FACTOR REPLACEMENT THERAPY

Drug Class: Coagulation Factor Concentrates (Biologics / Blood Products)

System: Hematologic | Purpose: Hemostasis & Bleed Control

NGN NCLEX-RN • 2026 Test Plan • Clinical Judgment High-Yield Review

1. DRUG OVERVIEW — WHY WE GIVE IT

Definition: IV infusion of purified/recombinant clotting factors to replace a missing or deficient factor and restore the coagulation cascade.

KEY INDICATIONS:

- **Hemophilia A:** Factor VIII deficiency (X-linked recessive, males)
- **Hemophilia B:** Factor IX deficiency (Christmas disease, X-linked recessive)
- **von Willebrand Disease:** vWF concentrate (Humate-P) — most common inherited bleeding disorder
- **Warfarin reversal / major bleed:** 4-Factor PCC (Kcentra) — replaces II, VII, IX, X
- **Factor inhibitors:** Recombinant Factor VIIa (NovoSeven), FEIBA — bypass agents
- **Prophylaxis:** Scheduled dosing to prevent spontaneous joint/muscle bleeds (severe hemophilia)
- **On-demand:** Acute bleeding episodes, pre-procedure/surgical coverage, trauma

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2. MECHANISM OF ACTION (SIMPLIFIED)

THE CORE CONCEPT:

Missing factor → cascade breaks → cannot form fibrin clot → bleeding

Replace the missing factor → cascade restored → clot forms → bleeding stops

PATHWAY MAP:

- Factor VIII & IX → act together in the INTRINSIC pathway (activate Factor X)
- Factor X → converts prothrombin (II) → thrombin (IIa)
- Thrombin → converts fibrinogen (I) → fibrin → stable clot
- PCC (Kcentra) → replaces vitamin K–dependent factors II, VII, IX, X (rapid warfarin reversal)
- Factor VIIa (NovoSeven) → BYPASSES inhibitors → directly activates X via tissue factor
- vWF → carries Factor VIII + promotes platelet adhesion to damaged vessel wall

💡 **Big picture:** You are giving the missing 'puzzle piece' of the clotting cascade. The patient is bleeding because one protein is absent — your infusion delivers that protein.

🟧 3. THERAPEUTIC EFFECTS — IS IT WORKING?

SIGNS OF EFFECTIVENESS:

- Bleeding SLOWS or STOPS (visible bleed, hematuria, epistaxis resolves)
- Pain and swelling in joint bleeds (hemarthrosis) decrease
- Hemoglobin & hematocrit STABILIZE (no further drop)
- Vital signs normalize: HR ↓, BP ↑ toward baseline
- Factor activity level rises to target on assay (e.g., 30–50% for minor bleed, 80–100% for major/surgical)
- aPTT (Hemophilia A/B) → shortens toward normal range
- INR (with PCC) → corrects within 30 minutes for warfarin reversal

🎯 **NCLEX expected outcome:** "Bleeding controlled AND factor level/coagulation labs trending toward normal." Both clinical AND lab evidence are required.

🟩 4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON (expected, manageable):

- Headache, flushing, nausea
- Mild infusion site reaction (redness, tingling)
- Chills, low-grade fever
- Fatigue

🚨 **SERIOUS / LIFE-THREATENING:**

- **Anaphylaxis** — hives, wheezing, hypotension, angioedema (highest risk: Factor IX products)
- **Thrombosis** — DVT, PE, MI, stroke, DIC (especially with PCC, FEIBA, high-dose Factor VIIa)
- **Factor INHIBITOR development** — antibodies neutralize the factor → sudden loss of response (suspect when bleeding doesn't stop)
- **Transfusion-transmitted infection** — HIV, Hep B/C (very rare with modern products; historical risk)
- **Hemolytic reaction** — with high-volume plasma-derived products in patients with blood group A, B, or AB
- **Volume overload / pulmonary edema** — crackles, SOB, ↑BP, JVD (elderly, cardiac patients)

⚠️ **Toxicity clue:** Think THROMBOSIS when a bleeding patient suddenly develops chest pain, leg swelling, or neuro changes after factor infusion — you've overshot hemostasis into clotting.

