aerosolized or IV:
  - Aerosolized
    - < 5 yrs.: 8 mg/kg/dose in 5mL sterile water (Max: 300 mg/dose)
    - > 5 yrs.: 300 mg/dose in 5 mL sterile water
    - Administer with salbutamol → 2 puffs pre- & post-pentamidine
  - Intravenous
    - 4 mg/kg given once monthly

## 7. Chemotherapy Anaphylaxis Precautions

- The following medications can cause anaphylaxis reactions:
  - ✓ Etoposide or teniposide
  - ✓ Carboplatin
  - ✓ L-Asparaginase
  - ✓ Bleomycin- be sure to push SLOWLY (1 unit/minute)
  - ✓ Paclitaxel

### Treatment of Reactions:

- **Grade I – II: Hives, pruritis, mild wheezing,**
  1. **Stop infusion**, change IV tubing, **start** NS at 1600 mL/m<sup>2</sup>/day (maintenance rate)
  2. Give **Hydrocortisone** 2 mg/kg IV (Max: 250 mg/dose)
    - *Note: if unavailable then may use another steroid such as prednisone, methylprednisolone or dexamethasone*
  3. Give Antihistamine: Chlorpheniramine (Allergex) 1 mg (2-5 years), 2 mg (6-11 years), 4 mg (>12 years) PO / or promethazine 1 mg/kg/dose (for children 25 mg is usually sufficient though up to 50mg can be given) IV/PO
- **Grade III-IV: Anaphylaxis, shock, hypotension,** serum sickness, chest tightness, severe bronchospasm, cough, chills, vomiting, tachycardia, cyanosis
  1. **Stop infusion**, change IV tubing, **start** NS at 1600 mL/m<sup>2</sup>/day (maintenance rate)
  2. Give epinephrine (**Adrenaline**) 1:10,000 give **0.1 mL/kg IV/IO /IO (0.01 mg/kg)** Push Stat dose
    - **OR -**
  3. Give Epinephrine (Adrenaline) 1:1,000 give 0.01 mL/kg IV/IO Push Stat dose
  4. After epinephrine given, give antihistamine & hydrocortisone (per dosing above).
  5. Monitor patient closely & repeat medications as needed given clinical condition
- For any reaction monitor vital signs every 2-5 minutes until patient is stable including heart rate, respiratory rate, blood pressure, & pulse oximetry (where available)
- Chemotherapy that causes a reaction **must not be repeated** as a repeat dose can be fatal. A paediatric hematologist-oncologist ought to be consulted to determine if an alternate medication would be possible.
- All resuscitation management should be done per the guidelines of **Pediatric Advanced Life Support (PALS)** and the above instructions are to just be a summary of overall emergency support

## 8. Oncologic Emergencies: Tumor Lysis Syndrome and Space Occupying Lesions

### A. Tumor Lysis Syndrome (TLS)

- Lysis of tumor cells releases electrolytes & urea cycle products resulting in **hyperuricemia, hyperkalaemia, hyperphosphatemia** & resultant hypocalcemia.

## Paediatric Haematology/Oncology Ward Officer's Handbook

- Severe TLS seen with large tumor burden including (but not limited to):
  - ✓ Burkitt Lymphoma
  - ✓ Acute Lymphoblastic Leukaemia
  - ✓ A Myeloid Leukaemia
  - ✓ Neuroblastoma
- TLS Labs: minimum every two days (up to every 6 hrs as resources allow)
  - ✓ Urea, creatinine & electrolytes
  - ✓ Calcium
  - ✓ Magnesium
  - ✓ Phosphate
  - ✓ Uric Acid
- Maintain urine output at > 2.5 mL/kg/hr

### ❖ Specific Management:

- **Hyperuricemia Management**
  - ✓ **Hydration** with 3000 mL/m<sup>2</sup>/day (125 mL/m<sup>2</sup>/hr or 2 times maintenance) with fluids NOT containing potassium (e.g. DNS, NS, D5W, etc.)
  - ✓ **Allopurinol** 100 mg/m<sup>2</sup>/dose PO given three times daily (Max: 800 mg/day). Typically available in 100 mg tablets.
  - ✓ Rasburicase: typically not available in the resource-limited setting
- **Hyperkalaemia**
  - ✓ If K >7, then obtain an EKG
  - ✓ Avoid potassium in fluids to help prevent this complication → Stop any potassium supplementation if present
  - ✓ If there are EKG changes (peaked T wave, loss of P wave, widened QRS complex) then treat with:
    - **Calcium gluconate** 10% solution at a dose of 50 mg/kg or 0.5 mL/kg (max 20 mL = 2 g) slowly over 5 min IV, this dose is equivalent to 50 mg/kg (ideally through a central line).
      - This is very important to stabilize the cardiac membrane!
    - Regular insulin 0.1 units/kg (max 10 units) and dextrose 0.5 g/kg over 30 min,
    - Kayexalate 1 g/kg/dose PO four times daily (1g/kg lowers potassium by 1 mEq if patient is stooling appropriately)
    - Inhaled Salbutamol 2.5 mg (<25 kg), 5mg (25-50 kg), 10 mg (>50 kg) in 2 mL of saline and inhaled.
- **Hyperphosphatemia**
  - ✓ Consider aluminum hydroxide 25 mg/kg/dose four times daily & avoid foods containing large amounts of phosphate to lessen enteral phosphate absorption.
  - ✓ Dialysis, where available, is the only therapeutic option
- **Hypocalcaemia**
  - ✓ Symptoms of hypocalcaemia - anorexia, vomiting, cramps, spasms, tetany, seizures
  - ✓ Avoid calcium unless symptoms are severe or life-threatening
  - ✓ If symptomatic, then treat with:
    - 10% calcium gluconate 100-200 mg/kg/dose IV (Max: 1-2 gm/dose)

over 5-10 min, may repeat in 6 hours or follow with a continuous infusion of 200-800 mg/kg/day (ideally through a central line).

- **Hyperleukocytosis**

- ✓ Defined as WBC > 100,000/mm<sup>3</sup>
- ✓ Commonly seen in ALL and AML at presentation or relapse
- ✓ High risk for pulmonary & CNS complications due to viscosity & stasis
  - IV fluid rate 3,000 mL/m<sup>2</sup>/day = 125 mL/m<sup>2</sup>/hr (at least 2 times maintenance)
  - Monitor WBC counts along with TLS labs (minimum daily up to q6 hrs as able)
  - Monitor pulse oximetry for evidence of pulmonary complications, continuous monitoring where possible
  - Transfuse pRBC with extreme caution (only indicated if cardiovascular compromise secondary to anaemia) as this may increase viscosity. *Hgb should be kept below 8.5 g/dL*
  - May transfuse platelets for active bleeding or platelets <50,000/mm<sup>3</sup>
  - Although not available in resource-limited settings, leukopheresis is recommended if possible
  - Cytoreductive medications like hydroxyurea or cytarabine may be considered

## **B. Space Occupying Lesions**

### ❖ Mediastinal mass/upper airway lesion

- Can cause superior vena cava syndrome and tracheal compression
  - ✓ **Avoid sedation**
  - ✓ Avoid procedures that may compromise airway & consult anesthesia for procedures
  - ✓ Elevate head of bed
- Obtain diagnostic tissue with the least invasive method - e.g. peripheral lymph node biopsy preferred over thoracotomy to biopsy chest mass.
- May need **emergency** chemotherapy, steroids, and/or radiation therapy as a lifesaving measure, even prior to full diagnostic work-up.

### ❖ Intracranial mass/spinal cord compression

- **Emergently give dexamethasone** for cerebral oedema and spinal cord compression
  - ✓ Dexamethasone Dose:
    - <20 kg: Give dexamethasone 2 mg IV every 6 hours
    - >20 kg: Give dexamethasone 4 mg IV every 6 hours (max 16 mg/day)
  - ✓ Give Dexamethasone even before imaging!
  - ✓ Taper over 1 week. Chronic low daily dose may be necessary. While on steroids it is always good practice to also add ranitidine. Dexamethasone is strongly preferred to other steroids due to its ability to cross the blood-brain barrier.
- For signs of **increased intracranial pressure**
  - ✓ Airway – Breathing - Circulation
  - ✓ Fluid restrict to 0.75 x maintenance using NS
  - ✓ Dexamethasone (dose as above) IV every 4-6 hours
  - ✓ Acetazolamide 5 mg/kg/dose every 6 hours
  - ✓ Mannitol 0.25-1 g/kg/dose IV bolus, may repeat every 6-8 hours
  - ✓ Emergent CT scan
  - ✓ Elevate head of bed 15-30 degrees

- Any central nervous system involvement by tumor requires immediate involvement of neurosurgery
- May need **emergency** chemotherapy and/or radiation therapy as a lifesaving measure, even prior to full diagnostic work-up

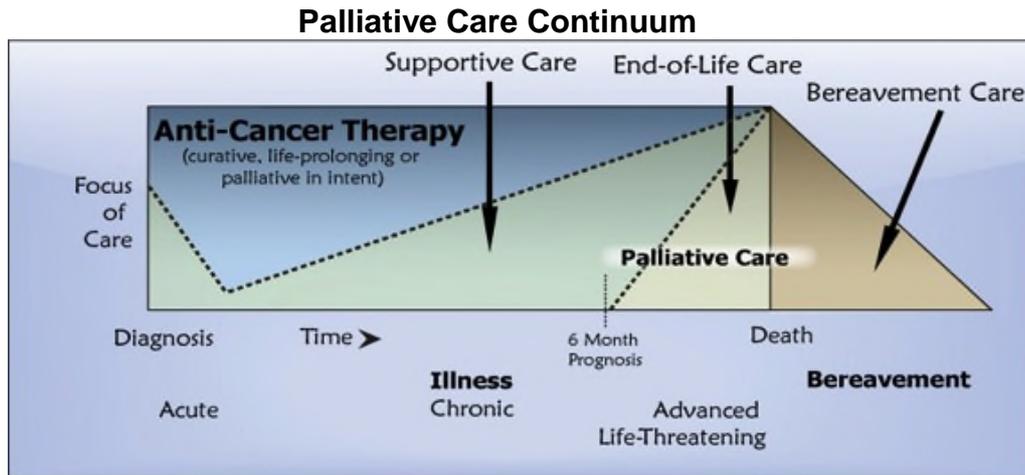
## 9. Immunizations in Oncology Patients

- Live vaccines, **especially oral polio** must be avoided for patient & family members during chemotherapy.
  - Yellow fever, MMR, varicella, oral polio and intranasal influenza vaccines must be avoided by the patient as well as the family and close contacts
  - Killed or recombinant vaccines can be administered to the patient & family members; response is generally seen despite immunosuppression; however, patients undergoing bone marrow transplant generally require re-immunization 1 year post-transplant.
  - Live vaccines can be resumed 6 months after chemotherapy is completed.
  - Annual injectable influenza vaccine is recommended for immunosuppressed patients where the vaccine is available.
-

# Symptom Management & Palliative Care

## 1. Palliative Care

- Palliative care *begins when an illness is diagnosed* and continues irrespective of whether or not a child is receiving disease-directed therapy.
- In 2002, the World Health Organization (WHO) defined **palliative care** as:
  - ✓ “An approach which **improves quality of life** of patients and their families facing life-threatening illness, through the prevention and **relief of suffering** by means of **early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual.**”



- **Common Symptoms Requiring Management in the Course of Oncology Care**

Anorexia/cachexia	Dyspnea
Anxiety	Fatigue
Ascites	Insomnia
Bowel obstruction	Malignant pleural effusions
Constipation	Mucositis
Delirium	Nausea/vomiting
Depression	Pain
Diarrhea	Skin problems

- ✓ Symptoms frequently interfere with the patient's and family's capacity to do the things they enjoy.
- ✓ They can impair the oncologist's ability to administer anticancer therapy, particularly when the symptoms are the result of the anticancer treatment itself.
- ✓ **If left unmanaged, they may lead to changes that shorten survival.**
- ✓ Besides the physical manifestations of a symptom, always look for the influence of **psychological, social, spiritual, end-of-life, and loss** issues.
- ✓ When modification of the disease process is no longer feasible, symptom relief to manage the experience may become the total focus of care.

## 2. Pain control

- Pain is a common, underreported, and under-diagnosed problem for hospitalized children world-wide, especially for infants or developmentally-delayed children.
- Types of Pain:
  - ✓ **Somatic pain:** mediated by the somatic nervous system, serves skin, bone, and muscle.

**Paediatric Haematology/Oncology Ward Officer's Handbook**

- Pain localization is *precise* and is often described as *sharp, aching, or throbbing*.
  - ✓ **Visceral pain:** mediated by the autonomic nervous system, serves internal structures such as the gastrointestinal tract.
    - It is typically *difficult to localize* or describe, and is sometimes characterized as *crampy*.
  - ✓ **Neuropathic pain:** has been defined as a primary lesion or dysfunction of the nervous system. It can be either peripheral or central.
    - Patients tend to describe neuropathic pain with words like *burning, tingling, numbness, shooting, stabbing, or electric-like* feelings.
- **Pain Assessment**
    - ✓ Should be performed as part of routine vital signs and included in all daily progress notes

**Toddler - School Age Pain Scale**



**FLACC Infant Pain Scale: For Ages 0-3 Years and non-verbal**

FLACC Scale			
Scoring			
Categories	0	1	2
<b>Face</b>	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
<b>Legs</b>	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
<b>Activity</b>	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
<b>Cry</b>	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
<b>Consolability</b>	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort
Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Consolability is scored from 0-2, which results in a total score between zero and ten.			
Merkel, S and others. The FLACC: A behavioral scale for scoring postoperative pain in young children, <i>Pediatr Nurse</i> 23(3):293-297, 1997. Copyright: Jannetti Co. University of Michigan Medical Center.			

• **WHO Analgesic Ladder**

- ✓ Advocates a step-wise approach to treating pain
- ✓ At every step of the analgesic ladder non-opioid analgesics form the basis of the pain management.
- ✓ Paracetamol and NSAIDs (*if not contraindicated*) should always therefore be prescribed *with* opioid analgesia.



➤ **STEP 1: Non-opioid Analgesics**

- **Paracetamol** 15mg/kg/dose every 4-6 hours (max: single dose 650 mg; 4 g/day)
  - Avoid this medication if the patient has liver disease
- **Ibuprofen** 10 mg/kg/dose every 6-8 hours (Max: single dose 800 mg; 2400 mg/day)
  - Avoid this medication in patients with thrombocytopenia and renal disease
  - Gastrointestinal prophylaxis with ranitidine recommended
    - Ranitidine: 2-4 mg/kg/dose twice daily

➤ **STEP 2: Add Strong Opioid Analgesics to Non-Opoids**

- **Intravenous Morphine Sulfate:** 0.05 mg/kg/dose every 4-6 hours
  - For opioid-naïve patients:
    - <10 kg should not exceed 0.5 mg
    - 10-20 kg should not exceed 1 mg
    - 20-40 kg should not exceed 2 mg
    - >40 kg should not exceed 4 mg.
  - Further titration should be done in consultation with the paediatric haematologist-oncologist.
- **Oral Morphine Sulfate Immediate Release** 0.15 to 0.5 mg/kg/dose PO every 4-6 hours
  - Appropriate to use initially when calculating total daily dose morphine required by patient
  - Appropriate to use for breakthrough pain
- **Oral morphine Sulfate Extended or Sustained Release**
  - **These pills should never be cut or crushed!!!!**
  - Calculate immediate release morphine dosing required for patient over 24 hour period of time and then divide that total 24 hour dose to every 8 or every 12 hours for extended release dose

❖ Note: **IV to PO dosing conversion** for morphine is: 1:3 (1 mg IV is = 3 mg PO).

❖ Note: Meperidine (Pethidine, Demerol) should no longer be used because it is considered *inferior to morphine due to its toxicity on the central nervous system*.

