# Bleeding Tendency and Coagulopathy in Children

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# 1. Definition

Bleeding tendency refers to an increased risk of spontaneous or excessive bleeding due to abnormalities in:

- Blood vessels
- Platelets (number or function)
- Coagulation factors
- Fibrinolytic system

Coagulopathy is a disorder of the coagulation cascade that impairs normal clot formation and may lead to excessive bleeding or, less commonly, thrombosis.

Clinical Principle: The pattern of bleeding often provides the first clue to the underlying disorder.

## Classification

| Disorder | Typical Examples |
| --- | --- |
| Platelet disorders | Immune thrombocytopenia (ITP), leukemia, drug-induced thrombocytopenia |
| Platelet function disorders | Glanzmann thrombasthenia, Bernard–Soulier syndrome, aspirin effect |
| Coagulation factor deficiencies | Hemophilia A, Hemophilia B, von Willebrand disease |
| Acquired coagulopathies | Vitamin K deficiency, liver disease, disseminated intravascular coagulation (DIC), anticoagulants |
| Vascular disorders | IgA vasculitis (Henoch-Schönlein purpura), Ehlers-Danlos syndrome |

# 2. Clinical Presentation

## History

Ask about:

### Bleeding Characteristics

- Easy bruising
- Petechiae
- Purpura
- Epistaxis
- Gum bleeding
- Prolonged bleeding after cuts
- Hemarthrosis
- Muscle hematomas
- Gastrointestinal bleeding
- Hematuria
- Menorrhagia (adolescents)

### Important History

- Age at first bleeding episode
- Previous surgery or dental extraction
- Umbilical stump bleeding
- Circumcision bleeding
- Recent viral illness
- Medications: Aspirin, NSAIDs, Anticoagulants
- Liver disease
- Kidney disease
- Malnutrition
- Vitamin K prophylaxis at birth
- Family history of bleeding disorders
- Consanguinity

# Physical Examination & Pattern of Bleeding

## Physical Examination

Assess:

- ABCs if active bleeding
- Vital signs
- Pallor
- Petechiae
- Purpura
- Ecchymoses
- Mucosal bleeding
- Joint swelling
- Muscle swelling
- Hepatosplenomegaly
- Lymphadenopathy
- Signs of chronic liver disease

## Pattern of Bleeding

| Clinical Finding | Likely Cause |
| --- | --- |
| Petechiae, purpura, mucosal bleeding | Platelet disorder |
| Hemarthrosis | Hemophilia |
| Deep muscle hematoma | Coagulation factor deficiency |
| Delayed postoperative bleeding | Factor deficiency |
| Immediate bleeding after trauma | Platelet disorder |
| Oozing from venipuncture sites | DIC |

# 3. Diagnostic Approach

### Step 1 — Assess severity

Is bleeding life-threatening?

- Airway bleeding
- Intracranial hemorrhage
- Massive GI bleeding
- Hemodynamic instability

↓ Immediate stabilization

### Step 2 — Determine bleeding pattern

#### Mucocutaneous bleeding

Think:

- Platelet disorders
- von Willebrand disease

#### Deep tissue bleeding

Think:

- Hemophilia
- Coagulation factor deficiencies

# Step 3 — Initial Laboratory Evaluation

## Initial laboratory evaluation

- CBC with platelet count
- Peripheral blood smear
- PT/INR
- aPTT
- Fibrinogen
- D-dimer (if DIC suspected)

## Diagnostic Flowchart

Bleeding Child ↓ Stabilize ABCs ↓ CBC + Platelet count ↓ Platelets low?

