

ANEMIA OF BLOOD LOSS (HEMORRHAGE)

Anemia due to blood loss is broadly classified into:

1. Acute blood loss (hemorrhage)
 2. Chronic blood loss (leads to iron deficiency)
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ACUTE BLOOD LOSS (ACUTE HEMORRHAGE)

Basic Pathophysiology

Acute hemorrhage causes:

- Immediate loss of intravascular volume
- Reduction in circulating red cell mass (initially masked)

 Critical concept (very high-yield):

In early acute bleeding, hemoglobin and hematocrit may appear normal because plasma and RBCs are lost proportionately.

EFFECTS OF ACUTE BLOOD LOSS

Hemodynamic Consequences

Loss of blood volume → ↓ Venous return → ↓ Cardiac output → Tissue hypoxia → Cardiovascular collapse

 If blood loss > 20% of total blood volume → Shock → Death (if untreated)

HEMODILUTION PHASE

If the patient survives and is resuscitated (oral or IV fluids):

Fluid replacement → Plasma volume restored → Red cell mass remains low → Hemodilution

 Timeline:

- Begins immediately

- Fully evident after 2-3 days

→ Only then is the true degree of anemia revealed

MORPHOLOGY OF ANEMIA IN ACUTE BLOOD LOSS

- Normocytic
- Normochromic

 Reason:

- No defect in hemoglobin synthesis
 - No maturation abnormality of RBCs
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MARROW RESPONSE & RECOVERY

Acute blood loss → ↓ Tissue oxygen tension → ↑ Renal erythropoietin secretion → Stimulation of erythroid precursors in marrow

Timeline of recovery:

- Lag phase: 5-7 days
- Followed by:
 - ↑ RBC production
 - Reticulocytosis in peripheral blood

 Exam pearl:

Reticulocytosis confirms intact bone marrow response

FLOWCHART: ACUTE BLOOD LOSS ANEMIA

Acute hemorrhage → Loss of intravascular volume → Cardiovascular compromise ± shock → Fluid resuscitation → Hemodilution (2-3 days) → Normocytic normochromic anemia → ↑ Erythropoietin → Reticulocytosis (after 5-7 days) → Gradual correction of anemia

CHRONIC BLOOD LOSS

With persistent, slow blood loss:

Repeated blood loss → Gradual depletion of iron stores
→ ↓ Hemoglobin synthesis → Impaired erythropoiesis
→ Chronic anemia of underproduction

 Important:

This ultimately manifests as iron deficiency anemia, which is a type of microcytic anemia.

ACUTE vs CHRONIC BLOOD LOSS

Feature	Acute Blood Loss	Chronic Blood Loss
Volume loss	Sudden	Slow, continuous
Initial Hb	Often normal	Low
RBC morphology	Normocytic, normochromic	Microcytic, hypochromic
Iron stores	Normal	Depleted


Reticulocytes	↑ (after 5-7 days)	Normal or ↓
Main danger	Shock	Iron deficiency

ADULT REFERENCE RANGES FOR RED BLOOD CELLS



Parameter	Units	Men	Women
Hemoglobin (Hb)	g/dL	13.2-16.6	11.6-15.0
Hematocrit (Hct)	%	38-49	35-45
RBC count	$\times 10^6/\mu\text{L}$	4.4-5.6	3.9-5.1
Reticulocyte count	%	0.6-2.7	0.6-2.7
MCV	fL	78-98	78-98

MCH	pg	26-34	26-34
MCHC	g/dL	32-36	31-36
RDW	%	11.8-14.5	12.2-16.1

 Exam tip:

Normal MCV + anemia after trauma → think acute blood loss

EXAM SUMMARY BOX

- Acute hemorrhage → volume loss first, anemia later
 - Hemodilution unmasks anemia after 2-3 days
 - Reticulocytosis appears after 5-7 days
 - Chronic blood loss → iron deficiency anemia
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-> The End <-