• **Special Considerations - Adjuvant Analgesics:**

- ✓ **Neuropathic pain:**
  - Consider addition of a tricyclic antidepressant to opioids

- **Amitriptyline**
  - ♦ Starting dose: 0.1 mg/kg PO initially at bedtime
  - ♦ May advance as tolerated over 2-3 weeks to 0.5-2 mg/kg at bedtime (max: 100mg/day).
- Also, consider addition of a neuroleptic
  - **Gabapentin** -
    - ♦ Starting dose: 5 mg/kg/dose (max: 300 mg/dose) PO at bedtime
    - ♦ If ineffective, increase the dose every 3-5 days, first to 5 mg/kg PO q 12 h, then to 5 mg/kg PO q 8 h. (Max: 3,600 mg/day).
    - ♦ Always **remember do NOT withdraw this medication abruptly**, since withdrawal can precipitate seizures and increase pain.
- ✓ **Bone pain:**
  - Consider addition of a corticosteroid to NSAIDS and opioids in management
    - **Prednisolone**
      - ♦ 0.5-1 mg/kg/dose PO twice daily PRN (max: 80mg/day).
      - ♦ Always remember to start gastrointestinal prophylaxis, like ranitidine, when starting steroid treatment.

### 3. Nausea/Vomiting

- Give these medications 30 minutes prior to chemotherapy
- Scheduled dosing is recommended especially for platinum-containing chemotherapy regimens
- **Anti-emetic Medications** (medications currently available at PMH):
  - ✓ **Granisetron (Kytril)** a selective 5-HT<sub>3</sub> receptor antagonist:
    - Dose 10 mcg/kg/dose (typically 0.5 mg if <50 kg and 1mg if >50 kg, max 1mg) IV or PO daily/every 12 hours PRN or Scheduled
    - Best for moderate to highly emetogenic chemotherapy
  - ✓ **Dexamethasone:**
    - Dose: 6 mg/m<sup>2</sup>/dose (max 10 mg/dose) IV or PO given daily prior to chemotherapy or every 12 hours
  - ✓ **Promethazine (Phenergan):**
    - Dose: 1 mg/kg/dose (for children 25 mg is usually sufficient though up to 50mg can be given) IV/PO every 6 hours as needed or scheduled
  - ✓ **Metoclopramide (Reglan, Clopamon):**
    - Dose: 0.1 mg/kg (max 10 mg) IV every 6-8 hours
    - Great for moderately emetogenic chemotherapy or delayed nausea/vomiting
    - Can give 1 mg/kg as an anti-emetic, but an anti-histamine must be given simultaneously to prevent a dystonic reaction.

**Paediatric Haematology/Oncology Ward Officer's Handbook**  
**Emetogenicity of Chemotherapy Agents**

**Note:** (sd) = standard dosing      (hd) = high dose

None	Mild	Moderate	Severe
6-mercaptopurine	5-fluorouracil	Actinomycin-D	Cisplatin
6-thioguanine	Cyclophosphamide ( <i>sd</i> )	Carboplatin	Cyclophosphamide ( <i>hd</i> )
Bleomycin	Intrathecal Chemotherapy	Cytarabine ( <i>sd</i> )	Cytarabine ( <i>hd</i> )
Hydroxyurea	Etoposide Teniposide	Daunomycin Doxorubicin	Dacarbazine
L-asparaginase	Methotrexate ( <i>sd</i> )	Ifosfamide	Nitrogen mustards
Vincristine Vinblastine		Methotrexate ( <i>hd</i> )	

## 4. Constipation

- ❖ Most commonly caused by vincristine, inactivity & opioid medications
- ❖ ***No rectal exam, rectal temperature, enemas, or suppositories for patients on chemotherapy unless discussed with a paediatric haematologist-oncologist***
  - Even minor trauma to the rectal mucosa can introduce a life-threatening infection in patients with neutropenia

### Management

- A bowel regimen is recommended for all patients on vincristine therapy as preventing constipation is preferred to treating after it has started
  - ✓ Ensure patient is hydrated & consider giving one of the following:
    - **Bisacodyl (Dulcolax)**
      - 3 - 12 years: 5 mg PO once daily to BID (max: 10mg)
      - > 12 years: 10 mg PO once daily to TID (max: 30mg)
    - **Docosate sodium (Colace, a stool softener)**
      - < 3 years: 30 mg by mouth divided once daily to 4 times daily
      - 3 – 6 years: 60 mg by mouth divided once daily to 4 times daily
      - > 6 years: 150 mg by mouth divided once daily to 4 times daily
    - **Lactulose**
      - 1-3 mL/kg/day divided by mouth twice daily (max 60 mL/day)
    - **Liquid Paraffin (mineral oil)**
      - <12 years: 5-15 mL/day divided once to twice daily
      - >12 years: 15-45 mL/day divided once to twice daily
    - **Polyethylene glycol 3350 (Miralax/Movicol)**
      - 1-1.5 g/kg/day (max 17 g/day) in 4-8 oz. of liquid by mouth daily.
        - ♦ *Avoid mixing in milk, orange juice or formula.*
      - **Bowel prep regimen (Klean-Prep)** is an option also.
        - ♦ Please read the sachet for dosing instructions.
    - **Prune juice**
      - 120-240 mL PO daily to twice daily; to reduce sweetness, mix with a little lemon juice.

- **Senna (stimulant laxative)**
  - 2-6 years: 4.3 mg dose PO once to twice daily
  - 6-12 years: 8.6 mg dose PO once to twice daily
  - Age >12 years: 17.2 mg dose PO once to twice daily
  - Since this is a stimulant, it must be used in combination with a stool softener and should not be used on a regular basis

## 5. Mucositis & Oral Hygiene

**Mucositis Grading System**

Grade	Symptoms
I	Painless ulcers, erythema, mild soreness
II	Painful erythema, oedema, ulcers; patient able to eat
III	As per Grade II but patient is unable to eat
IV	Requires parenteral or NG tube nutritional support

- Medication options for mouth care
  - ✓ Mouthwash: 1 L NS + 1 teaspoon table salt + 1 teaspoon NaHCO<sub>3</sub> + 5 mL glycerin
    - Take 10 mL swish & spit out four times daily
  - ✓ Nystatin: can be used as prophylaxis or to treat thrush
    - Infants: 1 mL of 100,000 units/mL solution applied to each side of mouth four times daily
    - Children: 5 mL swish & swallow four times daily
  - ✓ Magnesium or Aluminum Hydroxide + Chlorpheniramine syrup + Lidocaine ("Magic Mouthwash")
    - Mix in a 1:1:1 ratio (e.g. 50 mL of each), and take 5 mL per dose, swish & **spit** four times daily (if child is too young to spit, then leave out the lidocaine)

**Chemotherapy Agents & Mucositis Severity**

Minimal or No Mucositis	Mild Mucositis	Moderate-Severe Mucositis
Asparaginase	Bleomycin	Cytarabine
Etoposide (VP-16)	Cisplatin	Daunorubicin
Ifosfamide	6-mercaptopurine	5-fluorouracil
Vincristine	Procarbazine	Methotrexate
	6-thioguanine	Doxorubicin
	Vinblastine	
	Cyclophosphamide	

## 6. Anxiety

- **Complementary therapies:** Complementary or alternative medical approaches may help some patients.
  - ✓ Progressive muscle relaxation, massage therapy, guided imagery, hypnosis, meditation, music, or aromatherapy can be particularly useful tools to decrease anxiety.

- ✓ Patients should be advised to minimize or avoid caffeine and sleep habits should be evaluated as necessary.

- **Pharmacologic management:**

- ✓ **Acute anxiety**

- Benzodiazepines are usually the medications of choice for the short-term management of acute anxiety reactions when immediate relief is desired.
- *Choose a benzodiazepine based on the desired half-life.*
- Longer half-life benzodiazepines have a more sustained effect, although some (e.g., diazepam [ $t_{1/2} = 20-54$  hr]) may accumulate.
  - **Diazepam:** 0.05 mg/kg/dose IV every 4 hours PRN (max starting dose 1 mg, max after titrating 10 mg/dose, max: 0.3 mg/kg/dose)
- Midazolam, with its very short half-life ( $t_{1/2}=1.8-6.4$  hr), may be an ideal anxiolytic/amnestic for procedures, particularly when given IV.
  - **Midazolam:** 0.05 mg/kg, titrate to effect (max starting dose 1 mg, total max after titrating: 6 mg)
- Whichever medication is chosen, start with low doses and titrate to effect and tolerability.

## 7. Malignant Wound Care

- The *management principles* and dressing choices for malignant wounds are the *same as those for decubitus ulcers*. However, malignant wounds bring up a few additional issues that deserve comment.
  - ✓ **Antineoplastic treatments** may offer significant palliation of the symptoms from a malignant wound.
    - Radiation therapy may decrease bleeding, pain, and exudate.
    - Chemotherapy may lead to wound healing in patients with responsive disease.
  - ✓ **Superficial infection:** topical treatment with metronidazole or silver sulfadiazine may be sufficient
  - ✓ **Deep tissue infection:** systemic metronidazole should be used
  - ✓ **Non-healing wound:** topical agents such as povidone (Betadine) that are cytotoxic to bacteria can be used.
    - Betadine will help keep the wound clean, although some patients find it irritating and painful.
    - Because of its cytotoxic effect on granulation tissue, *Betadine should not be used for wounds that are expected to heal.*
  - ✓ **Odor Management:**
    - Metronidazole IV liquid on bandages to help odor
    - Odor absorbers can be used in the patient's room
      - Kitty litter or activated charcoal can be placed on a cookie tray underneath the bed.
      - Secondary dressing that contains charcoal or a disposable diaper can be used to cover a particularly odorous wound.
    - Introduce a competing odor
      - Bowl of vinegar, vanilla, or coffee
      - Essential oils – peppermint oil or wintergreen on a scarf, mask, or on top of the bandaging may help with the smell. Avoid direct contact with skin without a carrier oil.
        - ♦ Also try: eucalyptus, tea tree oil, lavender, thyme, bergamot, & orange oil
      - Fragrances and perfumes are often poorly tolerated by patients and should be avoided.

- ✓ **Frank bleeding:** Silver nitrate or cautery can be used for frank bleeding.
  - Radiation therapy is very effective for control of local bleeding.
  - Consider topical application of tranexamic acid (IV solution or crushed tablets mixed with saline) to help control wound bleeding

## 8. Dyspnea

- **Opioids:** Opioids are the most effective medication for symptomatic control of dyspnea.
  - ✓ Mechanism of Action: not well understood. Possible they alter the perception of dyspnea in a manner analogous to their alteration of the perception of pain.
  - ✓ Opioids relieve dyspnea at doses far lower than those that depress the respiratory rate and oxygen saturation.
    - **Opioid-naïve patients** - Small amounts of morphine can relieve dyspnea.
      - **Morphine:** For child >14 years of age: start with 10-15 mg PO q 1 h PRN or 5 mg IV/SC q 30 min PRN.
        - ♦ Titrate to effect using standard opioid dosing guidelines. The duration of the effect is about 4 hours.
    - **Patients on baseline opioids** - Start by increasing the opioid dose by 25%; this often provides relief, and then titrate to effect.
- **Oxygen**
  - ✓ Oxygen can reverse hypoxemia.
    - If hypoxemia is the cause of dyspnea, oxygen may be the only required therapy.
    - However, the *perceived benefit of oxygen* among dyspneic cancer patients *far exceeds the number with hypoxemia*.
- Other management: Sit the child upright, ensure airflow over the child's face, reassurance, relaxation and distraction
- **Terminal Secretions**
  - ✓ **Atropine** (anticholinergic)
    - Children : 0.01-0.02 mg/kg SC/IV/IM (if <5 kg then no min dose, if >5 kg then min: 0.1 mg/dose, max: 0.4 mg/dose) Q4-6 hours PRN
    - Adult: 0.5 mg/dose SC/IV/IM Q4-6 hours PRN

## 9. Hospice/End of Life

- **Death:**
  - ✓ The death of a child affects the physical and psychological wellbeing of family members for the rest of their lives.
  - ✓ Events occurring around the time of death, both positive and negative, play a critical role in defining how family members grieve and ultimately come to terms with the event.
  - ✓ Families who have lost a child have identified several needs regarding end-of-life care.
    - Need to have complete information honestly communicated
    - Easy access to essential staff members who will be supportive
    - Assistance in coordinating necessary services
    - Have their relationship with their child maintained as much as possible
    - Be allowed to feel that their child's life and death has meaning
    - Always use the child's name when talking to a family
  - ✓ The family will need psychosocial, emotional, and spiritual support which can be provided by a multidisciplinary team of caregivers: nurses, social workers, psychologists, traditional healers, spiritual leaders, and family members.

## References

1. Nathan D, Orkin S, Ginsburg D, Look A. Nathan and Oski's Hematology of Infancy and Childhood, Sixth Edition. 2003.
2. Pizzo P, Poplack D. Principles and Practices of Pediatric Oncology. 2006.
3. Suell M, Bomgaars L. Texas Children's Cancer Center & Hematology Service Resident Handbook. 2005.
4. Dodd RY, Notari EPt, Stramer SL. Current prevalence and incidence of infectious disease markers and estimated window-period risk in the American Red Cross blood donor population. *Transfusion* 2002;42(8):975-9.
5. Hastings CA, Torkildson JC, Agrawal AK, Handbook of Pediatric Hematology Oncology: Children's Hospital and Research Center Oakland. Second Ed. Wiley-Blackwell. 2012
6. Wee B, Hillier R. Interventions for noisy breathing in patients near to death. *Cochrane Database Sys Rev*, 2008;(1)CD005177.
7. Brown DJ. Palliation of breathlessness. *Clin Med*, 2006;6:133-136.
8. Himmelstein BP, Hilden JM, Boldt AM, Weissman D. Medical progress:pediatric palliative care. *N Eng J Med*. 2004;350:1752-1762.
9. Hockenberry MJ, Wilson D. Wong's Essentials of Pediatric Nursing. 8<sup>th</sup> ed. St Louis, MO: Mosby;2009.
10. Klepstad P, Kassa S, Jystad A, Hval B, Borchgrevink PC. Immediate- or sustained-release morphine for dose finding during start of morphine to cancer patients; a randomized, double blind trial. *Pain*. 2003;101: 193-198.
11. World Health Organization (WHO), WHO guidelines on the pharmacologic treatment of persisting pain in children with medical illnesses. Geneva, Switzerland: WHO; 2012.
12. Quill T, Holloway R, Stevens Shah M, Caprio T, Olden A, Storey Jr, C Porter. *Primer of Palliative Care*, 5<sup>th</sup> Edition. 2010, American Academy of Hospice and Palliative Medicine.

