



VITAMINS PHARMACOLOGY INFOGRAPHIC

NCLEX-RN 2026 Test Plan • NGN + NCJMM Clinical Judgment

A • B-Complex • C • D • E • K

High-yield • Priority-action focused • Canva-ready color coding



KEY CONCEPT: Fat-Soluble vs Water-Soluble



FAT-SOLUBLE (A, D, E, K)

- Stored in LIVER & fatty tissue
- Take WITH fatty meal for absorption
- Toxicity RISK is HIGH (accumulates)
- Deficiency develops SLOWLY
- Mnemonic: 'All Dogs Eat Kibble'



WATER-SOLUBLE (B, C)

- NOT stored — excess excreted in urine
- Daily intake required
- Toxicity RISK is LOW (except B6, C)
- Deficiency develops QUICKLY
- B-complex + C





VITAMIN A (Retinol)

Fat-Soluble • Vision & Epithelium • Cat X in pregnancy



1. DRUG OVERVIEW

- Generic: Retinol, Retinyl palmitate; Active derivatives: Isotretinoin (Accutane), Tretinoin
- Class: Fat-soluble vitamin / Retinoid
- System: Integumentary, Visual, Immune

INDICATIONS:

- Night blindness & xerophthalmia (deficiency)
- Severe cystic acne (isotretinoin)
- Measles in children (WHO recommendation — reduces mortality)
- Epithelial maintenance (skin, cornea, mucosa)
- Supports immune function and bone growth



2. MECHANISM OF ACTION

- Retinol → Retinal → binds OPSIN → forms RHODOPSIN → low-light vision
- Retinoic acid → regulates gene transcription → epithelial differentiation
- → Maintains cornea, skin, mucous membranes, and immune cells
- Isotretinoin → ↓ sebum production → ↓ acne inflammation



3. THERAPEUTIC EFFECTS

- Improved dark/night vision within 1–2 weeks
- Resolution of Bitot's spots & corneal dryness
- Healthy skin and mucous membranes
- Reduction in acne lesions (isotretinoin — takes weeks to months)
- Serum retinol normalizes (>20 mcg/dL)



4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Nausea, vomiting
- Dry skin, dry lips (cheilitis)
- Headache
- Hair loss / thinning
- Photosensitivity



SERIOUS / TOXIC

- HYPERVITAMINOSIS A: hepatotoxicity
- TERATOGENICITY → Category X (isotretinoin)
- ↑ Intracranial pressure / pseudotumor cerebri
- Blurred vision, papilledema
- Bone pain, fractures (chronic high dose)
- Depression & suicidal ideation (isotretinoin)

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS**: pregnancy status (iPLEDGE); LFTs; lipid panel; visual changes
- → **MONITOR**: signs of ↑ICP (headache, vomiting, vision changes); skin/mucosa
- → **HOLD if**: pregnant/planning pregnancy, liver disease, or ↑ICP symptoms
- → **NOTIFY HCP**: severe headache, vision changes, depression, jaundice
- **CONTRAINDICATIONS**: pregnancy (absolute for isotretinoin), severe hepatic disease, hypervitaminosis A
- **INTERACTIONS**: tetracyclines (↑ICP), vitamin E (↑ toxicity), warfarin (↑ bleeding)

6. LABS & DIAGNOSTICS

- **Serum retinol**: normal 20–80 mcg/dL; <10 = severe deficiency
- **LFTs (AST/ALT)**: monitor monthly on isotretinoin — hepatotoxicity risk
- **Lipid panel**: isotretinoin ↑ triglycerides dramatically
- **β-hCG**: pregnancy test BEFORE start + monthly (iPLEDGE)
- **CRITICAL**: TG >500 mg/dL → risk pancreatitis → hold drug

7. ADMINISTRATION & SAFETY

- **ROUTE**: Oral capsule/tablet; IM injection for severe deficiency
- **TIMING**: Take WITH food containing fat (↑ absorption)
- **Isotretinoin**: 2 negative pregnancy tests before start; enrolled in iPLEDGE REMS program
- ⚠ **HIGH-ALERT**: teratogenic → no sharing, no blood donation × 1 month after discontinuation
- Store away from light; protect from heat

8. PATIENT EDUCATION

- Eat orange/yellow veggies, leafy greens, liver, eggs, dairy
- Use **SUNSCREEN** — photosensitivity with retinoids
- Use **TWO** reliable forms of contraception (isotretinoin) throughout + 1 month after
- Do **NOT** donate blood during therapy + 1 month after
- Report: severe headache, vision changes, yellow skin, mood changes / suicidal thoughts
- Avoid additional vitamin A supplements & high-dose multivitamins
- Apply moisturizer and lip balm routinely

