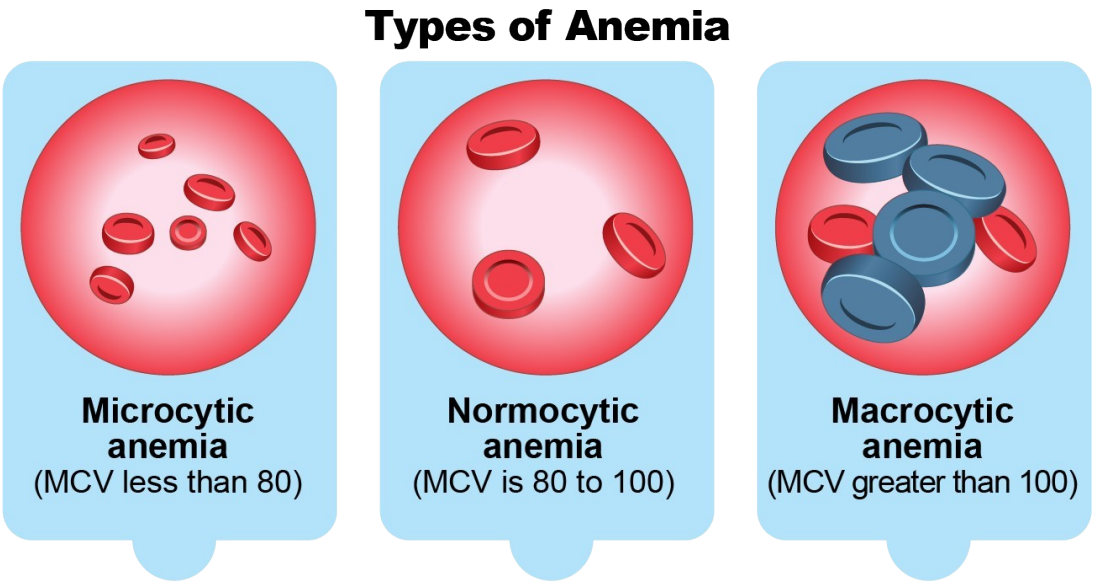
Introduction to Normocytic Anemias

Normocytic anemias are a group of blood disorders characterized by a norma l mean corpuscular volume (MCV). The most common types of normocytic an emias include anemia of chronic disease and hemolytic anemia.

This learning module focuses on the disease process of normocytic anemias and enables you to meet the following course outcomes:

- CO 1: Analyze pathophysiologic mechanisms associated with selected disease states across the lifespan.
- CO 2: Examine the way in which homeostatic, adaptive, and compensa tory physiological mechanisms can be supported and/or altered throug h specific therapeutic interventions across the lifespan.
- CO 3: Distinguish risk factors associated with selected disease states a cross the lifespan.
- CO 4: Integrate advanced pathophysiological concepts in the diagnosis and treatment of health problems in selected populations.



MCV = Mean Corpuscular Volume = size of red blood cell

Anemia of Chronic Disease Pathophysiology A nurse practitioner (NP) evaluates a 45-year-old client who presents with fatigue and weakness. The NP diagnoses the client with anemia of chronic disease. What is the primary pathophysiological mechanism causing this normocytic anemia? Excessive blood loss

Impaired iron absorption

Delayed maturation of erythrocyte precursors

Defective erythropoiesis

The primary pathophysiological mechanism underlying normocytic anemias such as anemia of chronic disease is defective erythropoiesis. Chronic inflammation affects the bone marrow, leading to impaired production of red blood cells despite adequate iron availability.

Impaired iron absorption is more relevant to microcytic anemias, where the size of red blood cells is reduced due to insufficient iron for hemoglobin synthesis. Excessive blood loss typically results in hypovolemic anemia and can lead to microcytic or normocytic anemia, depending on the rate of blood loss. However, normocytic anemias are not primarily characterized by excessive blood loss. Delayed maturation of erythrocyte precursors is a characteristic feature of macrocytic anemias, not normocytic anemias.