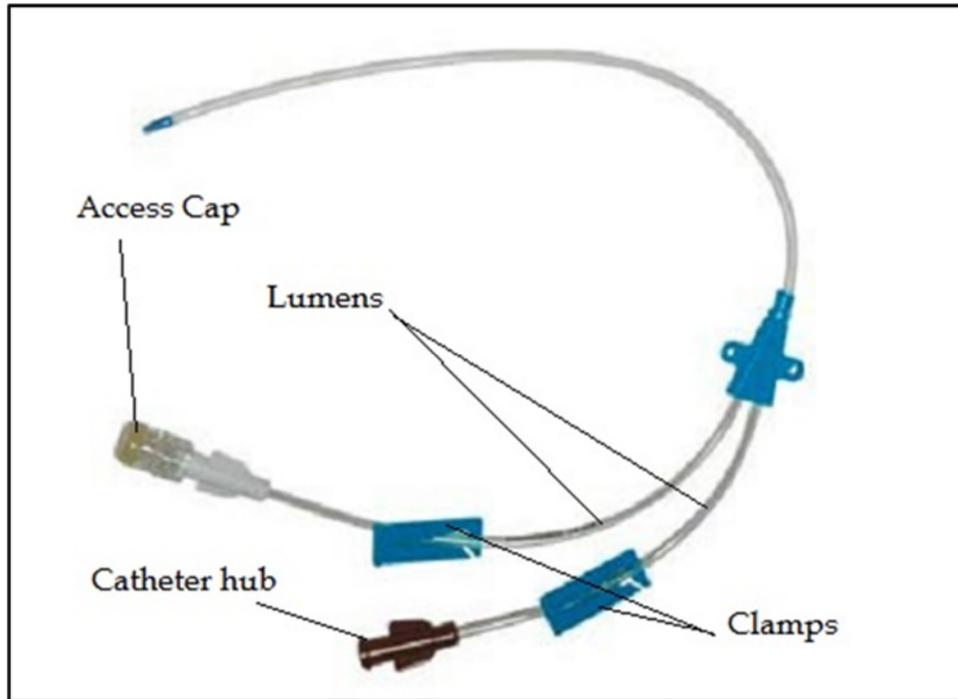
## Appendix A- Port Access Protocol

## PRINCESS MARINA HOSPITAL PORT-A-CATH ACCESS PROTOCOL

- Place EMLA on port site 20-30 minutes before procedure
- Gather appropriate supplies:
  1. Sterile dressing pack
  2. Sterile gloves
  3. Alcohol swabs
  4. Mask (if available)
  5. Port needle of appropriate size for patient
  6. Heparin syringes (1 ml of 1000 IU/ml of Heparin and 9 ml of normal saline in a 10ml syringe)
  7. 5ml syringes for blood draw
  8. Blood sample tubes
- Proceduralist washes hands and puts on mask if available
- Open sterile pack
- Fill bowl with betadine
- Place implantable port needle onto sterile field
- Don sterile gloves
- Take a piece of sterile gauze and pick up heparin syringe (maintain sterile field)
- Attach heparin syringe to port needle and flush through the length of the tubing until a small amount of liquid is coming out of the needle
- Clamp the line on the port and leave the syringe attached
- Scrub the skin starting at the top of the port area with a sterile cotton swab dipped in betadine. Scrub in a concentric circle extending 5 cm in all directions of the port.
- Stabilize the port between your index and middle finger (2<sup>nd</sup> and 3<sup>rd</sup> digits) with one hand and insert the needle into the center of the port until contact with the bottom of the port.
- Pull back on the syringe to assess for a blood return
- Flush port with 5ml of heparin/NS
- Cover port needle and sterile port area with Tegaderm or sterile dressing. It is critical that this area remain sterile so bacteria do not enter the port via the needle.
- If drawing labs, clamp port line, detach heparin/NS syringe, and attach a 5ml sterile syringe
- Draw 5ml of blood and waste (this blood is contaminated with heparin)
- Attach another 5ml syringe and draw what labs are needed
- After blood drawn, flush another 5ml of heparin/NS and clamp.
- The port must be flushed with 5ml of heparin/NS after every blood draw or infusion of a medication/blood product if the line is going to be locked. This will ensure that the line does not form a thrombus and remains patent. If medications or IV fluids will be running through the port then flushing is not necessary.
- Use an alcohol swab on the hub of the port line and any cap, syringe, or IV line you are connecting to the port every time. This will prevent the port from getting infected.
- Remember to draw slowly as this will prevent creating a vacuum in the port and introducing air into the line.
- If air is in the line, draw on the heparin syringe until all of the air is in the syringe. Hold the syringe vertical (allowing air to go to the top) and flush the heparin/NS.

## APPENDIX B- CVC CARE PROTOCOL

## CENTRAL VENOUS CATHETER (CVC) CARE & MAINTENANCE POLICY



### OBJECTIVE

To provide guidelines to minimize the risk of infection and to maintain patency of central venous catheters (CVCs) used for vascular access in the administration of fluids, medications, blood products and for blood sampling.

General Info	
1.1	<ul style="list-style-type: none"> <li>◆ Assess the skin around the dressing and the security of the luer-lock connections.</li> <li>◆ Report temperatures greater than or equal to 38.0°C to the physician</li> <li>◆ Report evidence of skin infection (erythema, edema, pain) to the physician</li> </ul>
1.2	<ul style="list-style-type: none"> <li>▫ Change IV tubing every <b>4 days</b> when infusing fluids or medications.</li> <li>▫ Change Access Cap every <b>4 days</b> if getting infusions <b>or every 7 days</b> at the time of the heparin flush if not receiving infusions (if access caps are available).</li> </ul>
1.3	<ul style="list-style-type: none"> <li>◆ Use 10 ml diameter syringes when flushing or administering medications directly into access cap on lumen.</li> </ul>
1.4	<ul style="list-style-type: none"> <li>▫ Flush all dormant or intermittent lumens with <b>3mL of 100 IU/mL heparin</b> after infusing medications or fluids, after drawing blood, or at least every 24 hours. <ul style="list-style-type: none"> <li>✓ Dormant lumens = lumen not infusing fluids regularly</li> <li>✓ Intermittent lumens = lumens intermittently infusing with fluids</li> </ul> </li> <li>▫ <b>To make heparin:</b> <ul style="list-style-type: none"> <li>✓ Draw up 1 mL of 1000 IU/mL Heparin in a 10 ml syringe</li> <li>✓ Draw up 9 mL of 0.9% normal saline in the heparin syringe</li> <li>✓ Total concentration will be 100 IU/mL</li> </ul> </li> </ul>
1.5	<ul style="list-style-type: none"> <li>◆ Plastic hemostats/clamps (if available) should be kept at the bedside of a patient (avoid using metal hemostats to avoid tearing the catheter). The hemostats/clamps can be utilized to clamp the catheter in the event of breakage to prevent an air embolus or blood loss.</li> </ul>
1.6	<ul style="list-style-type: none"> <li>▫ Before each time you flush or put any medicine into the IV tubing, put on non-sterile gloves and wash the injection cap with sterile alcohol (spirits) for 15 second in a back and forth twisting manner. Let dry for 15 seconds (do not blow on it or fan it dry).</li> </ul>



Dressing Change	
2.1	Change dressing weekly unless the dressing becomes wet, loose or soiled.
2.2	Chlorhexidine (if available) can be used instead of Povidone Iodine/Betadine.
2.3	Gather the following supplies: <ul style="list-style-type: none"> <li>✓ CVC dressing kit (mask for patient &amp; provider/assistants, sterile gloves, sterile drape, clear occlusive dressing, chlorohexidine swab sticks or povidone iodine/betadine swab sticks, sterile alcohol pads, Biopatch antimicrobial disc, sterile gauze, securement strips, tape 1 inch wide).</li> <li>✓ Exam gloves</li> </ul>
2.4	Perform hand hygiene with alcohol gel or soap/water before starting the procedure.
2.5	<ul style="list-style-type: none"> <li>▫ Open dressing change kit: Open sterile drape and add sterile supplies to field or open sterile dressing kit and organize supplies using sterile technique (use sterile gloves to touch supplies if needed).</li> <li>▫ Place mask on patient, provider and any assistants.</li> </ul>
2.6	<ul style="list-style-type: none"> <li>◆ Put on a pair of non-sterile exam gloves.</li> <li>◆ Remove occlusive dressing from CVC site starting at the bottom and working up towards the insertion site.</li> <li>◆ Utilize a sterile alcohol pad to help remove adhesive from tape if needed. <b>DO NOT USE SCISSORS</b> to remove dressing.</li> </ul>
2.7	Observe the site for edema, redness, and active drainage.
2.8	Remove exam gloves; perform hand hygiene again before putting on the sterile gloves. (You may want to bring your own specific size of sterile gloves as the kits often have smaller standard size gloves).
2.9	<p><b>Chlorohexadine:</b></p> <ul style="list-style-type: none"> <li>• A - If only one chlorohexadine swab stick with sponge, then scrub the site for 30 seconds using friction and back/forth &amp; up/down, diagonal and circular patterns. Allow skin to dry completely (30-60 seconds). [Do not blow on it to dry or wave hands back and forth].</li> <li>• B - If triple pack of chlorohexadine swabs, then use one of the swab sticks to clean the skin around the CVC for at least 10 seconds. Use repeated back and forth strokes of the swab stick. Repeat with the other two swab sticks scrubbing for at least 10 seconds with each stick. Wait until dry, at least 30 seconds. [Do not blow on it to dry or wave hands back and forth].</li> <li>◆ Place the chlorohexidine antimicrobial disc (e.g. Biopatch) with the blue side (writing side) up and the white side next to the skin at the CVC insertion site. Position it where the slit is in the direction the catheter will lie once it is secured with the occlusive dressing.</li> </ul> <p><b>Povidone Iodine/Betadine:</b> Add 3 povidone iodine/betadine swabsticks in the sterile field of the dressing change kit (if not available, use sterile gauze clamped in sterile forceps –dip into sterile bowl of betadine). Clean the skin around the CVC site with one of the swab sticks making concentric circles (start near the line insertion point, then make a small circle, then a larger circle, then a larger circle) around the CVC to approximate the size of the dressing. Repeat with other two swab sticks. Wait until dry, at least two minutes.</p>
2.10	Remove backing from the clear dressing and apply over the catheter area. If the catheter is a tunneled line, loop the excess catheter within the clear dressing using securement strips from the kit.
2.11	Place a 2.5 cm wide by 5-7 cm long piece of tape <b>under</b> the catheter at the edge of the transparent dressing. Place another 2.5 cm on top of the previous piece of tape. Add date and initials



Changing Access Caps	(If available)
3.1	Active lumen access caps (continuous and intermittent infusions) are changed, ideally, with IV tubing changes ( <u>every 4 days</u> ), when blood samples for cultures are obtained, or ideally, <u>at least every 7 days</u> , if no IV infusions are given.
3.2	Dormant lumen (no meds except heparin per protocol) access caps are changed weekly at the time of a heparin flush.
3.3	Every time the access cap is removed from the catheter hub, it should be replaced with a new sterile access cap.
3.4	Flush new access cap with normal saline to expel air prior to placement on the CVC.
3.5	Clean the connection site of the CVC/access cap with a sterile alcohol swab for 15 seconds and allow to dry for 15 seconds.
3.6	Clamp the catheter using the in-line clamp or plastic forcep clamp. NEVER CHANGE CAP WITHOUT CLAMPING LUMEN FIRST! Remove old access cap, clean the threads of the catheter hub with a sterile alcohol swab for 15 seconds and allow to dry for 15 seconds.
3.7	Place new sterile access cap on the hub of the catheter.
<b>Documentation</b>	
4.1	Documentation should include the following: <ul style="list-style-type: none"> <li>✓ Assessment of the condition of the dressing</li> <li>✓ Catheter related procedures: date, time, indication, description, complications, medications given, and patient response.</li> <li>✓ Notification of physician with catheter related issues, including time and response</li> </ul>

Flushing the Catheter	
5.1	Flush the catheter <ul style="list-style-type: none"> <li>◆ on a regular schedule</li> <li>◆ after you draw blood</li> <li>◆ after you put any fluid through the tube</li> <li>◆ anytime you see blood in the catheter cap.</li> </ul>
5.2	Reminder: Every time you flush the catheter with normal saline or heparin, use the “push-and-pause” method: push a little solution, then pause for 1-2 seconds, then push a little more, pause, and so on. This method cleans the inside of the catheter tube.
5.3	Prepare a clean work area & wash your hands.
5.4	Gather: <ul style="list-style-type: none"> <li>◆ normal saline (one 10 ml syringe for each lumen)</li> <li>◆ heparin syringes (one 10 ml syringe of 100 IU/ml heparin for each lumen)</li> <li>◆ non-sterile gloves</li> <li>◆ alcohol wipes</li> </ul>
5.5	Make sure syringes do not have air bubbles in them. Point the syringe with the tip facing upward, pull back slightly on the plunger, and squirt the air bubble out before using.
5.6	Put on non-sterile gloves
5.7	Scrub the injection cap with a sterile alcohol wipe for 15 seconds and let dry for 15 seconds.
5.8	Attach the normal saline syringe tip into the injection cap. Unclamp the catheter. Flush with 3-5 mL of normal saline using the push-and-pause method. Remove syringe from the injection cap & clamp catheter.
5.9	Scrub the injection cap with a sterile alcohol wipe for 15 seconds and let it dry for 15 seconds.
5.10	Attach the heparin syringe tip into the injection cap, unclamp catheter, and flush with 3 mL of heparin using the push-and-pause method. Remove syringe from injection cap. Clamp the catheter.
5.11	Repeat steps 5.7-5.10 for each lumen of the catheter. Use a new alcohol wipe, normal saline and heparin syringe for each lumen.



Obtaining a Blood Sample from CVC		
6.1	Specimens should be drawn from the red lumen or large port/distal port.	
6.2	Assemble these supplies: <ul style="list-style-type: none"> <li>✓ 0.9% normal saline flush in a 10 mL syringe (x2)</li> <li>✓ heparin flush for dormant lumen in a 10 mL syringe (100 units/mL)</li> <li>✓ exam gloves</li> <li>✓ 3-way stopcock (if available)</li> <li>✓ specimen tubes</li> <li>✓ alcohol prep pads (sterile)</li> <li>✓ 10 mL syringes (however many needed for amount of specimens to obtain)</li> </ul> sterile access cap if change is needed	
	Stopcock Method	Without Stopcock
6.3	Assemble the 3-way stopcock (if available) with “waste syringe” & flush syringe.	Scrub the CVC/access cap with sterile alcohol wipe for 15 seconds, let dry for 15 seconds.
6.4	Scrub the CVC/access cap with sterile alcohol wipe for 15 seconds, let dry for 15 seconds.	Attach waste syringe and unclamp lumen. Draw out 5 ml of “waste blood” and discard into biohazard container. Reclamp the lumen.
6.5	Attach stopcock to CVC access cap. (A single stopcock or 2 stopcocks can be luer locked together based on clinical need.) – If stopcock not available, skip step & attach waste syringe per step 6.6 to access cap.	Scrub CVC/access cap again as per step 6.3
6.6	Turn stopcock so that only the waste syringe is turned on and unclamp the lumen & draw out 3-5 ml of “waste blood.” Turn the stop cock to turn off to the waste syringe & leave attached. (If not stopcock, then waste the 5 ml).	Attach specimen syringe and unclamp lumen. Withdraw specimen into the syringe & reclamp the lumen.
6.7	Open the specimen syringe by turning the stopcock. Draw the specimen into the syringe(s).	Scrub CVC/access cap again as per step 6.3
6.8	Flush “waste” back into CVC unless otherwise ordered & removes syringe.	Attach saline flush syringe and unclamp lumen. Flush lumen with 3-5 ml of saline. Clamp lumen.
6.9	Attach saline flush syringe and open stopcock to flush lumen. If lumen is dormant, follow with a heparin flush.	If lumen is dormant, follow also with a heparin flush of 3 ml of 100 IU/ml heparin.

Appendix C- Sickle Cell Haemoglobinopathy  
Outpatient Roadmap



CANCER AND HEMATOLOGY CENTERS



# Botswana Paediatric Haematology & Oncology

## *Sickle Haemoglobinopathy Outpatient Roadmap*

Name: \_\_\_\_\_ DOB: \_\_\_\_\_ PA#: \_\_\_\_\_

Diagnosis: \_\_\_\_\_

### Confirmatory Hgb Electrophoresis (6 months or 2 years of age):

Date: \_\_\_\_\_ A1 \_\_\_\_\_ A2 \_\_\_\_\_ S \_\_\_\_\_ F \_\_\_\_\_

### Baseline Labs – Date: \_\_\_\_\_

Hgb \_\_\_\_\_ MCV \_\_\_\_\_ Reticulocyte Count: \_\_\_\_\_ LDH \_\_\_\_\_ Total Bilirubin: \_\_\_\_\_

### Family Studies

Mother \_\_\_\_\_ Date \_\_\_\_\_

Father \_\_\_\_\_ Date \_\_\_\_\_

### Sibs

\_\_\_\_\_ Date \_\_\_\_\_

\_\_\_\_\_ Date \_\_\_\_\_

### Immunizations (Age Due)

!!!Vaccines which are in **BOLD** are critical for the patient to receive!!!