**YES →** Platelet disorder (ITP, leukemia, DIC)
**NO →** PT / aPTT
**Normal PT + prolonged aPTT →** Hemophilia / von Willebrand disease
**Prolonged PT ± prolonged aPTT →** Vitamin K deficiency / Liver disease / DIC

# 4. Differential Diagnosis

## Platelet Disorders

| Disease | Typical Features |
| --- | --- |
| Immune thrombocytopenia (ITP) | Petechiae after viral infection |
| Leukemia | Bruising + fever + bone pain |
| Aplastic anemia | Pancytopenia |
| Drug-induced thrombocytopenia | Medication history |

## Consumptive Coagulopathy

| Disease | Features |
| --- | --- |
| DIC | Bleeding + thrombosis + critically ill child |

## Vascular Disorders

| Disease | Features |
| --- | --- |
| IgA vasculitis | Palpable purpura + abdominal pain + arthritis |
| Connective tissue disorders | Easy bruising with normal coagulation tests |

## Coagulation Disorders

| Disease | Typical Features |
| --- | --- |
| Hemophilia A | Hemarthrosis, prolonged aPTT |
| Hemophilia B | Similar to Hemophilia A |
| von Willebrand disease | Epistaxis, menorrhagia, mucosal bleeding |
| Vitamin K deficiency | Prolonged PT, newborns |
| Liver disease | PT and aPTT prolonged |

# 5. Investigations

## Essential First-Line Tests

| Investigation | Purpose |
|---|---|
| CBC | Platelet count, anemia |
| Peripheral smear | Platelet morphology, blasts |
| PT/INR | Extrinsic pathway |
| aPTT | Intrinsic pathway |
| Fibrinogen | DIC evaluation |
| D-dimer | DIC assessment |
| Liver function tests | Liver disease |
| Renal function | Uremic platelet dysfunction |

## Second-Line Tests (When Indicated)

- Mixing study
- Factor VIII level
- Factor IX level
- von Willebrand factor antigen
- von Willebrand activity (ristocetin cofactor or GPIb binding assay)
- Platelet function testing
- Bone marrow examination (if leukemia/aplasia suspected)
- Genetic testing (selected inherited disorders)

# 6. Management Algorithm

Bleeding child ↓ Assess ABCs ↓ Life-threatening bleeding?

**YES →**

- IV access
- Resuscitation
- Blood products
- Urgent hematology consultation

**NO →** CBC + PT + aPTT ↓ Identify underlying disorder ↓ Specific treatment

## Initial Emergency Management

- ABC stabilization
- Control external bleeding
- IV access
- Fluid resuscitation if needed
- Blood typing and cross-match
- Avoid unnecessary intramuscular injections
- Early hematology consultation for significant bleeding

# 7. Drug Summary Table

| Condition | First-line Treatment |
|---|---|
| Hemophilia A | Recombinant factor VIII concentrate |
| Hemophilia B | Recombinant factor IX concentrate |
| Mild Hemophilia A | Desmopressin (DDAVP) in selected patients |
| von Willebrand disease | DDAVP (selected types) or VWF-containing concentrate |
| Vitamin K deficiency | Vitamin K |
| ITP with significant bleeding | Corticosteroids or IVIG |
| DIC | Treat underlying cause + blood component therapy |

## Important Drug Doses

| Drug | Pediatric Dose |
|---|---|
| Vitamin K (phytonadione) | 0.5–1 mg IM at birth (prophylaxis); 1–5 mg IV/PO for deficiency depending on age and severity |
| IVIG (ITP) | 0.8–1 g/kg IV (single dose) or 0.4 g/kg/day for 2–5 days |
| Prednisolone | 1–2 mg/kg/day PO (ITP) |
| Tranexamic acid | 10–15 mg/kg IV or PO every 8 hours (maximum 1 g/dose) |
| Desmopressin (DDAVP) | 0.3 µg/kg IV over 20–30 minutes (selected patients only) |

⚠ Avoid aspirin and NSAIDs in children with bleeding disorders because they impair platelet function.

# 8. Admission Criteria

Admit children with:

- Active major bleeding
- Hemodynamic instability
- Intracranial hemorrhage
- Gastrointestinal bleeding
- Hemoglobin requiring transfusion
- Newly diagnosed hemophilia with significant bleeding
- Suspected DIC
- Severe thrombocytopenia (<20,000/μL) with bleeding
- Suspected leukemia or aplastic anemia

# 9. Referral Criteria

## Pediatric Hematology

Refer urgently for:

- Suspected hemophilia
- Suspected von Willebrand disease
- Persistent thrombocytopenia
- Recurrent unexplained bleeding
- Abnormal coagulation profile
- Suspected inherited bleeding disorder

## Emergency Referral/PICU

Immediate transfer if:

- Intracranial hemorrhage
- Airway bleeding
- Massive GI bleeding
- Hemorrhagic shock
- DIC with organ dysfunction

# 10. Follow-Up

| Condition | Follow-up |
| --- | --- |
| ITP | Platelet count until recovery |
| Hemophilia | Lifelong hematology follow-up |
| von Willebrand disease | Regular follow-up before surgery or dental procedures |
| Vitamin K deficiency | Repeat PT/INR after treatment |
| DIC | Monitor coagulation profile until resolution |

# 11. Clinical Pearls

✓ Petechiae usually indicate a platelet problem, not a coagulation factor deficiency.