9. NCLEX TEST TRAPS ⚠

- **TRAP**: β-carotene (plant source) = SAFE in pregnancy. Preformed retinol = TERATOGENIC.
- **TRAP**: Isotretinoin + tetracycline → pseudotumor cerebri (NEVER together)
- **TRAP**: Patient says 'I take a multivitamin AND vitamin A' → toxicity risk
- **TRAP**: Night blindness ≠ cataracts. Vitamin A deficiency = reversible night blindness.
- **TRAP**: Depression screening is a PRIORITY nursing action on isotretinoin

10. MEMORY BOOSTERS

- **"A for ACES"**: Aces night vision • Anti-Acne • Abortive (teratogen!)
- **"Retinol = Retinal"**: needed for RETINA → vision
- **Toxicity mnemonic 'HI-V-A'**: Headache, ↑ICP, Vomiting, Alopecia
- **iPLEDGE**: I Promise Less Estrogen Damages the Growing Embryo



CLINICAL JUDGMENT SNAPSHOT

- ▶ **#1 PRIORITY RISK**: Teratogenicity (isotretinoin) → fetal harm; chronic toxicity → hepatotoxicity and ↑ ICP.
- ▶ **WHAT HARMS FIRST**: In pregnancy — the fetus (craniofacial/CNS defects). In non-pregnant — rising ICP and liver injury.
- ▶ **FIRST NURSING ACTION**: Verify pregnancy status & iPLEDGE enrollment BEFORE administering isotretinoin. For toxicity signs (severe HA, vision change) → HOLD drug, notify HCP.



VITAMIN B COMPLEX

Water-Soluble • Energy, Nerves, Blood, Pregnancy



1. DRUG OVERVIEW — THE B VITAMINS

- **B1 Thiamine:** Wernicke's encephalopathy, beriberi, alcoholism
- **B2 Riboflavin:** migraine prophylaxis, cheilosis
- **B3 Niacin:** pellagra (3 D's — Dermatitis, Diarrhea, Dementia), hyperlipidemia
- **B6 Pyridoxine:** ISONIAZID toxicity antidote, peripheral neuropathy, morning sickness
- **B9 Folic acid:** PREVENTS NEURAL TUBE DEFECTS in pregnancy; megaloblastic anemia; methotrexate rescue
- **B12 Cobalamin:** pernicious anemia, peripheral neuropathy; requires INTRINSIC FACTOR
- System: Hematologic, Neurologic, Metabolic, OB



2. MECHANISM OF ACTION

- B1 → coenzyme for carbohydrate metabolism → prevents CNS damage in alcoholism
- B6 → cofactor in neurotransmitter synthesis → offsets INH-induced neuropathy
- B9 → DNA synthesis → prevents neural tube defects & megaloblastic anemia
- B12 → binds intrinsic factor in stomach → absorbed in terminal ileum → RBC maturation + myelin synthesis
- B3 → lowers LDL & triglycerides; raises HDL



3. THERAPEUTIC EFFECTS

- ↑ Energy, ↓ fatigue; resolved glossitis/cheilosis
- B12: ↑ Hgb/Hct within 1 week; neuro symptoms improve over months
- Folate: ↓ MCV; fetal NTD prevention; methotrexate toxicity reversed
- B1: reversal of confusion/ataxia (Wernicke's triad: confusion, ataxia, nystagmus)
- B3: LDL ↓, HDL ↑, TG ↓
- B6: resolves INH-induced peripheral neuropathy



4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- B3: FLUSHING (give ASA 30 min prior)
- B6: nausea
- B12 IM: injection site pain
- Folate: bitter taste, nausea
- Urine turns bright yellow (B2)



SERIOUS

- B3: hepatotoxicity, hyperglycemia, hyperuricemia/gout
- B6 CHRONIC HIGH DOSE: sensory neuropathy
- B12: anaphylaxis (rare); hypokalemia on therapy initiation
- Folate masks B12 deficiency → neuro damage progresses

- B1 IV rapid push: anaphylaxis

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS**: neuro status, diet, alcohol use, pregnancy, MCV, B12 & folate levels
- → **MONITOR**: Hgb/Hct, reticulocytes, K⁺ (B12 start), LFTs (B3), glucose (B3)
- → **⚠️ CRITICAL RULE**: GIVE THIAMINE BEFORE GLUCOSE in alcoholics — IV glucose first = Wernicke's encephalopathy
- → **⚠️ PRIORITY**: Rule OUT B12 deficiency before giving folate (folate corrects anemia but neuro damage progresses)
- → **HOLD B3 if**: active liver disease, severe gout, or active peptic ulcer
- → **NOTIFY**: new numbness/tingling (B6 toxicity), jaundice (B3), chest pain
- **INTERACTIONS**: B6 ↓ levodopa; folate ↓ phenytoin; B3 + statins → rhabdomyolysis