🟪 5. PRIORITY NURSING CONSIDERATIONS

→ ASSESS before infusion:

- Baseline vitals, lung sounds, neuro status, bleeding sites
- Allergy history — especially mouse/hamster protein (recombinant products) or prior reactions
- IV patency with large-bore access; verify product, dose, lot number with 2nd RN
- Weight-based dose calculation (units/kg)

→ MONITOR during & after:

- Vitals Q15 min × 1 hr, then per protocol — watch for anaphylaxis onset
- S/S bleeding: bruising, bleeding gums, hematuria, melena, joint pain/swelling
- S/S thrombosis: calf pain, chest pain, SOB, sudden unilateral weakness

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- Neuro checks — intracranial bleed is the #1 killer in hemophilia

→ HOLD / DO NOT INFUSE:

- Active thrombotic event (DVT, PE, MI, stroke, DIC)
- Known allergy to the product or its components
- Signs of inhibitor development without confirmed bypass strategy
- Reconstituted product sitting > 3 hours or cloudy/discolored

→ NOTIFY provider immediately for:

- Any signs of anaphylaxis (stop infusion FIRST, then notify)
- New or worsening bleeding despite correct dose — possible inhibitor
- New-onset chest pain, SOB, calf pain, or neuro changes
- Headache, vomiting, or change in LOC — rule out intracranial bleed

CONTRAINDICATIONS:

- Known hypersensitivity to mouse, hamster, or bovine protein (recombinant)
- DIC (avoid PCC and FEIBA — will worsen clotting)
- Active thromboembolic disease

DRUG INTERACTIONS:

- Antifibrinolytics (tranexamic acid, aminocaproic acid) + PCC/FEIBA → ↑↑ thrombosis risk
- Emicizumab (Hemlibra) + FEIBA → thrombotic microangiopathy risk
- Estrogen/OCPs → additive clotting risk
- NSAIDs & aspirin → AVOID in hemophilia (↑ bleeding)

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6. LABS & DIAGNOSTICS

KEY LABS TO MONITOR:

- **aPTT:** PROLONGED in Hemophilia A & B; corrects with successful replacement (normal 25–35 sec)
- **PT/INR:** Normal in hemophilia; ELEVATED in warfarin OD (target INR < 1.5 after PCC reversal)
- **Factor VIII or IX activity assay:** Target 30–50% minor bleed, 50–80% major bleed, 80–100% life-threatening/surgery
- **Bethesda assay:** Detects & quantifies inhibitors (> 5 BU = high titer)
- **Platelet count:** Normal in hemophilia; ↓ with DIC (rules out other bleeding causes)
- **CBC (H/H):** Monitor for blood loss — trending, not single values
- **Fibrinogen:** ↓ in DIC; keep > 100 mg/dL
- **D-dimer:** ↑ if thrombosis develops (DVT, PE, DIC)

CRITICAL VALUES / RED FLAGS:

- Factor activity < 1% = SEVERE hemophilia → spontaneous bleeds
- Hgb < 7 g/dL with active bleed → transfuse PRBCs alongside factor
- INR > 1.5 after PCC → repeat dose may be needed
- Bleeding DESPITE adequate dosing = suspect inhibitor → draw Bethesda titer

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7. ADMINISTRATION & SAFETY

ROUTE & TIMING:

- IV route ONLY — never IM (causes hematoma in bleeding disorders)

- Slow IV push or infusion per manufacturer (typically 2–10 mL/min)
- Use FILTERED administration set provided with product
- Infuse within 3 hours of reconstitution

SPECIAL INSTRUCTIONS:

- Reconstitute gently — do NOT shake (foaming denatures protein)
- Warm to room temperature before infusion
- Dedicated IV line — do NOT mix with other meds or fluids
- Weight-based dose: Factor VIII ≈ 1 unit/kg raises level by ~2%; Factor IX ≈ 1 unit/kg raises level by ~1%
- Document lot number, product name, expiration, volume infused