A nurse practitioner (NP) evaluates a 28-year-old client who presents with fatigue, jaundice, and dark-colored urine. The NP diagnoses the client with hemolytic anemia. What is the most likely pathophysiological mechanism causing this normocytic anemia?

Impaired iron absorption

Increased red blood cell

destruction Excessive blood loss

Defective erythropoiesis

Hemolytic anemia is characterized by the premature destruction of red blood cells, leading to the release of hemoglobin. The symptoms of fatigue, jaundice, and dark-colored urine are classic manifestations of hemolysis.

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Defective erythropoiesis involves abnormalities in the production of red blood cells. While it can contribute to certain types of anemias, hemolytic anemia is primarily characterized by the accelerated destruction of mature red blood cells.

Excessive blood loss, while a cause of anemia, typically leads to hypovolemic anemia rather than hemolytic anemia.

Risk for Hemolytic Anemia

Which client should the nurse practitioner (NP) recognize as most at risk for developing hemolytic anemia?

60-year-old with a history of iron-deficiency anemia

35-year-old who recently underwent surgery for a bleeding

ulcer 28-year-old with a family history of thalassemia

50-year-old who experienced a transfusion reaction after a blood transfusion

A client who experienced a transfusion reaction after a blood transfusion is at significant risk for developing hemolytic anemia. Transfusion reactions can involve the destruction of donor red blood cells, leading to hemolysis and associated symptoms such as fever, chills, and jaundice.

Iron-deficiency anemia is characterized by a lack of iron to produce hemoglobin. It does not inherently predispose individuals to hemolytic anemia.

Thalassemia is a genetic disorder affecting the production of hemoglobin but does not directly lead to hemolysis of red blood cells, a key feature of hemolytic anemia.

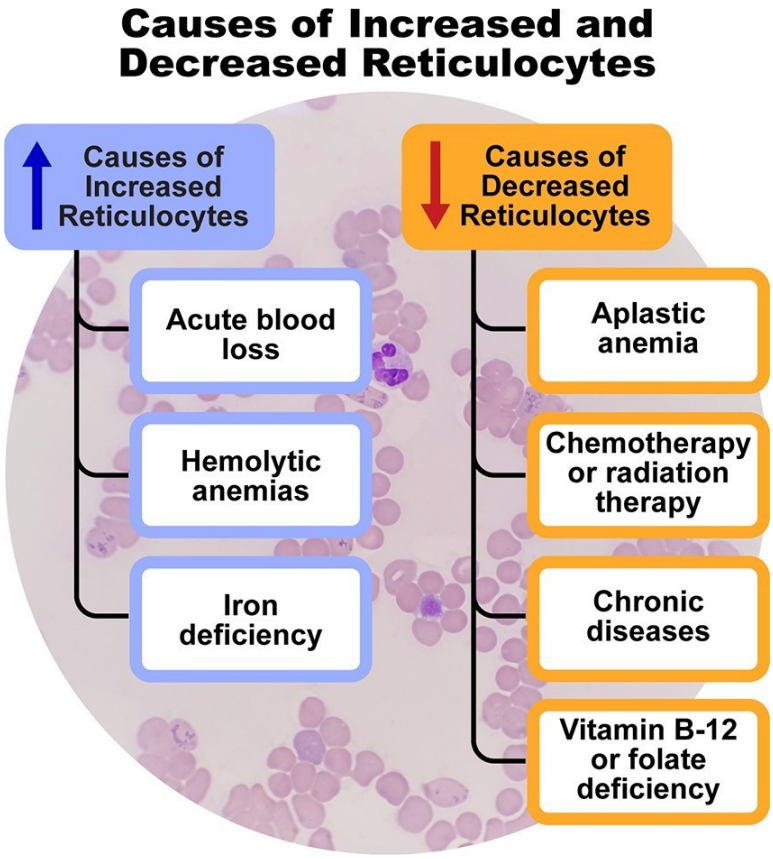
Excessive blood loss from surgery can lead to hypovolemic anemia but does not inherently cause hemolysis.