BCG \_\_\_\_\_ (birth)

**HBV #1** \_\_\_\_\_ (birth)

OPV #1 \_\_\_\_\_ (2 mo)

OPV #2 \_\_\_\_\_ (3 mo)

OPV #3 \_\_\_\_\_ (4 mo)

RV #1 \_\_\_\_\_ (2 mo)

RV #2 \_\_\_\_\_ (3 mo)

**DPT-HBV-Hib#1** \_\_\_\_\_ (2 mo)

**DPT-HBV-Hib #2** \_\_\_\_\_ (3 mo)

**DPT-HBV-Hib #3** \_\_\_\_\_ (4 mo)

**DPT-HBV-Hib#4** \_\_\_\_\_ (15-18 mo)

**PCV-13 #1** \_\_\_\_\_ (2 mo)

**PCV-13 #2** \_\_\_\_\_ (3 mo)

**PCV-13 #3** \_\_\_\_\_ (4 mo)

**PCV-13 #4** \_\_\_\_\_ (12-15 mo)

Measles #1 \_\_\_\_\_ (9 mo)

Measles #2 \_\_\_\_\_ (18 mo)

DT booster #1 \_\_\_\_\_ (18 mo)

DT booster #2 \_\_\_\_\_ (7 yrs)

OPV booster \_\_\_\_\_ (18 mo)

OPV booster \_\_\_\_\_ (7 yrs)

TT booster \_\_\_\_\_ (13 yrs)

**HAV #1** \_\_\_\_\_ (12 mo)

**HAV #2** \_\_\_\_\_ (18 mo)

**PPSV 23 #1** \_\_\_\_\_ (2 yrs)

**PPSV 23 #2** \_\_\_\_\_ (7 yrs)

**Meningococcal #1** \_\_\_\_\_ (2yrs)

**Meningococcal #2** \_\_\_\_\_ (5-7 yrs\*)

**Meningococcal #3** \_\_\_\_\_ Q 5 yrs

**Meningococcal #4** \_\_\_\_\_ Q 5 yrs

Name: \_\_\_\_\_ DOB: \_\_\_\_\_ PA#: \_\_\_\_\_

**Folic acid**

For patients with Hgb < 9 gm/dL and retic > 5%

- a. 0.5 mg daily for < 2 years of age
- b. 1.0 mg daily for > 2 years of age

Date: \_\_\_\_\_ Folate \_\_\_\_\_ mg

Date: \_\_\_\_\_ Folate \_\_\_\_\_ mg

**Penicillin prophylaxis**

- a. 125 mg PO BID for age birth – 2 years
- b. 250 mg PO BID for 3 – 5 years (see below)

Date: \_\_\_\_\_ PCN \_\_\_\_\_ mg PO BID

Date: \_\_\_\_\_ PCN \_\_\_\_\_ mg PO BID

Date PCN Discontinued: \_\_\_\_\_

**GENERAL INSTRUCTIONS FOR VISITS/ASSESSMENTS**

1. Patients should be seen every 3 months from diagnosis.
2. Begin penicillin prophylaxis with first visit. At 5 years, PCN *may be discontinued* for the following patients: Patient without prior history of documented pneumococcal infection and patients who have received 1 dose of PPSV23 (pneumococcal 23), and appropriate PCV 13 doses.
3. Review all childhood immunizations and update as needed.
4. Patients are to receive **influenza vaccine yearly**, unless medically contraindicated. **Hepatitis A Vaccines** should be given to patients receiving chronic transfusions, or with liver dysfunction, or with Hepatitis C.
5. Assess:
  - a. History/duration and reason for hospitalizations since last visit.
  - b. History/duration of pain crises or other crises managed at home.
  - c. Missed school days because of SS related complications.
  - d. Penicillin prophylaxis compliance assessment.
  - e. Blood product utilization.
6. **Catch-Up immunizations for unvaccinated children without functioning spleen** (See CDC Catch-up Immunization Schedule for further clarifying details):
  - **PCV13** – if child ≥ 72 months, then give 1 dose PCV13 only. Otherwise see chart below for *catch-up* PCV 13 doses & timing.

Age at first dose (mo.)	Primary PCV13 series^	PCV13 booster dose
2--6	3 doses	1 dose at age 12--15 mo.
7--11	2 doses	1 dose at age 12--15 mo.
12--23	2 doses	---
24--71	2 doses	---

^ Minimum interval between doses is 8 weeks except for children vaccinated at age <12 months for whom minimum interval between doses is 4 weeks. Minimum age for administration of first dose is 6 weeks.

- **PPSV23:** Starting at age 2 years, child should receive 1 dose of PPSV23 followed by a booster 5 years apart – max 2 doses.
  - a. Do NOT give PCV 13 & PPSV 23 simultaneously. First give PCV 13, **wait 8 weeks**, then give PPSV 23. If PPSV 23 has already been given, then you must wait 1 year to avoid interference between the vaccines.
- **Meningococcal:** Age 2 years and older should receive primary series - 1 dose of MPSV4 (2 doses 2 months apart for MCV4), then booster dose\* of MPSV4 after 3-5 years (\*if <4 years old at first dose); otherwise boosters every 5 years.
  - a. If a child needs MCV4, he must first be caught up with PCV13 and you must wait 4 weeks before you vaccinate him with MCV4-D (Menactra, Sanofi Pasteur).
  - b. No evidence of similar wait with MPSV4 or other MCV4 brands.
- **Hib:** All unvaccinated children age 15 months or older, administer only 1 dose.
- PPSV23, meningococcal, and Hib vaccines should be administered at least 2 weeks before a scheduled splenectomy, if possible.

Name: \_\_\_\_\_ DOB: \_\_\_\_\_ PA#: \_\_\_\_\_

## Hydroxyurea Monitoring

---

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

**Date:** \_\_\_\_\_ **Hgb:** \_\_\_\_\_ **MCV:** \_\_\_\_\_ **Plt:** \_\_\_\_\_ **ANC:** \_\_\_\_\_ **Dose:** \_\_\_\_\_

Note: \_\_\_\_\_

## Appendix D- Hemophilia A Guidelines

Texas Children's Cancer Center and Hematology Service  
Clinical Practice Pathway  
**Guidelines for Congenital Bleed Disorders: General Assessment and Management**

---

TREATMENT OF BLEEDING CRISIS IN PATIENTS WITH HEMOPHILIA A (FACTOR VIII)

**Appendix I**

These recommendations are designed to provide general guidelines for management of typical bleed. The treating medical team may determine that circumstances require more or less medical intervention. For new patients and/or patients who are HIV negative, recombinant factor is recommended whenever possible. DOSE TO UNIT VIAL DOSE WHENEVER POSSIBLE.

Event	Factor Dose 1 <sup>st</sup> Dose (%)	Following Dose / Schedule	Comments
1) Hemarthrosis Any joint	40-50 units/Kg (80-100)	25-35 units/Kg (50-70) q.12-24h x 2-5d	- ice x 20 mins; immobilize x 48° - then light ambulation, Ace wrap - persistent pain ↑ swelling = ↑ dose
2) Hematoma Soft Tissue	35-50 units/Kg (70-100)	25 units/Kg (50) daily x 2 d	- local ice pack x 20 mins
3) Hematuria	35-50 units/Kg (100)	25 units/Kg (50) q.12-24h x 2-7d	- hydration - prednisone 1-2 mg/Kg/d x 7-14d - search for other causes
4) Gastrointestinal	35-50 units/Kg (70-100)	25-35 units/Kg (50-70) q.12h x 2-7d	- assess cause/extent - monitor CBC
5) Mucosal	35-50 units/Kg (70-100)	25 units/Kg (50) daily x 1-2d	- local ice pack - Amicar 100mg/Kg q.6h x 3-5d
6) Head trauma	50 units/Kg (100)	35 units/Kg (70) q.12h x 7-10d	- <b>don't wait for neuro signs</b> - <b>CT after 1<sup>st</sup> dose</b> - Inhibitor screen - Monitor F8 trough; maintain >80%
7) Major surgery	50 units/Kg (100)	25-35 units/Kg (50-70) q.12h x 3-8d	- monitor F8; maintain >50% - inhibitor screen -
8) Dental extraction	50 units/Kg (100)	25-35 units/Kg (35-50) daily x 3d	- Amicar 100mg/Kg q.6h x 3-5d

Special Circumstances

- 1) Trauma: Recombinant factor concentrates are always the preferred treatment of choice. F/U schedules delivered at 24<sup>o</sup> intervals may be more cost effective for patient. FFP 10-15ml/Kg may be used in emergent situation if factor concentrate not immediately available. **A follow-up plan to assure recovery is required.**
- 2) DDAVP: See page DDAVP Guidelines. Only for mild (>5% activity) deficiency states (no infant <2 year) and minor bleed complications. Dose 0.3 mcg/Kg IV in 30 cc/m<sup>2</sup> normal saline over 15 mins. May repeat daily x 2-3 days – max.
- 3) Inhibitor Screen
  - ≥5 BU or known resistance to factor
  - Factor 7a: 90-120 micrograms/Kg IVP may repeat every 2 hours x 3 doses
  - Positive: - FEIBA: 75-100 units/Kg – may repeat in 12 hours. Do not exceed 200units/Kg/24 hrs. Do not give with Factor 7a.

---

*These practice guidelines are intended for use by professional health care providers. These guidelines do not constitute advise concerning an individual's medical care and treatment.*

## Appendix E- Hemophilia B Guidelines

Texas Children's Cancer Center and Hematology Service  
Clinical Practice Pathway  
**Guidelines for Congenital Bleed Disorders: General Assessment and Management**

TREATMENT OF BLEEDING CRISIS IN PATIENTS WITH **HEMOPHILIA B (FACTOR IX)**

**Appendix II**

These recommendations are designed to provide general guidelines for management of typical bleed. The treating medical team may determine that circumstances require more or less medical intervention.

Event	Factor Dose 1st Dose (%)	Following Dose/Schedule	Comments
1) Hemarthrosis Any joint	50-120 units/Kg (40-100)	50-70 units/Kg (40-60) q.24h x 1-3d	- ice x 20 mins; immobilize x 48° - then light ambulation; Ace wrap - persisting pain, ↑ swelling = ↑ dose
2) Hematoma Soft tissue	50-100 units/Kg (40-80)	50 units/Kg (40) daily x 2 d	- local ice pack x 20 mins
3) Hematuria	75-120 units/Kg (60-100)	50 units/Kg (40) q.24h x 2-7d	- hydration - prednisone 1-2 mg/Kg/d x 7-14d - search for other causes
4) Gastrointestinal	100-120 units/Kg (80-100)	100 units/Kg (80) daily x 2-7d	- assess cause/extent - monitor CBC
5) Mucosal	75-120 units/Kg (60-100)	50-80 units/Kg (40-60) q.12-24h x 1-2d	- local ice pack - Amicar 100mg/Kg q.6h x 3-5d
6) Head trauma	100-120 units/Kg (90-100)	75-100 units/Kg (60-90) q.12h x 7-10d	- <b>don't wait for neuro signs</b> - <b>CT after 1<sup>st</sup> dose</b> - Inhibitor screen - Monitor F9 trough; maintain >50%
7) Major surgery	100-120 units/Kg (90-100)	100-120 units/Kg (90-100) daily x 7-10d	- Monitor F9; maintain >50% - Inhibitor screen
8) Dental extraction	100-120 units/Kg (90-100)	75-100 units/Kg (60-80) daily x 2-7d	- Amicar 100mg/Kg q.6h x 3-5d

Special Circumstances:

- 1) Trauma: FFP 10-15 ml/Kg may be used in emergent situation if factor concentrate not immediately available.
- 2) Doses: >50 units/Kg may be associated with thromboembolic complications with less pure Factor IX concentrates.
- 3) Life-threatening anaphylaxis has been reported with the use of high purity Factor IX especially with patients with severe factor 9 deficiency and large gene deletion. Families should be aware of this risk. Take anaphylaxis precautions with first 30 doses.
- 4) Dose calculation for recombinant Factor IX (BeneFix) should be adjusted by a multiple factor of 1.2.

*These practice guidelines are intended for use by professional health care providers. These guidelines do not constitute advice concerning an individual's medical care and treatment.*

## Appendix F -Haemostasis Clinic Note



# Botswana Paediatric Haematology & Oncology

## HAEMOSTASIS CLINIC NOTE

Date of Visit \_\_\_\_\_ PM # \_\_\_\_\_ PA# \_\_\_\_\_

Patient's Name: \_\_\_\_\_ DOB: \_\_\_\_\_

Weight: \_\_\_\_\_ kg Height: \_\_\_\_\_ cm

Vital Signs: T \_\_\_\_\_ BP \_\_\_\_\_ HR \_\_\_\_\_ O<sub>2</sub> sat \_\_\_\_\_ RR \_\_\_\_\_

Diagnosis:  Haemophilia A  Haemophilia B  von Willebrand Disease  
 Other \_\_\_\_\_

Baseline Labs & Date: (Factor VIII Level, Factor IX Level, VWF antigen, VWF activity)

Lab Test: \_\_\_\_\_ Value \_\_\_\_\_ Date: \_\_\_\_\_

Lab Test: \_\_\_\_\_ Value \_\_\_\_\_ Date: \_\_\_\_\_

Lab Test: \_\_\_\_\_ Value \_\_\_\_\_ Date: \_\_\_\_\_

Allergies: \_\_\_\_\_  
\_\_\_\_\_

Inhibitors?  Yes  No  
Comment: \_\_\_\_\_

Medications: \_\_\_\_\_  
\_\_\_\_\_

Compliance with Prophylaxis?  Yes  No  
Comment: \_\_\_\_\_

Currently on Prophylaxis?:  Yes  No  
 Factor VIII \_\_\_\_\_ units IV every \_\_\_\_\_  
 Factor IX \_\_\_\_\_ units IV every \_\_\_\_\_  
 Factor VIIa \_\_\_\_\_ units IV every \_\_\_\_\_

Target Bleeding Areas: \_\_\_\_\_  
\_\_\_\_\_

Events since last clinic visit: \_\_\_\_\_  
\_\_\_\_\_

### Bleeds since last visit?

Head Injury Date \_\_\_\_\_

Factor Use: \_\_\_\_\_

Mucous membrane Date \_\_\_\_\_

Factor Use: \_\_\_\_\_

Joints Date \_\_\_\_\_

Factor Use: \_\_\_\_\_

Abdominal Date \_\_\_\_\_

Factor Use: \_\_\_\_\_

Muscle Date \_\_\_\_\_

Factor Use: \_\_\_\_\_

Trauma Date \_\_\_\_\_

Factor Use: \_\_\_\_\_

## PHYSICAL EXAM

*\*Note Presence of: Swelling, Redness, Decreased ROM, Pain/Tenderness & Joint Asymmetry*

Hands/Wrists

Knees

Elbows

Ankles/Feet

Shoulders

Spine

Head/Neck

Other

Hips

---

## LABORATORY

### Labs to Obtain:

Full blood count

Factor VIII activity level

Factor IX activity level

von Willebrand factor antigen

von Willebrand factor activity/ Ristocetin co-factor analysis

Other: \_\_\_\_\_

---

## PLAN

### 1. Prophylaxis Yes No

**Factor VIII** \_\_\_\_\_ units (\_\_\_\_ units/kg) IV every \_\_\_\_\_

**Factor IX** \_\_\_\_\_ units (\_\_\_\_ units/kg) IV every \_\_\_\_\_

**Factor VIIa** \_\_\_\_\_ mcg (\_\_\_\_ mcg/kg) IV every \_\_\_\_\_

### 2. Emergencies: (Always round doses up to a full vial; DO NOT WASTE FACTOR!)

➤ For minor bleeds (e.g. joints), treat according to dose below. Treat daily until joint is pain free and baseline mobility achieved. A typical course is three days. **Call 72259379 after the first dose!**

➤ For major bleeds (i.e. internal hemorrhage, brain, other life-threatening bleed), treat according to dose below, then prepare for transfer to PMH. **Call 72259379 after the first dose!**

**Haemophilia A**

✓ **Minor Bleed:** FVIII \_\_\_\_ units (30 units/kg)

✓ **Major Bleed:** FVIII \_\_\_\_ units (50 units/kg)

**Haemophilia B**

✓ **Minor Bleed:** FIX \_\_\_\_ units (50 units/kg)

✓ **Major Bleed:** FIX \_\_\_\_ units (100 units/kg)

**Alternatives** for Haemophilia A or B in absence of concentrated factor replacements:

✓ FVIIa (NovoSeven) \_\_\_\_\_ units (90 micrograms/kg)

**OR**

- ✓ Plasma (FFP) \_\_\_\_\_ units or \_\_\_\_\_ mL (20 ml/kg)
- von Willebrand Disease**
  - ✓ Intranasal DDAVP (Stimate)
    - <50 kg: 150 microgram (1 spray)
    - >50kg: 300 micrograms every 12-24 hours for 2-3 days
  - ✓ Intravenous (IV) DDAVP - 0.3 microgram/kg in 30 ml of Normal Saline over 15 minutes. Repeat every 12-24 hours for 2-3 days
    - Limit fluid intake to 75% of maintenance for 24 hours post-DDAVP dosing to avoid hyponatremia
  - ✓ Plasma (FFP) \_\_\_\_\_ units or \_\_\_\_\_ mL (20 ml/kg)

**3. Adjunct for mucocutaneous bleeding**

- Tranexamic acid \_\_\_\_\_ mg (25mg/kg, max dose 1.5 g/dose, 500 mg tablets) by mouth every 8 hours for \_\_\_\_\_ days

**4. Other:**

Referral to (orthopedics, dental, physiotherapy, etc.)