✓ Hemarthrosis is highly suggestive of hemophilia.

✓ A normal platelet count with prolonged aPTT strongly suggests an intrinsic coagulation factor deficiency (e.g., Hemophilia A or B).

✓ von Willebrand disease is the most common inherited bleeding disorder and often presents with recurrent epistaxis or menorrhagia.

✓ In DIC, both bleeding and thrombosis can occur simultaneously.

✓ Always ask about family history, especially in boys with recurrent joint bleeding.

# 12. Common Mistakes & 13. Key Take-Home Messages

## 12. Common Mistakes in Exams and Clinical Practice

- ❌ Assuming all bruising in children is due to trauma.
- ❌ Missing leukemia in a child with bruising and thrombocytopenia.
- ❌ Forgetting to obtain PT and aPTT as initial coagulation studies.
- ❌ Performing intramuscular injections in children with suspected bleeding disorders.
- ❌ Treating hemophilia with fresh frozen plasma when specific factor concentrates are available.
- ❌ Forgetting vitamin K deficiency in neonates who did not receive prophylaxis.
- ❌ Overlooking non-accidental injury (child abuse) in children with unexplained bruising after excluding medical causes.

## 13. Key Take-Home Messages

1. The pattern of bleeding is the most important initial clue to the diagnosis.
2. Mucocutaneous bleeding suggests a platelet or von Willebrand disorder, whereas deep tissue bleeding suggests a coagulation factor deficiency.
3. Initial laboratory evaluation should include CBC, platelet count, PT/INR, and aPTT.
4. Hemophilia A is the most common severe inherited coagulation factor deficiency and typically presents with hemarthrosis and muscle hematomas.
5. von Willebrand disease is the most common inherited bleeding disorder and commonly causes epistaxis, easy bruising, and prolonged mucosal bleeding.
6. Vitamin K deficiency and DIC are important acquired causes of coagulopathy in children.
7. In life-threatening bleeding, stabilize the patient first and begin appropriate blood product replacement without delaying treatment for definitive diagnosis.
8. Avoid medications that impair platelet function (e.g., aspirin, NSAIDs) in children with suspected bleeding disorders.
9. Early involvement of pediatric hematology improves diagnosis and management of inherited and complex bleeding disorders.
10. Always consider serious underlying conditions such as leukemia or DIC in children with unexplained bleeding and abnormal blood counts.

# High-Yield Examination Tips

| Clinical Finding | Most Likely Diagnosis |
|---|---|
| Petechiae + isolated thrombocytopenia after viral illness | Immune thrombocytopenia (ITP) |
| Recurrent hemarthrosis in a boy + prolonged aPTT | Hemophilia A or B |
| Epistaxis + menorrhagia + normal platelet count | von Willebrand disease |
| Prolonged PT with normal aPTT in a newborn | Vitamin K deficiency |
| Prolonged PT and aPTT + low fibrinogen + elevated D-dimer | Disseminated intravascular coagulation (DIC) |
| Bruising + fever + bone pain + blasts on blood smear | Leukemia |
| Palpable purpura + abdominal pain + arthritis | IgA vasculitis |

# Guideline Basis

This revision sheet is based on current recommendations from the American Society of Hematology (ASH), the British Society for Haematology (BSH), the World Federation of Hemophilia (WFH), the American Academy of Pediatrics (AAP), and standard pediatric references including Nelson Textbook of Pediatrics (22nd Edition) and UpToDate (2025–2026). It emphasizes practical clinical reasoning, initial stabilization, diagnostic evaluation, and first-line management at the level expected of a 4th-year medical student and future general physician.