Pathophysiology of Normocytic Anemias

Normocytic anemias are characterized by the presence of normal-sized red blood cells. The red blood cells of normocytic anemias have a mean corpuscular volume (MCV) of 80-99 dL. When a client presents with normocytic anemia, a reticulocyte count should be performed to assess the number of immature red blood cells in the bone marrow.
Hemolytic anemia and anemia due to blood loss will cause elevated reticulocyte counts because the bone marrow is compensating for a loss.

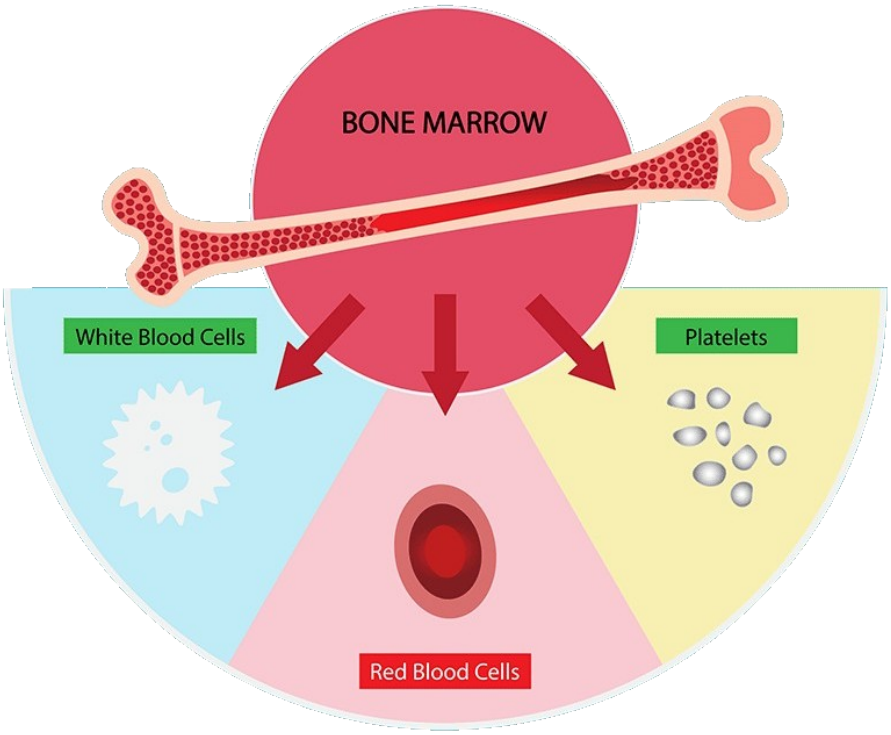
The pathophysiology of normocytic anemia can be attributed to various underlying causes, and it often involves disruptions in the production, maturation, or survival of red blood cells. Some common causes of normocytic anemias include chronic inflammatory diseases, chronic kidney disease, hemolytic anemias, chronic blood loss, endocrine

disorders, bone marrow disorders, nutritional deficiencies, and chronic hemoglobinopathies.



Pathophysiology of Anemia of Chronic Disease

Anemia of chronic disease is a mild to moderate anemia associated with chronic diseas e or inflammation. The condition results from a combination of factors including shorten ed lifespan of red blood cells, suppressed production of erythropoietin, inadequate bone marrow response to erythropoietin, and impaired iron metabolism and utilization.



Anemia of Chronic Disease Risk Factors

Risk factors for anemia of chronic disease include chronic inflammatory conditions, infections, cancer, autoimmune disorders, organ transplantation, congestive heart failure, age, and nutritional status. Click each section below to learn more about risk factors for anemia of chronic disease.

Chronic Inflammatory Conditions

Chronic inflammatory conditions such as rheumatoid arthritis, inflammatory bowel disease, and chronic kidney disease trigger inflammatory responses that can disrupt normal red blood cell production and iron metabolism.