---

**5. Return Visit:** Please return to Princess Marina Hospital for follow-up on \_\_\_\_\_

\_\_\_\_\_  
Physician Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Print Name

***Botswana Paediatric Haematology & Oncology Service, Princess Marina Hospital***  
**Botswana-Baylor Children's Clinical Centre of Excellence**  
**Texas Children's Cancer and Hematology Centers**  
**Baylor College of Medicine**  
[botswanahope@txch.org](mailto:botswanahope@txch.org) Tel: (+267) 72259379

## Appendix G -Tranexamic Acid



## Botswana Paediatric Haematology & Oncology

---

### Tranexamic Acid

Tranexamic acid is an antifibrinolytic that works especially well for mucocutaneous bleeding of the gums or nose. There are three options for its use for mouth bleeding:

1. Tranexamic acid tablets or IV solution. Typical dosing is 25mg/kg (max 1.5gm/dose) every 8 hours for 3-7 days. The tablets are typically 500 mg and the IV solution is 500mg/5ml.
2. The IV ampules of tranexamic acid 500mg/5ml can be used to make a 5% oral solution by diluting 5 ml of 500 mg/5ml tranexamic acid injection with 5 ml of sterile water. Ideally, this should be made with a filter needle. The solution can be taken orally per the same dosing per #1.
3. For mouth-only bleeding, the tranexamic acid solution, either from IV form as per #2 or crushed tablets, can be swished in the mouth. Place 5ml of the tranexamic acid solution to be swished in the mouth for around one minute then spit out. To create the solution from tablets, place each 500 mg tablet into 20 ml of water and let stand. Begin stirring and continue until the tablets are completely disintegrated to form a fine particular suspension. Dispersion time for each 500mg tablet is 2–5 minutes. The solution can be used for 5 days before expiry.

Appendix H -Management of Cytopenias - Discharge  
Instructions



## Botswana Paediatric Haematology & Oncology

### *Management of Cytopenias: Discharge Instructions*

- **Prophylaxis for prevention of *pneumocystis jiroveci* pneumonia (formerly PCP) for prolonged chemotherapy or steroid use:**

#### **Trimethoprim/sulfamethoxazole (TMP/SMX)\***

Can be given once daily or three times per week twice daily using the dosing below:

BSA (m <sup>2</sup> )	Regular Strength Tab 80/400	Liquid (mL) 40/200 per 5 ml
<0.3	N/A	2.5
0.3 – 0.79	0.5	5
0.8 – 1.39	1	10
1.40 – 1.89	1.5	15
>1.9	2	20

\*If patient cannot take TMP/SMX, then give Dapsone 4 mg/kg (max 200 mg/dose) by mouth once per week.

- **Prophylaxis for patients with anticipate severe and prolonged myelosuppression:**
  - ✓ Fluconazole 6 mg/kg/day once daily rounded to 25 mg increments. (Max: 200 mg/day)
- **Anemia:**
  - ✓ Transfuse packed red blood cells (RBCs) if hemoglobin <7 g/dL
  - ✓ Transfuse 10-15 ml/kg of RBCs to raise the hemoglobin by 1-2 g/dL
- **Thrombocytopenia:**
  - ✓ Transfuse platelets if etiology of thrombocytopenia is decreased production (as opposed to immune-mediated destruction) and the platelet count is :
    - < 10,000/microliter regardless of symptom
    - < 50,000/microliter and undergoing a surgical procedure, lumbar puncture, or IM injection
  - ✓ Transfuse one 50ml pack/10kg if random donor platelet packs available
  - ✓ If having any bleeding, transfuse platelets regardless of the platelet count
- **Fever (temperature >38° C):**
  - ✓ Patient needs to be seen at PMH or closest medical facility as soon as possible
  - ✓ FBC, type and cross, place intravenous cannula and draw blood culture before antibiotics
  - ✓ Start gram-negative rods coverage with an intravenous cephalosporin such as ceftriaxone or cefotaxime:
    - Ceftriaxone – 75 mg/kg/day IV Q 24 hours (max: 2 g/day)
    - Cefotaxime – 50-75 mg/kg/dose IV Q 8 hours; max 2 g IV per dose.
  - ✓ Also start a fluoroquinolone (levofloxacin) or aminoglycoside (gentamicin) to cover pseudomonas
    - Levofloxacin: 6 mo - 4 years: 8-10 mg/kg/dose IV Q 12 hours (max: 750 mg/dose)
    - > 4 years old: 8-10 mg/kg/dose IV once *daily* (max: 750 mg/day)
    - Gentamicin – 7.5 mg/kg/dose IV Q 24 hours; (max: 360 mg/dose)
  - ✓ If septic or with fevers >24 hours with the above regimen, add gram positive bacterial coverage like vancomycin.(10 to 15 mg/kg/dose IV Q 8 hours; max 500 mg/dose; 2 g/day)
  - ✓ If available and absolute neutrophil count <500, consider G-CSF (Neupogen) at 5 micrograms/kg/day IV or SQ
  - ✓ **Call doctor on call after blood culture, FBC, and antibiotics given!**

**DISCLAIMER:** Every effort has been exerted to ensure that the drug selection and dosages contained in this handout are in accord with current recommendations and practice at the time of this publication. However, the user is urged to use best clinical judgment regarding the prescription of these medications based on each patient's unique clinical status. The user is advised to check the package insert or drug reference guide for each drug for any change in indications, dosage, and for added warnings or precautions.

Appendix I - Management of Non-Myelosuppressive  
Chemotherapy Side Effects - Discharge Instructions



## Botswana Paediatric Haematology & Oncology

### *Management of Non-Myelosuppressive Side Effects: Discharge Instructions*

- **Hematuria (if getting cyclophosphamide):**
  - ✓ Immediately assess urine output
  - ✓ Sterilely place urinary catheter only if concern for urethral obstruction
  - ✓ Begin IV fluids at twice maintenance then call the PMH Pediatric Hematology-Oncology Phone at 72259379.
- **Nausea/vomiting:**
  - ✓ Check for dehydration and rehydrate as necessary
  - ✓ Anti-emetics that can be used include:
    - Granisetron (Kytril): 10 mcg/kg, max 1 mg IV/PO daily
    - Metoclopramide (Reglan): 0.1 mg/kg, max 10mg IV every 8 hours
    - Promethazine (Phenergan): 1 mg/kg/dose (for children 25 mg is usually sufficient though up to 50mg can be given) IV/PO every 6 hours
- **Hypomagnesaemia (if getting cisplatin):**
  - ✓ Cisplatin is known to cause magnesium wasting so patients getting this drug should be prescribed an oral magnesium supplement and have the serum magnesium level regularly checked.
  - ✓ As oral magnesium supplements can be difficult to find, most patients take an antacid tablet which has magnesium trisilicate & aluminum hydroxide - 1 tablet PO TID and titrate as needed to maintain normal magnesium levels.
  - ✓ With severe and/or symptomatic hypomagnesaemia, give magnesium sulfate 25-50 mg/kg IV (max 2g/dose).
- **Gastritis (if getting prednisone/dexamethasone):**
  - ✓ Give ranitidine 2-4 mg/kg/dose (max 300 mg/day) by mouth twice per day
- **Constipation (if getting vincristine):**
  - ✓ Ensure the patient is hydrated
  - ✓ Consider giving one of the following:
    - Polyethylene glycol 3350 (Miralax/Movicol) 1-1.5 g/kg/day (max 17 g/day) in 4-8 oz of liquid by mouth daily. *Avoid mixing in milk or formula.*
      - Klean-Prep is also an option. Please read the sachet for dosing instructions.
    - Lactulose 1ml/kg by mouth twice daily (max 60 ml/day)
    - Mineral Oil (Paraffin) <12 years: 5-15 mL/day divided once to twice daily; >12 years: 15-45 mL/day divided once to twice daily
    - Bisacodyl (Dulcolax) 3-12 years: 5 mg PO once daily to BID (max: 10mg); > 12 years: 10 mg PO once daily to TID (max: 30mg)
    - Ducosate (Colace)
      - < 3 y.o. give 30 mg by mouth divided once daily to 4 times daily; 3 – 6 y.o. give 60 mg by mouth divided once daily to 4 times daily; > 6 y.o. give 150 mg by mouth divided once daily to 4 times daily
    - Senna 2-6 years: 4.3 mg dose PO once to twice daily; 6-12 years: 8.6 mg dose PO once to twice daily; >12 years: 17.2 mg dose PO once to twice daily
  - ✓ **NEVER** give anything per rectum (enema, suppository, or thermometer) to an oncology patient

*DISCLAIMER: Every effort has been exerted to ensure that the drug selection and dosages contained in this handout are in accord with current recommendations and practice at the time of this publication. However, the user is urged to use best clinical judgment regarding the prescription of these medications based on each patient's unique clinical status. The user is advised to check the package insert or drug reference guide for each drug for any change in indications, dosage, and for added warnings or precautions.*

Appendix J -Nurse Chemotherapy Reference Chart  
Pastel

## Nurse Chemotherapy Reference Chart

Drug Name	Class/Primary Cancer Indications	Adverse Reactions/Common Side Effects	Nursing Considerations
<b>Bleomycin</b>	<i>Anti-tumor antibiotic</i> ; lymphomas, germ cell tumors, Kaposi sarcoma	<ul style="list-style-type: none"> <li>• Pneumonitis, pulmonary fibrosis</li> <li>• <b>Allergic reaction</b></li> <li>• Skin problems (rash, redness, tender skin, hyperpigmentation of fingernails)</li> <li>• Stomatitis</li> <li>• High fever 2-6 hrs after admin.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor for difficulty breathing</li> <li>• <b>Allergic reactions</b></li> </ul>
<b>Carboplatin</b>	<i>Alkylating agent</i> ; retinoblastoma, brain tumors, solid tumors	<ul style="list-style-type: none"> <li>• Peripheral neuropathies</li> <li>• Kidney damage (high doses)</li> <li>• <b>Nausea/Vomiting</b></li> <li>• Myelosuppression</li> <li>• Allergic reactions with &gt; 6 infusions</li> </ul>	<ul style="list-style-type: none"> <li>• High risk nausea/vomiting</li> <li>• Give anti-emetics</li> <li>• If &gt; 6 infusions, give premedication to avoid allergic reaction</li> </ul>
<b>Cisplatin***</b>	<i>Alkylating agent</i> ; osteosarcoma, brain tumors, germ cell tumors	<ul style="list-style-type: none"> <li>• Kidney damage</li> <li>• Hearing loss</li> <li>• Peripheral neuropathies</li> <li>• <b>Nausea/vomiting</b></li> <li>• Myelosuppression</li> <li>• Hypomagnesemia</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Pre and post hydration (refer to Chemo Plan) &amp; I/O</b></li> <li>• Taste changes (metallic taste of food)</li> <li>• Decreased blood levels of Mg<sup>++</sup>, K<sup>+</sup>, Ca<sup>+</sup> = Will need Magnesium supplement</li> <li>• High risk nausea/vomiting = pre-medicate with anti-emetics</li> </ul>
<b>Cyclophosphamide***</b>	<i>Alkylating agent</i> ; leukemia, lymphoma, solid tumors like osteosarcoma and rhabdomyosarcoma, brain tumors	<ul style="list-style-type: none"> <li>• <b>Nausea/vomiting</b></li> <li>• <b>Hemorrhagic cystitis</b> (bleeding from bladder)</li> <li>• Myelosuppression</li> <li>• Hair loss</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Pre and post hydration (refer to Chemo Plan)</b></li> <li>• <b>Give bladder protectant at high doses (&gt;1g/m<sup>2</sup>) (Mesna)</b></li> <li>• Monitor for hematuria &amp; strict I/O</li> <li>• High risk nausea/vomiting</li> <li>• Pre-medicate with anti-emetics</li> </ul>
<b>Cytarabine (ara-C)</b>	<i>Antimetabolite</i> ; leukemia	<ul style="list-style-type: none"> <li>• Myelosuppression</li> <li>• Nausea/Vomiting</li> <li>• Stomatitis</li> <li>• Hair loss</li> </ul>	<ul style="list-style-type: none"> <li>• Conjunctivitis with doses &gt; 1,000 mg/m<sup>2</sup> =requires steroid eye drops</li> <li>• Cerebellar toxicity with doses &gt; 1,000 mg/m<sup>2</sup></li> <li>• Pre-medicate with anti-emetics</li> </ul>
<b>Dactinomycin</b>	<i>Antibiotic</i> ; Wilms tumor, rhabdomyosarcoma	<ul style="list-style-type: none"> <li>• <b>Nausea/Vomiting</b></li> <li>• Myelosuppression</li> <li>• Hair loss</li> <li>• Skin photosensitivity/hyperpigmentation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Vesicant</b></li> <li>• Protect from light</li> </ul>
<b>Doxorubicin</b>	<i>Anthracycline antibiotic</i> ; leukemia, lymphoma, solid tumors, Kaposi sarcoma	<ul style="list-style-type: none"> <li>• Cardiomyopathy when life-time dose exceeds 350 mg/m<sup>2</sup></li> <li>• Myelosuppression</li> <li>• Mucositis</li> <li>• Hair loss</li> <li>• Nausea/vomiting</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Vesicant</b></li> </ul>
<b>Etoposide</b>	<i>Plant alkaloid/ topoisomerase II inhibitor</i> ; leukemia, solid tumors, lymphoma, germ cell tumors	<ul style="list-style-type: none"> <li>• Myelosuppression</li> <li>• Nausea/Vomiting</li> <li>• Hair loss</li> </ul>	<ul style="list-style-type: none"> <li>• Give as slow IV infusion (30-60 minutes) to avoid hypotension</li> <li>• IV tubing: etoposide can cause cracks in plastic</li> </ul>
<b>Methotrexate***</b>	<i>Anit-metabolite</i> ; leukemia, lymphomas, osteosarcomas	<ul style="list-style-type: none"> <li>• Mouth ulcers</li> <li>• Myelosuppression</li> <li>• Nausea/Vomiting</li> </ul>	<ul style="list-style-type: none"> <li>• Rescue doses of leucovorin are required for doses &gt; 500 mg/m<sup>2</sup></li> <li>• <b>Hydration important @ high doses!</b></li> </ul>
<b>Paclitaxel</b>	<i>Plant alkaloid or taxane</i> ; Kaposi sarcoma, solid tumors	<ul style="list-style-type: none"> <li>• Peripheral neuropathies</li> <li>• Muscle/joint pain</li> <li>• Myelosuppression</li> <li>• Hair loss</li> <li>• <b>Allergic Reactions</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Potentially fatal allergic reactions</b> <ul style="list-style-type: none"> <li>○ <b>Pre-medication crucial</b></li> </ul> </li> <li>• <b>Vesicant</b></li> <li>• Give before cisplatin or carboplatin</li> </ul>
<b>Vincristine</b>	<i>Vinca alkaloid</i> ; leukemia, lymphomas, neuroblastoma, Wilms Tumor	<ul style="list-style-type: none"> <li>• Constipation</li> <li>• Peripheral neuropathies</li> <li>• Hair loss</li> <li>• <b>IV USE ONLY</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Vesicant</b></li> <li>• <b>IV USE ONLY</b></li> <li>• Intratheccal (IT) use is fatal</li> </ul>

**Vesicant (definition):** chemotherapy that will cause serious tissue damage if it leaks out of the vein; requires additional, careful monitoring during infusion

\*\*\*= Hydration Important!! Refer to Chemo Plan

## Appendix K - Chemo Prep Guidelines

# Preparation Guidelines for Commonly Used Chemotherapy Agents @ PMH

## BLEOMYCIN

**Formulation and Stability:** Available in 15 and 30 unit vials as Bleomycin sulfate, a white or yellowish lyophilized powder. The sterile powder is stable under *refrigeration*.

