
Oncology Hematology Emergencies

1. Tumor Lysis Syndrome

Background:

- Tumor lysis syndrome is caused by massive tumor cell lysis with release of large amounts of potassium, phosphate, and nucleic acids into the systemic circulation. Catabolism of the nucleic acids to uric acid leads to hyperuricemia, increased uric acid excretion and renal dysfunction.
- Most commonly occurs after initiation of cytotoxic therapy in patients with high-grade lymphomas and acute lymphoblastic leukemia, but may occur spontaneously.

Signs and Symptoms:

- Nausea, vomiting, diarrhea, anorexia, lethargy, hematuria, oliguria, cardiac dysfunction, dysrhythmias, seizures, syncope.

Evaluation:

- Physical exam: General appearance, vital signs, complete exam.
- Labs: CBC with manual differential, serum electrolytes, magnesium, phosphate, LFTs, LDH, uric acid.

Management:

- Consult Pediatric Oncology.
- IVF and electrolyte management:
 - D5 0.9% NS (NO potassium) at 1.5x maintenance rate (max 150 mL/hr) to optimize renal perfusion.
 - For metabolic acidosis: Sodium bicarbonate (1 mEq/kg/dose) slow IV push once.
 - For volume overload: Consider furosemide (0.5 mg/kg/dose; max 20 mg/dose) IV once.
 - For hyperkalemia: See Hyperkalemia section in Renal/Electrolyte Emergencies.
 - For hyperuricemia: Rasburicase (0.2 mg/kg/dose) IV once over 30 minutes.

2. Fever and Neutropenia

Background:

- A single oral temperature of $>38.5^{\circ}\text{C}$ (101.3°F) and an absolute neutrophil count (ANC) <500 cells/microL.
- A temperature of $>38.0^{\circ}\text{C}$ (100.4°F) on two separate occasions at least 30 minutes apart within a 12 hour period and an absolute neutrophil count (ANC) <500 cells/microL.
- Patients with cancer have decreased mucosal integrity impaired immune function and are at increased risk for invasive bacterial and fungal infections.

Signs and Symptoms:

- Fever may or may not be present, shivering, excessive sweating, cool or warm extremities, lethargy, change in behavior, nausea, vomiting, oliguria, respiratory distress, redness or swelling near central line site, chills with central line use.

Evaluation:

- Do NOT obtain rectal temperatures.
- Physical exam: General appearance, vital signs, complete exam including skin, oropharynx, and perianal area.
- Labs: CBC with differential, blood culture (peripheral and central if CVL present), serum electrolytes.
- CXR and urinalysis and urine culture (avoid urethral catheterization) if symptomatic.

Management:

- Consult Pediatric Oncology.
- Antibiotics: See Sepsis and Septic Shock section (immunocompromised) in Infectious Emergencies.
 - *Antibiotics must be administered within 60 minutes of presentation.

3. Anterior Mediastinal Mass

Background:

- Non-Hodgkin lymphoma (NHL) is the fifth most common pediatric cancer with approximately 800 new cases diagnosed annually.
- Patients with NHL may present with acute airway obstruction and/or compression of the heart or intrathoracic great vessels.
- Other oncologic anterior mediastinal masses: Teratoma, thyroid tumor, thymoma, and T-cell ALL.

Signs and Symptoms:

- Respiratory distress, wheezing, stridor, facial edema, orthopnea, dysphagia, anxiety.

Evaluation:

- Physical exam: General appearance, vital signs, cardiopulmonary status.
- Labs: CBC with manual differential, serum electrolytes, magnesium, phosphate, uric acid, LDH.
- Imaging: CXR (PA and lateral).

Management:

- Consult Anesthesia to assist in airway evaluation and management.
- Consult Pediatric Oncology and Pediatric Critical Care.
- Supplemental oxygen, elevate head of the bed, maintain calm environment.
- Avoid sedating medications as these may lower airway tone and result in cardiopulmonary collapse.

4. Sickle Cell Disease: Vasoocclusive Crisis

Background:

- Sickle cell disease is an autosomal recessive disease that results in the production of a defective form of hemoglobin, hemoglobin S (HbS), which polymerizes and leads to irreversible red blood cell membrane damage.
- Sickled red blood cells obstruct the microcirculation and results in endothelial damage, intravascular inflammation, and tissue hypoxia.
- Vasoocclusive events can occur in every organ system.
- Factors which precipitate vasoocclusive events include cold weather, hypoxia, infection, dehydration, acidosis, and stress.