6. LABS & DIAGNOSTICS

- **B12**: normal 200–900 pg/mL; <200 = deficiency
- **Folate (serum)**: normal 2.7–17 ng/mL
- **MCV**: >100 fL → megaloblastic (B12 or folate deficiency)
- **Homocysteine**: ↑ in both B12 and folate deficiency
- **Methylmalonic acid (MMA)**: ↑ only in B12 deficiency (differentiates from folate)
- **Schilling test**: confirms pernicious anemia
- **CRITICAL**: B3 → LFTs; AST/ALT >3× normal = stop drug

7. ADMINISTRATION & SAFETY

- **B12 for pernicious anemia**: IM or DEEP subQ — oral ineffective (missing intrinsic factor). Lifelong therapy.
- **B1**: give BEFORE glucose in alcoholics; IV push slowly
- **B3**: take with food; extended-release at bedtime; ASA 325 mg 30 min prior to reduce flushing
- **B6**: oral with INH therapy (routine prophylaxis)
- **Folate**: 400 mcg/day for all women of childbearing age; 4 mg if prior NTD pregnancy
- **AVOID** hot drinks, alcohol, spicy foods with niacin (↑ flushing)

8. PATIENT EDUCATION

- B12 sources: meat, fish, eggs, dairy (vegans at risk)
- Folate sources: leafy greens, fortified cereals, beans, citrus
- Niacin **FLUSH**: expected, not allergy; take ASA + avoid alcohol/hot liquids
- Pernicious anemia = **LIFELONG** injections (never stop)
- Start folic acid **BEFORE** conception, not after
- Report persistent numbness/tingling, jaundice, chest pain
- Pyridoxine (B6): take daily if on isoniazid for TB

9. NCLEX TEST TRAPS ⚠️

- **TRAP:** Alcoholic admitted unresponsive → give **THIAMINE FIRST**, then glucose (not the reverse!)
- **TRAP:** Macrocytic anemia → don't just give folate. Check **B12 FIRST** to prevent masking.
- **TRAP:** Niacin flushing = expected effect, **NOT** anaphylaxis. Don't stop drug.
- **TRAP:** Pernicious anemia patient stops B12 because they 'feel fine' → irreversible neuro damage
- **TRAP:** Folic acid prevents NTDs only if taken **BEFORE** conception (neural tube closes week 4)
- **TRAP:** Isoniazid + no pyridoxine → peripheral neuropathy (always give B6 with INH)

10. MEMORY BOOSTERS

- **"ThiamiNE before gluCOSE":** rhymes — never forget in alcoholics
- **Pellagra 3 D's:** Dermatitis, Diarrhea, Dementia (+ Death if untreated = 4th D)
- **"FOLate = FOLd the neural tube":** prevents neural tube defects
- **"B12 needs IF to FLY":** Intrinsic Factor required
- **"INH → I Need Help":** give B6 to prevent neuropathy
- **Wernicke's triad:** COAT — Confusion, Ophthalmoplegia, Ataxia, Thiamine deficiency



CLINICAL JUDGMENT SNAPSHOT

- ▶ **#1 PRIORITY RISK:** Wernicke's encephalopathy if thiamine omitted in alcoholic; irreversible neuro damage if folate masks B12 deficiency.
- ▶ **WHAT HARMS FIRST:** The brain (CNS) — acute confusion/ataxia in B1 deficiency; demyelination in B12 deficiency.
- ▶ **FIRST NURSING ACTION:** Give **THIAMINE IV** before any glucose in alcoholic patient; verify B12 level **BEFORE** initiating folate therapy for macrocytic anemia.

★ MOST TESTED B VITAMINS — Key Differences

B Vitamin	Key Use	Deficiency	Key Risk	NCLEX Pearl
B1 Thiamine	Alcoholism, Wernicke's	Beriberi, Wernicke-Korsakoff	CNS damage if glucose given first	Give BEFORE glucose
B3 Niacin	Hyperlipidemia	Pellagra (3 D's)	Hepatotoxicity, flushing	ASA 30 min pre-dose for flush
B6 Pyridoxine	INH toxicity, neuropathy	Peripheral neuropathy	High dose = neuropathy	Always give with INH
B9 Folate	Prevent NTDs, megaloblastic anemia	Neural tube defects	Masks B12 deficiency	Start PRE -conception
B12 Cobalamin	Pernicious anemia	Megaloblastic + neuropathy	Irreversible neuro damage	IM lifelong if pernicious



VITAMIN C (Ascorbic Acid)