**IV Infusion:** Reconstitute to a concentration not to exceed 3 units/ml with normal saline and infuse over a minimum of 10 minutes (no greater than 1 unit/minute).

**Subcutaneous or IM:** Reconstitute to a concentration of 3-15 units/ml with normal saline. *Note:* Bleomycin should *not* be reconstituted or diluted with D5W or other dextrose containing diluents. When reconstituted in D5W, Bleomycin demonstrates a loss of A2 and B2 potency that does not occur when reconstituted in 0.9% sodium chloride. Bleomycin is stable for 24 hours at room temperature in Sodium Chloride.

**Special Precautions:** Due to the possibility idiosyncratic reaction, the manufacturer recommends that lymphoma patients receive a test dose of 2 units or less IV, IM or subcutaneously for the first 2 doses. Following administration of the test dose, consider monitoring of vital signs every 15 minutes for at least 1 hour and if no acute reaction occurs, the full dose may be given.

**Practical Tips:** Typically PMH supplies the 15 unit vial. Reconstitute with 5ml of NS or sterile water. It will keep for longer than 24 hours after reconstitution if kept 2-8 C but it is not clear how long.

## CARBOPLATIN

**Formulation and Stability:** Available in vials (50mg, 150mg and 450mg) as a white lyophilized powder. Should be stored at room temperature and *protected from light*. Per package insert, stable for 8 hours at room temperature if further diluted with D5W to 0.5 mg/mL.

**IV Infusion:** Reconstitute with 5, 15, or 45ml of sterile water, respectively, each ml containing 10mg carboplatin (see below). Carboplatin may be further diluted to 0.5-2 mg/mL with 5% dextrose or 0.9% sodium chloride with an 8 hour stability at room temperature. Infuse the diluted solution over 15-60 minutes. Avoid use of aluminum containing needles or administration sets.

VIAL SIZE	VOLUME OF DILUENT	CONCENTRATION
50 mg	5ml	10mg/ml
150 mg	15ml	10mg/ml
450 mg	45ml	10mg/ml

**Practical Tips:** The formulations most often supplied by PMH are 150mg/15ml or 450mg/45ml. A dose of up to 400mg can be put into a 200ml bag (2 mg/ml). Half Darrows (200ml) bags have been successfully used as a replacement when ideal diluents (NS or D5) are not available. An alternative, if available, is using a Buretrol filled with NS or D5. Usually infused over 60 minutes.

## CISPLATIN

**Formulation and Stability:** Available as an aqueous solution containing **1mg/ml of cisplatin** in sodium chloride (50ml, 100ml and 200 ml). Store at room temperature and **do not refrigerate**. *Protect unopened container from light*. The cisplatin remaining in the amber vial following initial entry is stable for 28 days protected from light or for 7 days under fluorescent room light. Cisplatin removed from its amber container should be protected from light if not used within 6 hours.

**IV Infusion:** Cisplatin may be further diluted in dextrose and saline solutions provided the solution contains  $\geq 0.2\%$  sodium chloride. Dextrose/saline/mannitol containing solutions, protected from light, are stable refrigerated or at room temperature, use within 24 hours. Infuse doses  $\leq 60$  mg/m<sup>2</sup>/day over 1 hour and doses  $> 60$  mg/m<sup>2</sup>/day over 1-8 hours.

**Practical Tips:** PMH usually provides 50mg/50ml or 10mg/10ml. The required dose is typically put in a 1 liter bag/bottle of DNS or NS. Mannitol, when available, comes in a 500ml bag that contains 200g of mannitol. Most cisplatin regimens call for 10g/m<sup>2</sup> of mannitol. Mannitol is added to the DNS or NS bottle/bag that contains the cisplatin. Usually ran over 4-6 hours.

## CYTARABINE

**Formulation and Stability:** Available in vials of 100 mg, 500 mg, 1 g, and 2 g containing a sterile powder for reconstitution. It is also available at a 20 mg/mL concentration with benzyl alcohol or as a preservative free solution, and at a 100 mg/mL concentration as preservative free solution. Store at room temperature. *Cytarabine solutions should be protected from light*.

**IV Infusion:** Reconstitute the lyophilized powder with Bacteriostatic Water for Injection, or 0.9% sodium chloride injection. When reconstituted with Bacteriostatic Water, cytarabine is stable for 48 hours at room temperature. Discard if solution appears hazy. May be further diluted with dextrose or sodium chloride containing solutions for IV infusion. May give by IV push, IV infusion, or by continuous infusion.

**IV Low Dose ( $\leq 200 \text{ mg/m}^2/\text{dose}$ ):** Reconstitute to a concentration of **20-100 mg/mL** and administer over 15-30 minutes.

**IV intermittent for intermediate dose ( $> 200 \text{ mg/m}^2/\text{dose}$ ) and high dose ( $>1,000 \text{ mg/m}^2/\text{dose}$ ):** Administer doses  $> 200 \text{ mg/m}^2 - < 3,000 \text{ mg/m}^2$  over 1-3 hours; administer doses  $\geq 3,000 \text{ mg/m}^2$  over 3 hours.

**Subcutaneous or IM:** Dilute with Bacteriostatic Water for Injection or 0.9% sodium chloride injection to a concentration not to exceed **100 mg/mL**. Rotate injection sites for SQ/IM administration.

**Intrathecal:** For intrathecal administration, dilute with **5-10 mL** preservative free 0.9% sodium chloride injection, lactated Ringer's injection or Elliot's B solution or as per institutional standard of practice. The volume of CSF removed should be equal to at least  $\frac{1}{2}$  the volume delivered.

**Suggested premedications and supportive care:**

**High dose ( $\geq 1,000 \text{ mg/m}^2/\text{dose}$ ):** Administer steroid eye drops (0.1% dexamethasone or 1% prednisolone ophthalmic solution), 2 drops to each eye every 6 hours, beginning immediately before the first dose and continuing for 24 hours after the last dose. If patient does not tolerate steroid eye drops, may administer artificial tears on an every 2-4 hours schedule.

**Practical Tips:** Check box or package insert to see if benzyl alcohol is added as a preservative. If yes, this should not be given intrathecally.

Patient Age (years)	Cytarabine dose	Recommended volume	10% CSF volume	CSF Volume*
1 – 1.99	30 mg	5–10 mL	5 mL	50 + 10 mL (babies)
2 – 2.99	50 mg	5-10 mL	8 mL	80 + 20 mL (younger children)
3 – 8.99	70 mg	5-10 mL	10 mL	100 + 20 mL (older children)
9 or greater	70 mg	5-10 mL	13 mL	130 + 30 mL (adults)

**CYCLOPHOSPHAMIDE**

**Formulation and Stability:** Available as powder for injection or lyophilized powder for injection in 500 mg, 1 g and 2 g vials. Store at room temperature. Per package insert, if reconstituted with NS, stable for 24 hours at room temperature or 6 days if refrigerated. If reconstituted with D5W, stable for 24 hours at room temperature or 36 hours if refrigerated.

**IV Infusion:** Reconstitute with Sterile Water or Bacteriostatic Water for Injection to a concentration of **20 mg/mL** and use immediately. If administered as undiluted drug at the 20 mg/mL concentration, reconstitute with NS only to avoid a hypotonic solution. Cyclophosphamide may be further diluted in dextrose or saline containing solutions for IV use. Administer doses  $\leq 500 \text{ mg/m}^2$  over 15-30 minutes; administer doses  $> 500 \text{ mg/m}^2$  to  $< 1,800 \text{ mg/m}^2$  over 30-60 minutes; administer doses  $\geq 1,800$  over 1-6 hours.

**Selected drug interactions:** Substrate of CYP2A6 (minor), CYP2B6 (major), CYP2C9 (minor), CYP2C19 (minor), CYP3A4 (major); Inhibits CYP3A4 (weak); Induces CYP2B6 (weak), CYP2C8 (weak), CYP2C9 (weak). Patients on inhibitors or inducers of CYP3A4 and CYP2B6 agents should be monitored closely for toxicity or reduced efficacy.

**Practical Tips:** Sterile water is not available at PMH beyond 5-15 ml vials. A variety of fluids, based on availability, have been used for reconstitution including D5, NS, DNS or Half Darrows. Typically, cyclophosphamide (500mg vials) are reconstituted with 25 ml of NS (or available fluid). The volume required for the dose is diluted in a 200ml bag of Half Darrows, NS, D5, or other available fluid. Remember to remove air from vial before reconstituting. Usually ran over 60 minutes.

**DACARBAZINE**

**Formulation and Stability:** Lyophilized powder, 100 mg and 200 mg of DTIC per vial. *Refrigerate. Protect vials from light.*

**IV Infusion:** Reconstitute with sterile water for injection (add 9.9 ml to 100 mg vial and 19.7 to 200 mg vial).

Reconstituted vials are stable 72 hours if refrigerated or 8 hours at room temperature. If drug is further diluted, it may be stored 24 hours in refrigerator or 8 hours at room temperature. Infuse diluted solution over 15-60 minutes. Slow infusion, as needed, for burning during administration.

**Selected drug interactions:** Dacarbazine is a major substrate for CYP1A2 and CYT2E1. Patients on CYP1A2 and CYP2E1 inhibitors or CYP1A2 inducers should be monitored closely for toxicity or reduced efficacy.

**Practical Tip:** Rarely used in pediatric oncology.

### **DACTINOMYCIN**

**Practical Tips:** The formulation supplied by PMH is 0.5 mg powder. It is reconstituted with 1.1 ml of sterile water, NS or available IV fluid. Can be further diluted with NS or D5. Protect from light. Per package insert, use within 4 hours of reconstitution. At PMH, given as an IV push over 5 minute following at least a 5 ml flush with NS or other available IV fluid to ensure patency of the line as dactinomycin is a strong vesicant. The dactinomycin should be followed by at least another 5 ml flush. Preferably, it can be given through the IV line with IV fluid running wide open. In the event of extravasation, infuse as much fluid as possible subcutaneously to dilute the dactinomycin and limit its toxic effects. Protect from light. **\*\*VESICANT\*\***

### **DOXORUBICIN**

**Formulation and Stability:** Available as red-orange lyophilized powder for injection in 10 mg, 20 mg, 50 mg, 150 mg vials and a 2 mg/mL solution in 10 mg, 20 mg, 50 mg, 75 mg, 200 mg vials.

Aqueous Solution: Store *refrigerated*. *Protect from light*. Retain in carton until contents used.

Powder for Injection: Store unconstituted vial at room temperature. Retain in carton until contents are used.

Reconstitute with preservative-free sterile water (*PMH package instructions differ from COG recs of NS*) to a final concentration of **2mg/mL**. After adding the diluent, the vial should be shaken and the contents allowed to dissolve. The reconstituted solution is stable for 7 days at room temperature under normal room light and 15 days under refrigeration 2°-8°C (*PMH package instructions indicate 24 hours at room temperature and 48 hours at 2°-8°C*) *Protect from exposure to sunlight*. Doxorubicin may be further diluted in 0.9% NaCl or dextrose containing solutions and administered by infusion.

**IV Infusion:** Administer IV through the tubing of rapidly infusing solution of D5W or 0.9% NaCl into a large vein. Avoid extravasation. **If pushing directly into IV, flush first with 5 ml of NS, then infuse DOXO SLOWLY over 5 minutes minimum. Repeat flush with another 5 ml NS.** Preferably, it can be given through the IV line with IV fluid running wide open.

**Selected drug interactions:** DOXOrubicin is a major substrate for CYP2D6 and CYP3A4 and an inhibitor of CYP2B6 (moderate), CYP2D6 (weak) and CYP3A4 (weak). Patients on CYP2D6 and CYP3A4 inhibitors, on CYP2B6 substrates and on CYP3A4 inducers should be monitored closely for toxicity or reduced efficacy.

**Practical Tips:** Forms typically available at PMH include 50mg powder, 50mg/25 ml and 10mg/5 ml solutions. Typically reconstituted with normal saline depending on fluid availability. Check the package insert for the 50 mg powder to determine appropriate storage time and discard accordingly. To avoid painful infusion and to lessen the risk of extravasation injury, doxorubicin is typically infused through the IV tubing with IV fluids running wide open. In the event of extravasation, infuse as much fluid as possible subcutaneously to dilute the doxorubicin and limit its toxic effects. **\*\*VESICANT\*\***

### **ETOPOSIDE**

**Formulation and Stability:** Available in sterile multiple dose vials. Store at room temperature.

**IV Infusion:** Dilute Etoposide to a final concentration <0.4 mg/mL in Dextrose or Normal Saline containing IV solutions. Etoposide infusions are stable at room temperature for 96 hours when diluted to concentrations of 0.2mg/ml; stability is 24 hours at room temperature with concentrations of 0.4mg/mL. **The time to precipitation is highly unpredictable at concentrations > 0.4mg/mL.**

**IV standard dose (≤ 200 mg/m<sup>2</sup>):** Infuse diluted solution (concentration ≤ 0.4 mg/mL) over at least 60-120 minutes; slow rate of administration if hypotension occurs. Rate should not exceed 300 mg/m<sup>2</sup>/hour (10 mg/kg/hour). The use of an in-line filter during the infusion is suggested.

**IV intermediate and high dose:** Infuse as a maximum rate of 300 mg/m<sup>2</sup>/hour (10 mg/kg/hour). Fluid volumes may be prohibitive at 0.4 mg/mL concentration; an alternative dilution of 0.6 mg/mL (8 hour stability) may be used. For concentrations > 0.4 mg/mL, use an in-line filter during infusions secondary to precipitate formation risk.

**Do not administer etoposide by rapid intravenous injection.** To avoid leaching of DEHP from PVC bags and tubing, prepare the Etoposide solution as close as possible preferably within 4 hours to the time of administration.