HIGH-ALERT PRECAUTIONS:

- Factor products are HIGH-ALERT medications → independent double-check required
- Emergency meds (epinephrine, O_2, suction) at bedside for anaphylaxis
- AVOID IM injections, rectal temps, aspirin, NSAIDs — all cause bleeding
- Apply prolonged pressure (5–10 min) to any venipuncture or injection site
- No contact sports; protective equipment for any activity
- Store per manufacturer — most refrigerated (2–8°C); protect from light

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8. PATIENT EDUCATION

PATIENT MUST KNOW:

- Hemophilia is lifelong and inherited — learn self-infusion for home prophylaxis
- Carry a MedicAlert bracelet identifying the bleeding disorder and factor type
- NEVER take aspirin, NSAIDs (ibuprofen, naproxen), or herbal blood thinners (ginkgo, garlic, fish oil)
- Use acetaminophen for pain; soft toothbrush & electric razor
- Avoid contact sports (football, boxing, wrestling); swimming and biking with helmet are OK
- Apply ice + pressure + elevation for minor bleeds; factor replacement for anything more
- Rotate infusion sites; inspect for bruising
- Register with a Hemophilia Treatment Center (HTC); genetic counseling for family planning

SEEK EMERGENCY CARE IMMEDIATELY IF:

- Head injury of ANY severity — risk of intracranial bleed
- Severe headache, vomiting, confusion, or vision changes
- Joint becomes hot, swollen, painful, and immobile (hemarthrosis)
- Blood in urine or stool, or black tarry stools
- Bleeding that will not stop after 10 min of pressure
- Chest pain, leg swelling, shortness of breath (thrombosis warning)
- Hives, swelling of face/tongue, wheezing after infusion (anaphylaxis)

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9. NCLEX TEST TRAPS

COMMONLY CONFUSED — DON'T FALL FOR THESE:

- **TRAP 1:** "Give IM vitamin K for the bleed" — WRONG. IM is CONTRAINDICATED in hemophilia. Factor replacement is the answer.
- **TRAP 2:** Assuming PT/INR is abnormal in hemophilia — only aPTT is prolonged. Factors VIII/IX are in the intrinsic pathway.

- **TRAP 3:** "Apply pressure for 1–2 minutes" — NOT enough. Hemophilia patients need at least 5–10 minutes of firm pressure.
- **TRAP 4:** Choosing FFP or cryoprecipitate over factor concentrate for a known hemophilia patient — factor concentrate is FIRST LINE (purer, safer, faster).
- **TRAP 5:** Giving aspirin or NSAID for pain in a hemophilia patient — NEVER. Use acetaminophen only.
- **TRAP 6:** Assuming a minor head bump is "fine to watch" — in hemophilia, ANY head injury = immediate factor infusion + CT scan.
- **TRAP 7:** Forgetting that hemophilia is X-linked recessive — sons of carrier mothers have 50% risk; daughters of affected fathers are OBLIGATE carriers.
- **TRAP 8:** PCC (Kcentra) vs FFP for warfarin reversal with major bleed — PCC is PREFERRED (faster, smaller volume, no thawing).
- **TRAP 9:** Not recognizing INHIBITOR development — patient bleeding despite correct dose = suspect inhibitor, not "needs more factor." Switch to bypass agent (Factor VIIa/FEIBA).
- **TRAP 10:** Priority question — anaphylaxis signs DURING infusion: STOP the infusion FIRST, then notify provider, then give epinephrine. (Stop the cause before treating the reaction.)

🟩 10. MEMORY BOOSTERS (MNEMONICS)

🧠 **"HEMOPHILIA A = 8"** — A is the 1st letter → Factor VIII (8). B → Factor IX (9). Alphabetical = numerical.

🧠 **"Christmas is in December = 9"** — Christmas disease = Hemophilia B = Factor IX. Christmas (Dec) → 9th factor.

🧠 **"PT PLAYS Outside, aPTT PLAYS Inside"** — PT = extrinsic pathway (warfarin). aPTT = intrinsic pathway (heparin, hemophilia).

