Summary of Abnormal CBCs

Anemia is defined as reduction of RBC volume or Hemoglobin concentration below the lower limit of normal for age and sex.

- In general 6 months old-puberty Hgb < 11 g/dL is abnormal.

Differential diagnosis:
Anemia can be classified based on RBC morphology: microcytic, normocytic, macrocytic

Microcytic	**Normocytic**	**Macrocytic**
Iron Deficiency Anemia Acute/Chronic Inflammation* Thalassemias Sideroblastic	**Low Retic (Inadequate production)** Diamond-Blackfan** Transient Erythroblastopenia of Childhood Infection Infiltration Medications Aplastic	**Megaloblastic** Folate Deficiency Vitamin B12 Deficiency Methylcobalamin defects Hereditary Orotic Aciduria Medications
	Nl/High Retic (Increased destruction) **Coombs Negative:** Acute blood loss Microangiopathic Hemolytic anemia Membrane Defects Hemoglobinopathies Enzyme defects **Coombs Positive:** Iso-immune Auto-immune	**Non-megaloblastic** Fanconi's anemia Liver disease Hypothyroidism Myelodysplasia Dyserythropoetic anemia Down Syndrome

Studies or calculations to consider:

- Reticulocyte Index = (Measured Hct/Expected Hct) * Retic % /Maturation Factor. If bone marrow is responding adequately to anemia, RI should be >2.
- Mentzer Index = MCV/RBC. Typically >13 is consistent with iron deficiency anemia, < 13 consistent with thalassemia.
- Iron studies: often not necessary if the history, physical and CBC are highly consistent with iron deficiency anemia. Iron studies should be considered if the history, physical and/or laboratory findings are conflicting.

The following results are typically encountered in iron deficiency anemia:

- Ferritin is low
- Total Iron Binding Capacity (TIBC) is high
- Iron level is low
- Iron Saturation is low
- Free erythrocyte protoporphyrin level is high

Further studies will depend on the specific situation.

Treatment:

- Symptomatic anemia (tachycardia, mental status change, shortness of breath, congestive heart failure): transfusion of PRBCs should be considered. PRBCs must be transfused very slowly when the anemia is chronic to avoid fluid overload.
- Less acute situations: give 6mg/kg/day of elemental oral ferrous sulfate for 2-3 months

Thrombocytopenia

- Platelet count < 150,000 per microliter
- Can present with mucocutaneous bleeding, bruising and petechiae
- Risk of intracranial hemorrhage is low when platelet count is above 20,000

Differential diagnosis:
Can be categorized into decreased production, sequestration, increased destruction

Decreased Platelet Production	**Increased platelet Destruction**	
Infiltrative Bone Marrow Diseases Inherited/Acquired bone marrow failure syndromes Congenital thrombocytopenias: TAR Syndrome Wiskott-Aldrich Syndrome Amegakaryocytic thrombocytopenia MYH9-related (i.e.May-Hegglin) Bernard-Soulier (also abnl platelet function) Cyanotic heart disease	**Immune Mediated** Idiopathic Thrombocytopenic Purpura (ITP) Evan's Syndrome (anemia and thrombocytopenia) Drug induced thrombocytopenia Infection Neonatal alloimmune thrombocytopenia Autoimmune disorders Post-transplant thrombocytopenia	**Non-Immune Mediated** Hemolytic Uremic Syndrome Thrombotic thrombocytopenic purpura Disseminated intravascular coagulation Kasabach-Merritt Syndrome Hypersplenism Hypothermia Mechanical destruction (prosthetic valve/indwelling device/HD/ECMO)