Infections

Chronic or recurrent infections, including bacterial, viral, or parasitic infections, create a persistent inflammatory response that can affect the balance of iron in the body.

Cancer

Cancer-related inflammation and treatments like chemotherapy can impact red blood cell production.

Autoimmune Disorders

Autoimmune diseases such as rheumatoid arthritis, systemic lupus erythematosus, vasculitis, or sarcoidosis cause the immune system to mistakenly attack the body's own tissues, leading to chronic inflammation.

Organ Transplantation

Rejection after organ transplantation, as well as the use of immunosuppressive medications to prevent rejection, can contribute to chronic inflammation.

Congestive Heart Failure

The chronic inflammation associated with heart failure can impact erythropoiesis and iron metabolism

Age

Anemia of chronic disease is more commonly observed in older adults, possibly due to the higher prevalence of chronic diseases and inflammatory conditions in this population.

Nutritional Status

Poor nutritional status, particularly deficiencies in nutrients like iron, vitamin B-12, and folate, can exacerbate the risk of anemia in the context of chronic diseases.

Anemia of Chronic Disease Clinical Manifestations

Clinical manifestations of anemia of chronic disease may include fatigue, shortness of breath, pale skin, dizziness, or cognitive impairment. Symptoms of anemia of chronic disease typically develop after 1 to 2 months into the course of the disease and may overlap with those of the underlying chronic disease or inflammatory condition. Individuals may be asymptomatic initially but develop clinical manifestations if their hemoglobin level drops significantly. It is essential to recognize the interconnectedness between chronic disease and anemia of chronic disease to accurately diagnose and effectively treat these individuals.