🧠 **"2, 7, 9, 10 — Warfarin's friends again"** — Vitamin K–dependent factors (II, VII, IX, X) = what PCC (Kcentra) replaces.

🧠 **"BLEED Safety"** — B: Bracelet (MedicAlert) | L: Limit contact sports | E: Electric razor | E: Educate family | D: Don't give aspirin/NSAIDs/IM injections.

🧠 **"RICE + Factor" for joint bleeds** — Rest, Ice, Compression, Elevation PLUS factor replacement.

🧠 **"HEAD BUMP = FACTOR + CT"** — Any head trauma in hemophilia: infuse factor FIRST, then scan. Never wait.

🧠 **Pattern across class:** ALL factor products carry risk of (1) anaphylaxis, (2) thrombosis, (3) inhibitor formation. Always monitor for these three.

💊 11. MOST TESTED DRUGS IN THIS CLASS

DRUG / PRODUCT	FACTOR REPLACED	PRIMARY USE	KEY NCLEX PEARL
Recombinant Factor VIII (Advate, Kogenate, Recombinate)	Factor VIII	Hemophilia A — prophylaxis & bleeds	1 unit/kg raises level by ~2%. No viral risk. First-line.
Recombinant Factor IX (BeneFix, Alprolix, Rixubis)	Factor IX	Hemophilia B — prophylaxis & bleeds	1 unit/kg raises level by ~1% (need MORE than VIII). Highest anaphylaxis risk.
Recombinant Factor VIIa (NovoSeven RT)	Factor VIIa	Patients with INHIBITORS (A or B)	Bypass agent — activates X directly. ⚠️ Thrombosis risk.

DRUG / PRODUCT	FACTOR REPLACED	PRIMARY USE	KEY NCLEX PEARL
FEIBA (Anti-Inhibitor Coagulant Complex)	Activated II, VII, IX, X	Hemophilia with high-titer inhibitors	Bypass agent. DO NOT combine with Hemlibra (TMA risk).
4-Factor PCC (Kcentra)	II, VII, IX, X + Protein C/S	Emergency warfarin reversal with major bleed	PREFERRED over FFP. Works in minutes. Thrombosis risk.
von Willebrand / Factor VIII Complex (Humate-P, Wilate)	vWF + Factor VIII	von Willebrand Disease, severe bleed	For vWD types unresponsive to desmopressin (DDAVP).
Emicizumab (Hemlibra) — SQ	Bispecific antibody (mimics VIII)	Hemophilia A prophylaxis (± inhibitors)	Subcutaneous, not IV. Lasts weeks. ⚠️ TMA if given with FEIBA.
Desmopressin (DDAVP)	Releases stored vWF & VIII	MILD Hemophilia A & vWD Type 1	Not factor replacement per se — triggers endogenous release. Watch hyponatremia.

🚨 CLINICAL JUDGMENT SNAPSHOT (NCJMM) 🚨

Q1. What is the #1 PRIORITY RISK with factor replacement?

→ Intracranial hemorrhage (in hemophilia) and thromboembolism (with PCC/FEIBA/VIIa). Both are LIFE-THREATENING and time-sensitive.

Q2. What will HARM the patient FIRST?

→ ANAPHYLAXIS during infusion — airway compromise kills within minutes. Second: an unrecognized head bleed turning into brain herniation.

Q3. What is the FIRST NURSING ACTION in a scenario?

→ SCENARIO A (anaphylaxis during infusion): STOP the infusion → maintain airway → notify provider → give epinephrine IM.

→ SCENARIO B (hemophilia patient with head injury): INFUSE FACTOR FIRST — before CT, before exam, before labs. Then assess neuro and image.

→ SCENARIO C (bleeding continues despite correct dose): Suspect INHIBITOR — draw Bethesda titer and prepare bypass agent (Factor VIIa or FEIBA).

→ SCENARIO D (warfarin OD with major GI bleed, INR > 10): Give 4-Factor PCC (Kcentra) IV + IV vitamin K. FFP is a distractor.