Clinician Guide for Complete Blood Counts with and without Differential Results

This guide is to aid clinicians on the interpretation of nonspecific hematologic abnormalities that are typically due to an increase or decrease in certain parameters, such as MCV (mean corpuscular volume), MCH (mean hemoglobin concentration), and an increase or decrease in cell lines.

Microcytic (low MCV) hypochromic (low MCH) anemia:

- Common causes:
  - Iron deficiency anemia
    - Iron studies recommended to differentiate from anemia of chronic disease
  - Anemia of chronic disease
  - Thalassemia minor
    - Usually marked by a high RBC count, low MCV, and normal hemoglobin.
    - Needs to be differentiated from polycythemia vera (see Erythrocytosis section).
- Other rare causes:
  - Lead poisoning – clinical correlation is very important
  - Hemoglobinopathy (Hemoglobin C disease and trait and hemoglobin E) – hemoglobin electrophoresis is needed to aid in diagnosis

Normocytic (normal MCV) and normochromic (normal MCH) anemia:

- Due to the variety of different causes, diagnosis is based on clinical picture as well as other testing such as iron studies, reticulocyte count, and renal function tests.
- Potential causes:
  - Iron deficiency
  - Chronic disease
  - Renal insufficiency
  - Blood loss
  - Hemolysis

Macrocytic (high MCV) anemia:

- B12 deficiency is the most common cause of macrocytic anemia
- Other causes
  - Drug effect
  - Folate deficiency
  - Hypothyroidism
  - Excessive alcohol consumption
  - Congenital disorders (rare)
  - Myelodysplastic syndrome (rare)

Thrombocytosis:

- Most common causes are reactive and typically related to infection or inflammatory state.
  - Post surgical states
  - Post splenectomy
  - Iron deficiency anemia
- Platelet counts not due to reactive causes and consistently above 450 x 10^3/µL may be due to a chronic myeloproliferative disorder

Thrombocytopenia:

- Can occur due to a variety of mechanisms
    - Decreased production of platelets causes
        - Congenital thrombocytopenia (rare) – can be associated with May-Hegglin anomaly, Bernard-Soulier syndrome and others.
        - Acquired thrombocytopenia
        - Drug effect
    - Increased destruction of platelets causes
        - Auto-immune disorders
        - Drug induced immune thrombocytopenia
        - After a viral infection such as infectious mononucleosis (rare)
    - Blood Loss

Platelet Aggregates:

- Often a preanalytical issue (occurs most frequently with capillary specimens)– sample needs to be redrawn and mixed adequately immediately after collection
- If platelet aggregates repeatedly occur it may be beneficial to have the sample collected and run in one location if possible. This will allow for the sample to be run right after being drawn to hopefully minimize platelet aggregation.

Blood parasites:

- A CBC may or may not detect blood parasites, the best option would be to order a Blood Parasite Smear Review and/or PCR if appropriate.

Erythrocytosis:

- Common causes include chronic hypoxia or reaction to certain drugs.
- Polycythemia vera should be considered if erythrocytosis is persistent and without cause. Testing for serum erythropoietin level and JAK2 may be indicated.

Neutrophilia:

- Common causes are reactive and include both acute and chronic infectious and inflammatory states.
- More rare causes are diverse and include heat stress, metabolic disorders, endocrine disorders, tissue hypoxia/damage and occult malignancy.

Neutropenia:

- Common causes include vial infections and some bacterial infections. Some drugs can also cause neutropenia.
- Some other rare causes include alcoholism and endocrine disorders

Monocytosis:

- Common causes include chronic infections, autoimmune conditions and reaction to some medications.
- Can also be seen following a splenectomy or with acute infections
- Persistent monocytosis (>1 x 10^3/µL) may be caused by chronic myeloproliferative disorder, especially in older patients.

Eosinophilia:

- Common causes include parasitic infection, allergies, autoimmune disease, and drug effect.
- Persistent moderately or severely elevated eosinophilia without other cause may be due to a chronic myeloproliferative disorder.

Lymphocytosis:

- Common causes include viral infections and some bacterial infections.
- Some benign causes of eosinophilia include cigarette smoking, splenectomy, or Addison's disease
- Persistent, without cause, and above 5.0 x 10^3/µL may indicate a chronic lymphoproliferative disorder and flow cytometric testing may be indicated.

Lymphocytopenia:

- Common causes include viral infections, autoimmune diseases, immunodeficiencies, splenomegaly, and corticosteroids.

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