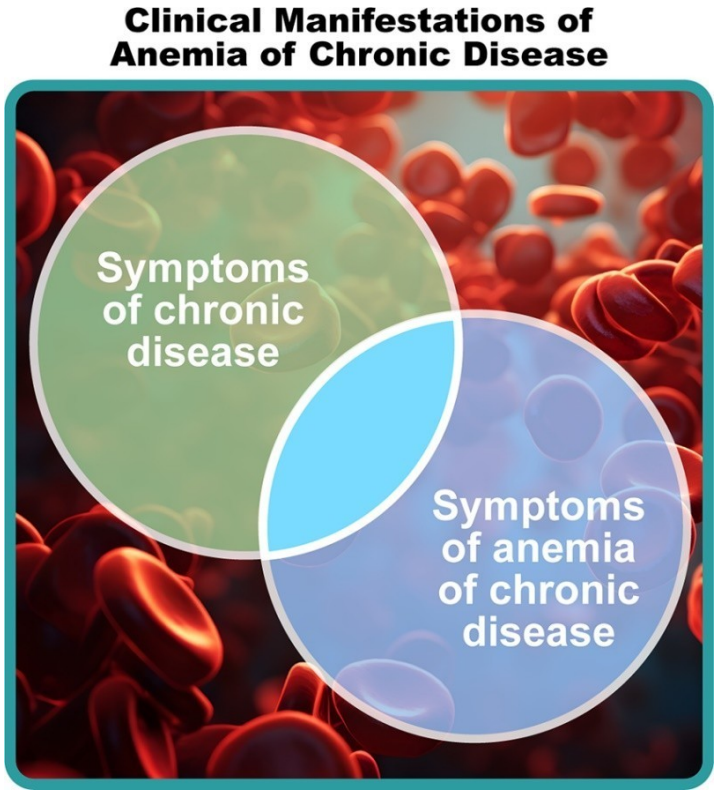


Image Description

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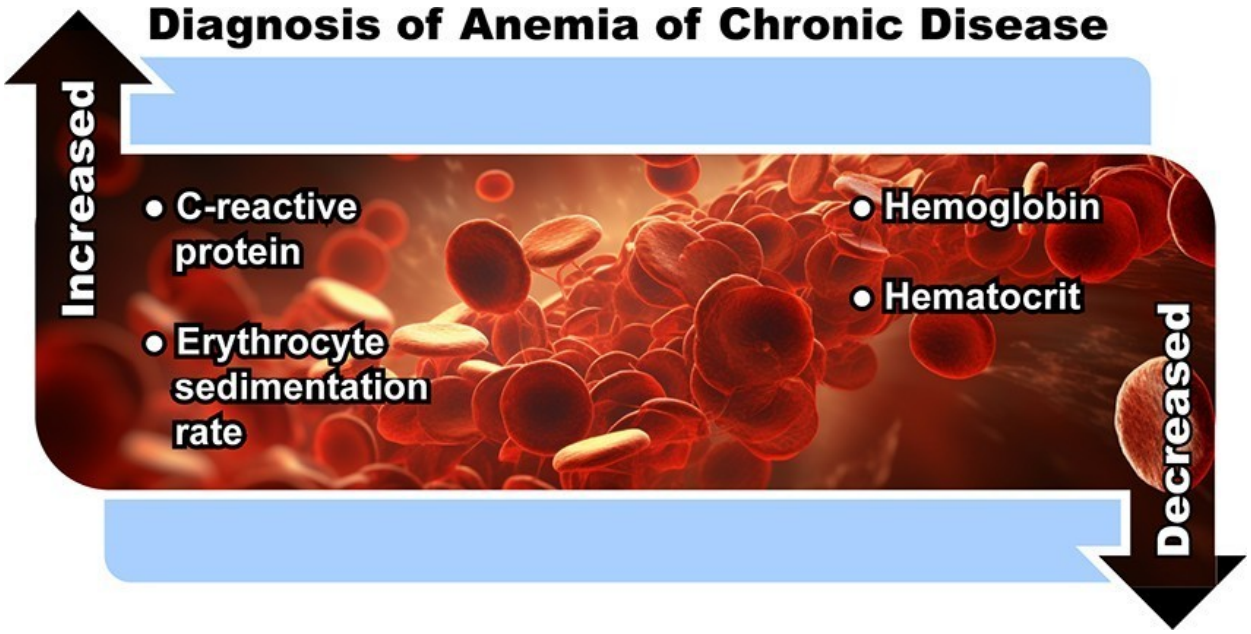
Anemia of Chronic Disease Diagnosis and Treatment

Diagnosis of anemia of chronic disease includes evaluation of medical history, physical examination, and laboratory tests. Laboratory results to confirm a diagnosis will include low hemoglobin and hematocrit, elevated reticulocyte count, and normal or increased serum ferritin. An elevated c-reactive protein (CRP) and elevated erythrocyte sedimentation rate (ESR) indicate inflammation and can support the diagnosis of anemia of chronic disease. The diagnosis of anemia of chronic disease may also be supported by observing how the anemia responds to treatment of the underlying chronic disease. Anemia of chronic disease may be difficult to differentiate from iron-deficiency anemia but should be suspected if there is a failure to respond to conventional iron replacement therapy.

Identifying and managing the underlying chronic disease or inflammatory condition that is contributing to the anemia of chronic disease is the primary

treatment for anemia of chronic disease. Clients with severe anemia secondary to chronic kidney disease can be treated with erythropoietin to increase iron stores.

Transfusions for critically ill clients can worsen the outcomes and increase morbidity and mortality.



Diagnosis of Anemia of Chronic Disease

- Increased C-creative protein
- Increased erythrocyte sedimentation rate
- Decreased hemoglobin
- Decreased hematocrit

The nurse practitioner (NP) evaluates a 30-year-old client with chronic kidney disease who presents with fatigue, weakness, and pallor. The laboratory results reveal a low hemoglobin, increased c-reactive protein, and increased erythrocyte sedimentation rate. The NP anticipates which additional laboratory finding?

Increased reticulocytes

Reticulocyte count is not relevant to anemia assessment

Normal reticulocyte count