Signs and Symptoms:

- Dactylitis is the most common symptom early in life and results in acute pain in the hands or feet.
- Splenic sequestration results in abdominal pain and may cause an acute, life-threatening, decrease in circulating red blood cells.
- Priapism results in a persistent painful erection.
- Acute chest syndrome results in respiratory distress.
- Stroke results in focal neurologic findings, altered mental status or seizures.

Evaluation:

- Physical exam: General appearance, hydration status, vital signs, cardiopulmonary exam, abdominal and neurologic exam, bone/joint evaluation, genital exam.
- Labs: CBC with differential, reticulocyte count, LFTs, serum electrolytes, blood culture, type and cross.
- Imaging:
 - Abdominal pain: KUB and consider abdominal US.
 - Acute respiratory distress: CXR.
 - Altered mental status: head CT, MRI with diffusion weighted imaging.

Management:

- Consult Pediatric Hematology.
- 0.9% NS bolus (20 mL/kg), then D5 0.45% NS at 1.5x maintenance rate.
- Supplemental oxygen to maintain oxygen saturations >92%.
- For wheezing: See Status Asthmaticus section in Respiratory Distress.
- For altered mental status or seizure: See Neurologic Emergencies.
 - Consult Pediatric Neurology and Pediatric Critical Care.
- Antibiotics: See Pneumonia section (complicated PMHx) in Respiratory Distress.
 - *Antibiotics must be administered within 60 minutes of presentation.
- Pain control:
 - Mild to moderate pain: Ibuprofen (10 mg/kg/dose; max 400 mg/dose) PO once OR Ketorolac (0.5 mg/kg/dose; max 15 mg/dose) IV once.
 - Moderate to severe pain: Morphine (0.05 mg/kg/dose; max 2 mg/dose) IV once; may repeat once if pain persists. Exercise caution as morphine may depress respiratory drive.

5. Anemia

Background:

- The lower limit of normal hemoglobin values gradually increases during childhood, from 10 g/dL in infancy to 13 g/dL in adolescents.
- Physiologic classification of anemia is based on reticulocyte count:
 - Inadequate RBC production: Low reticulocyte count.
 - Increased RBC destruction or losses: High reticulocyte count.
 - Reticulocyte count will not be elevated in the setting of acute RBC losses.
- Morphologic classification of anemia is based on mean corpuscular volume (MCV).
- Severe anemia (hemoglobin <5 g/dL) may result in high-output cardiac failure.

Signs and Symptoms:

- Lethargy, irritability, tachycardia, pallor, bleeding, dark urine, jaundice, lightheadedness, exercise or activity intolerance.
- Respiratory symptoms may indicate cardiac failure.

Evaluation:

- Detailed history of symptoms, family history, diet, medications, urine and stool color, travel.
- Physical exam: General appearance, vital signs, eyes (conjunctival palor), skin (jaundice), cardiac exam (tachycardia, pulses, gallop), pulmonary exam (crackles in cardiac failure), abdominal exam (hepatomegaly in cardiac failure, splenomegaly in hemolytic anemia).
- Labs: CBC, reticulocyte count, direct and indirect bilirubin, Coombs test, LDH, haptoglobin, peripheral blood smear.
- Obtain CXR (cardiomegaly) in patients with respiratory symptoms or signs of cardiac dysfunction.

Management:

- For severe anemia:
 - Supplemental oxygen to optimize oxygen delivery.
 - Acute GI bleeding:
 - Consult Pediatric GI and Pediatric Critical Care.
 - Consider pRBC transfusion (10-15 mL/kg over 2 hours).
 - Consider pantoprazole infusion (0.1 mg/kg/hr).
 - Chronic anemia:
 - Consult Pediatric Hematology and Pediatric Critical Care.
 - Avoid aggressive fluid resuscitation (may precipitate cardiac failure).
 - Consider pRBC transfusion (5 mL/kg IV over 4 hours) for patients with impaired hemodynamics.