**Suggested drug interactions:** Etoposide is a substrate for CYP1A2 (minor), CYP2E1 (minor) and CYP3A4 (major). It inhibits CYP2C9 (weak) and CYP3A4 (weak). Patients on CYP3A4 inducers or inhibitors should be monitored closely for toxicity or reduced efficacy.

**Practical Tips:** Typically available in 100mg/5ml vials. Etoposide can be diluted in a 200ml bag (Half Darrows, NS, D5 ¼ NS often available) up to 80mg per 200ml bag (0.4 mg/ml). A patient's dose can be divided into two 200ml bags to give the dose at the appropriate dilution. Usually ran over 60 minutes.

### **5-FLUOROURACIL**

**Formation and Stability:** Dilution not required for administration. May dilute in 50-1000 mL NS or D5W for infusion. When transferring the fluorouracil solution from a pharmacy bulk vial, the contents must be transferred within 4 hours after puncturing the vial. The vial should only be punctured 1 time. Additionally, the transferred drug solution should be administered within 4 hours. *Do not refrigerate or freeze. Protect from light.*

**IV push or short infusion:** Fluorouracil may be administered undiluted (50 mg/mL) or diluted by IV push or by short infusion over 3-15 minutes.

**IV continuous infusion:** The diluted solution can be infused over 24 hours or as multi-day continuous infusion. Practical tips: In the absence of IV pumps and large volume fluids, an option to consider for 24 hour infusion would be to split the dose into two 1 L bags/bottles and infuse at 85 ml/hr on the Diaflow.

### **METHOTREXATE**

**Formulation and stability:** Available as a lyophilized powder for injection in 20 mg and 1 g vials or as a 25 mg/mL solution in 2, 4, 8, 10, 20 and 40 mL. Sterile methotrexate powder or solution is stable at room temperature. *Protect from light.*

**IV Infusion (low dose (Capizzi) only, PMH unable to monitor excretion for ID/HD MTX):** Powder for injection: Dilute 1 g vial with 19.4 mL of non-preserved SWFI, Dextrose 5% in Water or 0.9% Sodium Chloride Injection for a **50 mg/mL** concentration. Dilute the 20 mg vial to a concentration  $\leq 25$  mg/mL with above diluents. The powder for injection may be further diluted in 0.9% sodium chloride or dextrose containing solutions to a concentration of  $< 25$  mg/mL for IV use. The 25 mg/mL solution may be further diluted in saline or dextrose containing solutions for IV use. **Do not use the preserved solution due to the risk of benzyl alcohol toxicity.** Methotrexate dilutions should be used within 24 hours and protected from light.

**IV push:** Undiluted: Inject over 2-5 minutes. Diluted: Infuse the diluted solution over 10-15 minutes.

**Intrathecal:** Use preservative free 25 mg/mL solution or 20 mg lyophilized powder for injection. For intrathecal administration, dilute with **5-10 mL** preservative free 0.9% Sodium Chloride Injection, lactated Ringer's or Elliot's B solution, or as per institutional standard of practice. The volume of CSF removed should be equal to at least half the volume delivered.

**Selected drug interactions:** Avoid NSAIDs, TMP/SMX, penicillins, probenecid, IV contrast media, proton pump inhibitors, phenytoin, and fosphenytoin.

**Practical Tips:** PMH supplies 50mg/2ml solution kept at room temperature. For IT use, the dose is drawn into a 5 ml syringe and further diluted with NS to fill the syringe. For IV use, the dose is drawn into a 20 ml and further diluted with NS or other available fluid to fill the syringe. This is given as an IV push directly into the cannula or infused via the IV line with fluids running wide open.

Patient Age (years)	Methotrexate dose	Recommended volume	10% CSF volume	CSF Volume*
1-1.99	8 mg	5-10 mL	5 mL	50 + 10 mL (babies)
2-2.99	10 mg	5-10 mL	8 mL	80 + 20 mL (younger children)
3-8.99	12 mg	5-10 mL	10 mL	100 + 20 mL (older children)
9 or greater	15 mg	5-10 mL	13 mL	130 + 30 mL (adults)

## **PACLITAXEL**

**IV (Dose ≤ 90 mg/m<sup>2</sup>/dose):** Infuse over 1 or 3 hours using non-PVC containers and administration set. An inline 0.22 micron filter should be used during administration.

**IV (Dose > 90 mg/m<sup>2</sup>/dose):** Infuse over 3 hours using non-PVC containers and administration set. An inline 0.22 micron filter should be used during administration.

**Suggested premedications:** Premedicate patients with a corticosteroid 12 and 6 hours or 30-60 minutes before paclitaxel. Administer H1-receptor antagonist (eg, diphenhydramine, 1 mg/kg [max 50 mg]), and an H2-receptor antagonist 30-60 minutes prior to paclitaxel administration.

**Selected drug interactions:** Paclitaxel is a substrate for CYP3A4 (major) and CYP2C8 (major) and an inducer of CYP3A4 (weak). Patients on inducers of CYP3A4 and CYP2C8 agents should be monitored closely for reduced level/efficacy of paclitaxel. CYP3A4 and CYP2C8 inhibitors may increase paclitaxel toxicity.

**Practical Tips:** PMH provides 100mg/16.7ml (6mg/ml) in ethanol solution. This must be diluted to 0.3-1.2 mg/ml using NS, D5, DNS, or RL. After dilution, stable at room temperature for 27 hours. Premedicate with dexamethasone 12 hours and again 30 minutes before dose as well as antihistamines (ranitidine + promethazine/chlorpheneramine/diphenhydramine) 30 minutes before infusion. Infuse over 3 hours due to risk for anaphylaxis.

## **VINBLASTINE**

**Formulation and Stability:** Lyophilized powder, 10 mg per vial. *Refrigerate. Protect from light.* Unused portions of the remaining solutions made with normal saline that do not contain preservatives should be discarded immediately. Unused preservative-containing solutions made with normal saline may be stored in a refrigerator for future use for a maximum of 28 days.

**IV Infusion:** Reconstitute each vial with bacteriostatic NS, to a final concentration of 1 mg/ml. Stable for 9 days after reconstitution if refrigerated.

**IV push:** Administer the reconstituted solution (1 mg/mL) over 1 minute

**Selected drug interactions:** VinBLASTine is a substrate of CYP3A4 (major) and CYP2D6 (minor) and an inhibitor of CYP3A4 (weak) and CYP2D6 (weak). CYP3A4 inhibitors may increase the level/effects of vinBLASTine and CYP3A4 inducers may decrease the levels/effects of vinblastine.

## **VINCRISTINE**

**Formulation and Stability:** Available in vials containing one mg vincristine sulfate and sterile water for injection. Store *refrigerated. Protect from light* and retain in carton until time of use. Do not mix with any IV solutions other than those containing dextrose or saline. Per package insert, stable for 12 hours at room temperature.

**IV Infusion:** Injection of vincristine sulfate should be accomplished within 1 minute. Vincristine sulfate must be administered via an **intact, free-flowing intravenous needle or catheter**. Care should be taken to ensure that the needle or catheter is securely within the vein to avoid extravasation during administration. The solution may be injected either directly into a vein or into the tubing of a running intravenous infusion. **Fatal if given intrathecally.**

**Selected drug interactions:** VinCRISTine is a substrate of CYP3A4 (major) and an inhibitor of CYP3A4 (weak). CYP3A4 inhibitors may increase the level/effects of vinCRISTine.

**Practical Tips:** At PMH, given as an IV push over 1 minute following at least a 5 ml flush with NS or other available IV fluid to ensure patency of the line as vincristine is a strong vesicant. The vincristine should be followed by at least another 5 ml flush. Preferably, it can be given through the IV line with IV fluid running wide open. In the event of extravasation, infuse as much fluid as possible subcutaneously to dilute the vincristine and limit its toxic effects.

**\*\*VESICANT\*\***

Prepared using resources available through the Children's Oncology Group by:

*M Monica Gramatges, MD*

*Assistant Professor of Pediatrics, Cancer and Hematology Service*

*Texas Children's Hospital*

Updated (added dactinomycin and paclitaxel) and practical tips based on experience and availability at PMH by:

*Jeremy Slone, MD, MPH*

*Baylor College of Medicine/Texas Children's Cancer and Hematology Centers*

*Princess Marina Hospital*

Updated using resources available through the Children's Oncology Group and medication package inserts by:

*Rachel Beaty, PharmD*

*Clinical Pharmacy Specialist, Hematology*

*Department of Pharmacy*

*Texas Children's Hospital*

## Appendix L- Chemotherapy Plan (Inpatient PHO)

Princess Marina Hospital  
 Inpatient Paediatric Haematology & Oncology  
**CHEMOTHERAPY PLAN**

\*\*\*Place in patient's chart after *Drug Sheet* when patient is admitted.\*\*\*

Patient's Name: \_\_\_\_\_ DOB: \_\_\_\_\_

**Check at Admission:** Weight: \_\_\_\_\_ kg Height: \_\_\_\_\_ cm BSA: \_\_\_\_\_ m<sup>2</sup>

Diagnosis: \_\_\_\_\_ Protocol: \_\_\_\_\_

Cycle: \_\_\_\_\_ For Admission Week of: \_\_\_\_\_

**Admission Labs (To be Obtained Before Starting Therapy): !!!PLACE CANNULA AND LEAVE IT IN!!!!**

- |   |             |  |
|---|-------------|--|
| <input type="checkbox"/> FBC                  | Date: _____ | Results: WBC _____ Hgb _____ Hct _____ Platelets _____ ANC _____ |
| <input type="checkbox"/> Liver Function Test  | Date: _____ | Results: ALT _____ AST _____ Total bili _____ Direct bili _____  |
| <input type="checkbox"/> Phosphorous          | Date: _____ | Results: _____   |
| <input type="checkbox"/> Uric Acid            | Date: _____ | Results: _____   |
| <input type="checkbox"/> LDH                  | Date: _____ | Results: _____   |
| <input type="checkbox"/> Renal Function Test  | Date: _____ | Results: Na _____ K _____ Urea _____ Creatinine _____            |
| <input type="checkbox"/> Magnesium            | Date: _____ | Results: _____   |
| <input type="checkbox"/> Urinalysis           | Date: _____ | Results: _____   |
| <input type="checkbox"/> Urine pregnancy test | Date: _____ | Results: _____   |

**Requirements to Start Therapy:**

- |   |  |
|---|--|
| <input type="checkbox"/> ANC > 750 + Platelets >75      | <input type="checkbox"/> Total and Direct bilirubin within normal limits |
| <input type="checkbox"/> ANC >1000 + Platelets >100     | <input type="checkbox"/> Creatinine within normal limits                 |
| <input type="checkbox"/> No requirements to start cycle |  |

\*\*\*\*Does the patient meet criteria to initiate chemotherapy? (Circle one)      Yes / No / Not applicable

**Anti-emetics Review:**

- |  |                              |                                    |
|--|------------------------------|------------------------------------|
| <input type="checkbox"/> Dexamethasone _____ mg (6mg/m <sup>2</sup> /dose, max 10 mg) IV / PO daily/every 12 hours | <input type="checkbox"/> PRN | <input type="checkbox"/> Scheduled |
| <input type="checkbox"/> Granisetron (Kytril) _____ mg (10mcg/kg, max 1 mg) IV/PO daily/every 12 hours             | <input type="checkbox"/> PRN | <input type="checkbox"/> Scheduled |
| <input type="checkbox"/> Metoclopramide (Clopamon) _____ mg (0.1mg/kg, max 10mg) IV every 6/8 hours                | <input type="checkbox"/> PRN | <input type="checkbox"/> Scheduled |

Princess Marina Hospital  
Inpatient Paediatric Haematology & Oncology  
CHEMOTHERAPY PLAN

Promethazine (Phenergan) \_\_\_\_\_ mg (0.25-1mg/kg, max 25mg) IV/PO every 4/6/8 hours  PRN  Scheduled

---

**Intravenous Fluids (IV Fluids) Review:**

Pre-hydration is required for:

Cyclophosphamide

- If > 1000 mg/m<sup>2</sup> of cyclophosphamide is given, give MESNA \_\_\_\_\_ mg IV x 3 doses. Total daily MESNA dose equals 60% of the cyclophosphamide dose in 3 divided doses IV over 15 to 30 minutes. Initial bolus of MESNA may be administered 15 minutes before or at the same time as the cyclophosphamide; subsequent doses are given 4 and 8 hours after the start of cyclophosphamide

Cisplatin

Other \_\_\_\_\_

**Pre-Hydration**

DNS or NS\* @ \_\_\_\_\_ ml/hr (125ml/m<sup>2</sup>/hr) over \_\_\_\_\_ hours. Total volume \_\_\_\_\_ ml. Repeat for \_\_\_\_\_ days

**Post-Hydration**

DNS or NS\* @ \_\_\_\_\_ ml/hr (125ml/m<sup>2</sup>/hr) over \_\_\_\_\_ hours. Total volume \_\_\_\_\_ ml. Repeat for \_\_\_\_\_ days

\* Avoid fluids with potassium such as RL

Comments: \_\_\_\_\_

---

**Chemotherapy Review:**

6-Mercaptopurine \_\_\_\_\_ mg (\_\_\_\_ mg/m<sup>2</sup>) PO \_\_\_\_\_

Bleomycin \_\_\_\_\_ units (\_\_\_\_ units/m<sup>2</sup>) IV push over \_\_\_\_\_ minutes (infuse at a rate of 1 unit per minute) for \_\_\_\_\_ days. Repeat \_\_\_\_\_

Carboplatin \_\_\_\_\_ mg (\_\_\_\_ mg/m<sup>2</sup>) IV \_\_\_\_\_

Cisplatin\* \_\_\_\_\_ mg (\_\_\_\_ mg/m<sup>2</sup>) with \_\_\_\_\_ g of mannitol (10g/m<sup>2</sup>) in \_\_\_\_\_ ml of DNS or NS via IV infusion over \_\_\_\_\_ hrs for \_\_\_\_\_ days.

\* Please order the patient's magnesium supplement on the *Drug Sheet*

Cyclophosphamide \_\_\_\_\_ mg (\_\_\_\_ mg/m<sup>2</sup>) IV in a 200ml bag of D5/NS infused over 30-60 minutes for \_\_\_\_\_ days

Cytarabine \_\_\_\_\_ mg (\_\_\_\_ mg/m<sup>2</sup> or age based) IV/SQ/IT \_\_\_\_\_

Princess Marina Hospital  
Inpatient Paediatric Haematology & Oncology  
CHEMOTHERAPY PLAN

Dactinomycin \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or \_\_\_\_\_ mg/kg) IV \_\_\_\_\_

Dexamethasone\* \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or \_\_\_\_\_ mg/kg) PO/IV every \_\_\_\_\_ hours/days for \_\_\_\_\_ days

\* Please order Ranitidine \_\_\_\_\_ mg (5mg/kg/dose, max 150mg/dose) PO every 12 hours to be taken for GI prophylaxis

Doxorubicin \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or \_\_\_\_\_ mg/kg) IV push through a free flowing IV over 10-15 minutes; for \_\_\_\_\_ days. \*CAUTION: Strong Vesicant\*

Etoposide \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup>) IV diluted to a 0.2-0.4 mg/ml concentration infused over 30-60 minutes; for \_\_\_\_\_ days.

Hydrocortisone \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or age based) IT \_\_\_\_\_

Methotrexate \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or age based) IV/PO/IT every \_\_\_\_\_ days for \_\_\_\_\_ days

Paclitaxel \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup>) IV over \_\_\_\_\_ hours; \*See roadmap for pre-paclitaxel meds \*

Prednisone\* \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or \_\_\_\_\_ mg/kg) PO every day/ \_\_\_\_\_ hours for \_\_\_\_\_ days

\* Please order Ranitidine \_\_\_\_\_ mg (5mg/kg/dose, max 150mg/dose) PO every 12 hours to be taken for GI prophylaxis

Vincristine \_\_\_\_\_ mg ( \_\_\_\_\_ mg/m<sup>2</sup> or \_\_\_\_\_ mg/kg) IV push through a free flowing IV over 1-2 minutes for \_\_\_\_\_ days. *Maximum 2 mg for most regimens.* \*CAUTION: Strong Vesicant\*

Other: \_\_\_\_\_

---

Any sections regarding medications are **NOT** intended to be used as a physician order, but as an overview to the patient's care. Please refer to the *Drug Sheet* for medication orders and the patient's *Chemotherapy Roadmap* for further details on the treatment regimen. The admitting physician should write for the anti-emetics on the patients *Drug Sheet*.

**Doses given may be adjusted if the patient's BSA has increased by >10% since their last cycle.**

*This plan has been reviewed by the Paediatric Oncologist. Labs and anti-emetics should be ordered on admission. A cannula should be placed when the labs are drawn. Pre-hydration should be started at admission.*

Please call the Paediatric Oncologist with any questions. (Phone: 72259379)

\_\_\_\_\_  
Physician Signature

Date: \_\_\_\_\_

\_\_\_\_\_  
Print Name

## Appendix M - PMH Hematology-Oncology Formulary

# PMH Pediatric Hematology-Oncology Formulary

## Hematology

- Bioplasma FDP (Fresh Human Plasma)
- Cyclosporine (Neoral) 25mg or 100mg tablets<sup>\$</sup>
- DDAVP 0.1mcg/ml Nasal Spray<sup>\$</sup>
- Enoxaparin (Clexane) 40mg/ml and 60mg/ml pre-filled syringes (I generally trust the nurse to estimate half of the syringe and give 20mg doses to smaller children)
- Erythropoietin (Epoen)
- Factor IX 500 IU/box<sup>@</sup><sup>\$</sup>
- Factor VIII 500 IU/box<sup>@</sup>
- Ferrimed Injection (Iron polymaltose – each 2 mL equivalent to 100 mg elemental iron)<sup>\$</sup>
- NovoSeven (varying concentrations, typically 1mg)<sup>\$</sup>
- Streptokinase (Streptase) 1,500,000 units<sup>#</sup><sup>@</sup>
- Tranexamic Acid (Cyklokapron IV 500) 500mg tablets; 500 mg/ 5 ml ampule IV; 100mg vials
- Vitamin K (Konakion MM) – 2 mg/0.2 ml for oral/IM/IV injection
- Warfarin (Coumadin) 5mg tablets

## Chemotherapy

- 6-Mercaptopurine 50mg tablets
- 6-Thioguanine
- 5-Fluorouracil 500mg/10ml vials
- Bleomycin 15 units/5ml<sup>#</sup><sup>@</sup>
- Carboplatin 150mg/15ml, 450 mg/45ml
- Cisplatin 50mg/50ml, 10mg/10ml
- Cyclophosphamide 500 mg/25ml powder<sup>#</sup>
- Cyclophosphamide 50 mg coated tablets (50 tablets/bottle)
- Cytarabine (Cytosar) 100mg (contains benzyl alcohol, not suitable for IT)
- Dacarbazine
- Dactinomycin 0.5 mg/ml<sup>#</sup>
- Dexamethasone 0.5mg, 1mg and 2mg tablets, 4mg/ml
- Docetaxel
- Doxorubicin 10 mg<sup>@</sup> and 50 mg<sup>#</sup><sup>@</sup> (lasts 48 hours after reconstitution with refrigeration); 10mg/5ml and 50mg/25ml<sup>@</sup>

- Etoposide 100 mg/5 mL vials
- Gemcitabine
- Hydrocortisone sodium succinate, Primacort-100 100mg<sup>#</sup> (Per manufacturer, Mcleod, contains no benzyl alcohol)
- MESNA (Uromitexan) 400mg/ml [4ml vials]
- Methotrexate 2.5mg tablets
- Methotrexate 50mg/2ml IM, IV, IT
- Paclitaxel 100mg/16.7ml<sup>\$</sup>
- Prednisone 5mg tablets or 1 mg tablets
- Vincristine 1 mg/mL<sup>@</sup> [1ml vials]
- Vinblastine

## Supportive Care

- Aciclovir (Loviric 400 Tablets) 400 mg tablets
- Albendazole (Zestaval 200) 200 mg tablets
- Allopurinol (100 mg tablets)
- Amitriptyline 10mg or 25mg coated tablet
- Amikacin sulphate (Selemycin) 500 mg/2 ml IV/IM
- Ampicillin Fresenius 250 mg
- Amphotericin
- Benzylpenicillin Injection BP 5 Mega
- Biscodyl 5 mg tabs
- Cefotaxime 1 g IM/IV
- Ceftriaxone
- Clindamycin 600 mg/4 ml ampules
- Cloxacillin
- Ciprofloxacin Injection 200 mg/100 ml
- Codiene 30mg tablets
- Enoxaparin sodium 60 mg/0.6 ml injection
- Filgratim (Neupogen, G-CSF) 300mcg/ml<sup>@</sup> [1ml vials]
- Fluconazole tablets and IV
- Furosemide 40 mg tablets
- Gabapentin 300mg capsules
- Ganciclovir (Cymevene) 500mg IV vials
- Gentamycin 80 mg/2 ml (Ampules)
- Granisetron (Kytril) 1mg tablets, 3 mg/3 ml or 4mg/4ml ampules<sup>\$</sup>

## PMH Pediatric Hematology-Oncology Formulary

---

- Heparin 1000 IU/ml [5ml vials] in code cart, mix 1 ml heparin with 9ml NS for port flushes
- Heparin 5000 IU/ml [1ml ampules]
- Klean-Prep (Polyethylene Glycol 3350 + electrolytes) – follow sachet directions<sup>\$</sup>
- Magnesium trisicillate/aluminum hydroxate/peppermint oil (only oral magnesium supplement)\*Antacid\*
- Magnesium sulphate injection 50% w/v (solution for IM, concentrate for IV) – 1g / 2 ml
- Meropenem (Ronem) 1000 mg IV Single dose vial – IV only
- Methylprednisolone (Solu-Medrol) 1000 mg/16 ml vial
- Metocolopramide (Clopamon) 10mg/2ml vials
- Metronidazole IV infusion – 500 mg/100 ml IV only
- Mineral Oil (Liquid Paraffin)
- Morphine Immediate Release Liquid 15mg/5ml
- Morphine MST Continuous (Prolonged release) 10 mg, 30 mg tablets
- Morphine (Fresenius PF) 15 mg/1 ml injection – 1 ml ampules
- Mupircoin ointment
- Omeprazole B.P. Capsules – 20 mg
- Phosphate Enema
- Piperacillin-tazobactam
- Promethazine (Phenergan) 25mg tablets and 25mg/1 ml or 50mg/2ml ampules
- Vancomycin (Vancocin CP powder) 500 mg/10 ml

@ Requires refrigeration on the Paediatric Surgical Ward (2-8 C)

# Requires reconstitution

\$ Special order form required

Appendix N -PMH PHO Daily Rounding Note



# Botswana Paediatric Haematology & Oncology

## Daily Rounding Note

**Date:** \_\_\_\_\_ **Hospital Admission Day:** \_\_\_\_\_ **Patient Name** \_\_\_\_\_

**Primary Diagnosis:**  Cancer (Type) \_\_\_\_\_  Haemophilia A / B  Other \_\_\_\_\_

**Reason for Admission:**  Scheduled Chemotherapy  New Diagnosis - Cancer  
 Fever & Neutropenia  Haemophilia / Acute Bleeding  
 Other \_\_\_\_\_

**Events in last 24 hours:** \_\_\_\_\_

**Maximum Temperature** \_\_\_\_\_ °C / **Time** \_\_\_\_\_ **Current Vitals:** T \_\_\_\_\_ °C **HR** \_\_\_\_\_ bpm **BP** \_\_\_\_\_ / \_\_\_\_\_

**RR** \_\_\_\_\_ /min **O<sub>2</sub> sat** \_\_\_\_\_ % **Actual Fluid Intake in last 24 hours** \_\_\_\_\_ ML

**Expected Fluid Intake in last 24 hours** \_\_\_\_\_ ML **Percentage of expected fluid given** (Actual ÷ Expected x 100) \_\_\_\_\_ %

**PHYSICAL EXAM**

General \_\_\_\_\_  
 HEENT \_\_\_\_\_  
 CVR \_\_\_\_\_  
 RESP \_\_\_\_\_  
 ABD \_\_\_\_\_  
 EXT \_\_\_\_\_  
 DERM \_\_\_\_\_  
 NEURO \_\_\_\_\_

**LAB RESULTS**

WBC \_\_\_\_\_ HGB \_\_\_\_\_  
 MCV \_\_\_\_\_ PLT \_\_\_\_\_  
 ANC \_\_\_\_\_  
 LDH \_\_\_\_\_ Uric acid \_\_\_\_\_  
 Mg \_\_\_\_\_ Na \_\_\_\_\_  
 K \_\_\_\_\_ Cl \_\_\_\_\_  
 Urea \_\_\_\_\_ Creatinine \_\_\_\_\_  
 ALT \_\_\_\_\_ AST \_\_\_\_\_  
 Alb \_\_\_\_\_ TB \_\_\_\_\_  
 DB \_\_\_\_\_ Other \_\_\_\_\_

**ASSESSMENT**

\_\_\_\_\_ year old Male / Female with \_\_\_\_\_  
 Admitted for \_\_\_\_\_  
 Other assessments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**PLAN**

Review *Chemotherapy Plan* in front of chart  Changes to *Chemotherapy Plan* \_\_\_\_\_

**Antibiotics:**

- |                             |                             |
|-----------------------------|-----------------------------|
| 1. _____ Day _____ of _____ | 3. _____ Day _____ of _____ |
| 2. _____ Day _____ of _____ | 4. _____ Day _____ of _____ |

**Hydration:** \_\_\_\_\_ (fluid type) at \_\_\_\_\_ ml/hr for \_\_\_\_\_ hours (excludes Chemo plan fluids)

**Labs to obtain today:**

- |                              |                                      |  |
|------------------------------|--------------------------------------|--|
| <input type="checkbox"/> FBC | <input type="checkbox"/> Uric Acid   | <input type="checkbox"/> Magnesium     |
| <input type="checkbox"/> RFT | <input type="checkbox"/> LDH         | <input type="checkbox"/> Blood Culture |
| <input type="checkbox"/> LFT | <input type="checkbox"/> Phosphorous | <input type="checkbox"/> _____         |

**Imaging:**

- \_\_\_\_\_ of \_\_\_\_\_  
 \_\_\_\_\_ of \_\_\_\_\_

**Other Plans:**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Resident/Medical Officer Name/Signature:**

\_\_\_\_\_

**Attending Signature:**

**Print Name:**

**Phone: 72259379 / Speed Dial 548**

**Phone Number:** \_\_\_\_\_

## Appendix O -Ferrimed Iron Injection Protocol



## **Ferrimed (iron polymaltose) Injection Protocol**

*For Children with Iron Deficiency Anemia*

**Medication:** *Iron Polymaltose (Ferrimed)* – 2 ml ampule contains 100 mg elemental iron

### **Pre-medication:**

- Place cannula and administer *methylprednisolone (Solumedrol)* 2mg/kg IV once, to be given 30 minutes prior to test dose. Leave cannula for emergency access in case of anaphylaxis.
- Also consider giving pre-medication with *Paracetamol* 15 mg/kg oral once.
- Apply EMLA to Ferrimed injection site 20-30 minutes before test dose is to be given.
- Gather emergency medications:
  - Hydrocortisone - Give 2 mg/kg IV once PRN for anaphylaxis
  - Epinephrine (adrenaline) 0.1mg/ml [1:10,000] – Give 0.01mg/kg IV once PRN for anaphylaxis
  - Salbutamol 2mg/5ml aerosolized – Give in the event of wheezing
  - Promethazine 25 mg/ml – Give 1 mg/kg (max 25 mg) IV once PRN for anaphylaxis

### **Test Dose for First Treatment:**

There is a rare risk of anaphylaxis. Give test dose first & monitor for:

- ✓ Urticaria
- ✓ Edema of the tongue or throat

Observe for a minimum of 30 minutes post-administration of test dose. If no adverse reaction occurs within the 30 minute waiting period, the remaining portion of treatment dose may be given.

- Test Dosage:** Administer half of the daily dose in children (i.e. for a child of 25 kg, give ½ ampule or 1 ml or 50 mg iron).

### **Treatment Dose:**

*Not recommended for infants less than 4 months old due to lack of evidence.*

- ♦ Children up to 5 kg: ¼ ampule or 0.5 ml or 25 mg iron polymaltose
- ♦ Children 5 kg – 10 kg: ½ ampule or 1 ml or 50 mg iron polymaltose
- ♦ Children 10 kg – 45 kg: 1 ampule or 2 ml or 100 mg iron polymaltose
- ♦ Adults > 45 kg: 2 ampules or 4 ml or 200 mg iron polymaltose

### **Instructions:**

- Inject Ferrimed with a 50-75 mm (5-6 cm) length, 19 or 20 gauge needle.
- Place injection into upper outer quadrant of buttocks using “Z-technique” (push the skin down approximately 2 cm over the injection site before inserting the needle). See Ferrimed package insert for illustration.

### **After Effects:**

Possible side effects of Ferrimed administration:

- ✓ Gastrointestinal upset – Nausea, Vomiting
- ✓ Musculoskeletal – Joint pains
- ✓ General – Headache, dizziness, fever, tachycardia, injection site pain, or long-lasting skin discoloration at the injection site
- ✓ Call us at **72259379** if you have any questions or concerns.



**Ferrimed (iron polymaltose) Injection Clinic Note**

Date of Visit \_\_\_\_\_

Patient's Name: \_\_\_\_\_

DOB: \_\_\_\_\_

Weight: \_\_\_\_\_ kg

**Vital Signs:** T \_\_\_\_\_ BP \_\_\_\_\_ HR \_\_\_\_\_ O<sub>2</sub> sat \_\_\_\_\_ RR \_\_\_\_\_

**Pre-medication Checklist:**

- Place cannula – **Location:** \_\_\_\_\_
- Administer *methylprednisolone (Solumedrol)* 2mg/kg IV – **Patient Dose:** \_\_\_\_\_ **Time:** \_\_\_\_\_
- Give *Paracetamol* 15 mg/kg oral – **Patient Dose:** \_\_\_\_\_ **Time:** \_\_\_\_\_
- Apply EMLA to Ferrimed injection site 20-30 min. before injection – **Location:** \_\_\_\_\_
- Gather & calculate emergency medications & check if given:
  - Hydrocortisone - Give 2 mg/kg IV once PRN for anaphylaxis – **Patient Dose:** \_\_\_\_\_
  - Epinephrine (adrenaline) 0.1mg/ml [1:10,000] – Give 0.01mg/kg IV once PRN for anaphylaxis – **Patient Dose:** \_\_\_\_\_
  - Salbutamol 2mg/5ml aerosolized – Give in the event of wheezing
  - Promethazine 25 mg/ml – Give 1 mg/kg (max 25 mg) IV once PRN for anaphylaxis –
    - **Patient Dose:** \_\_\_\_\_

**Test Dose:** (Only needed for first visit. If patient has received without reaction in the past, then proceed to treatment dose.)

- Iron Polymaltose (Ferrimed) ( 1/2 of treatment dose)** **Patient Test Dose:** \_\_\_\_\_  
**Time:** \_\_\_\_\_

Observation: \_\_\_\_\_

**Treatment Dose:**

- **Iron Polymaltose (Ferrimed) – Patient Dose:** \_\_\_\_\_ **Location:** \_\_\_\_\_  
**Time:** \_\_\_\_\_

Documentation of After Effects:

\_\_\_\_\_

\_\_\_\_\_

**Return Visit:**

\_\_\_\_\_

Physician Signature

Date

Print Name