Water-Soluble • Collagen, Immunity, Iron Absorption



1. DRUG OVERVIEW

- Generic: Ascorbic acid
- Class: Water-soluble vitamin / Antioxidant
- System: Integumentary, Hematologic, Immune

INDICATIONS:

- Scurvy (classic deficiency)
- Wound healing support (post-op, pressure injuries, burns)
- Enhance iron absorption (non-heme iron in vegetarians / iron-deficiency anemia)
- Antioxidant support; methemoglobinemia (adjunct)
- Immune support during illness



2. MECHANISM OF ACTION

- Cofactor for PROLYL HYDROXYLASE → collagen cross-linking → capillary integrity & wound healing
- Reduces $\text{Fe}^{3+} \rightarrow \text{Fe}^{2+}$ in gut → ↑ non-heme iron absorption
- Electron donor → scavenges free radicals (antioxidant)
- Supports neutrophil function & immune response



3. THERAPEUTIC EFFECTS

- Resolved gum bleeding, petechiae, ecchymoses
- Improved wound healing & tissue repair
- Increased Hgb when combined with iron therapy
- Normal serum ascorbic acid (0.4–1.5 mg/dL)
- Decreased bruising and fatigue



4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Diarrhea / loose stools
- Nausea, abdominal cramping
- Heartburn
- Flushing, headache



SERIOUS

- KIDNEY STONES (oxalate) at high doses
- REBOUND SCURVY if stopped abruptly after chronic high dose
- Hemolysis in G6PD deficiency (high IV dose)
- Iron overload in hemochromatosis/thalassemia
- False-positive glucose/occult blood tests

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS**: diet, wound status, iron labs, renal function, G6PD status
- → **MONITOR**: urine output & kidney function if high dose; CBC if combined with iron
- → **HOLD if**: kidney stones, hemochromatosis/thalassemia, severe renal impairment
- → **NOTIFY HCP**: flank pain, hematuria, severe diarrhea
- **CONTRAINDICATIONS**: hemochromatosis, G6PD deficiency (high-dose IV), oxalate kidney stones
- **INTERACTIONS**: ↑ iron absorption; ↓ effectiveness of warfarin (high dose); false glucose readings

6. LABS & DIAGNOSTICS

- **Serum ascorbic acid**: normal 0.4–1.5 mg/dL; <0.2 = deficiency
- **Urinary oxalate**: ↑ indicates stone risk at high doses
- **Ferritin / iron panel**: monitor if combined with iron
- **BUN/Creatinine**: renal function with chronic high-dose
- **False positives**: urine glucose (Clinitest), occult blood, may falsely ↓ true glucose readings

7. ADMINISTRATION & SAFETY

- **ROUTE**: Oral (most common); IV/IM for severe deficiency or scurvy
- **TIMING**: With meals if GI upset; take with iron for absorption boost
- **MAX dose**: 2,000 mg/day in adults (UL); higher doses → stone risk
- Do NOT stop abruptly after chronic high doses → **TAPER** to avoid rebound scurvy
- Store in cool, dry place; light-sensitive

8. PATIENT EDUCATION

- **Food sources**: citrus, strawberries, bell peppers, broccoli, kiwi, tomatoes
- **Cooking/heat** destroys vitamin C — eat raw when possible
- Take with iron tablets to enhance absorption
- **Smokers** need more vitamin C (smoking depletes it)
- Stay well hydrated (2–3 L/day) to prevent stones
- Don't mega-dose to 'prevent colds' — may shorten duration slightly but no strong evidence
- **Report**: flank pain, blood in urine, severe diarrhea

9. NCLEX TEST TRAPS ⚠

- **TRAP**: Vitamin C + oral iron → **INCREASES** iron absorption (this is a **THERAPEUTIC** pairing, not an error)
- **TRAP**: Large doses do NOT prevent the common cold reliably — don't reinforce myth
- **TRAP**: Rebound scurvy from abrupt discontinuation — taper chronic doses
- **TRAP**: Hemochromatosis patient on 'just a multivitamin with C' → iron overload worsens
- **TRAP**: Urine glucose dipstick results falsely abnormal — teach diabetic patient to time testing

10. MEMORY BOOSTERS

- **"C for COLLAGEN"**: gums, vessels, skin, bones
- **Scurvy 4 B's**: Bruising, Bleeding gums, Bad wound healing, Bone pain
- **"C helps Iron C-limb in"**: ↑ iron absorption
- **"Too much C = Stones in 3"**: kidney stones at high dose
- **Historical**: British sailors = 'Limeys' because limes (vit C) prevented scurvy



CLINICAL JUDGMENT SNAPSHOT

- ▶ **#1 PRIORITY RISK**: Kidney stones at high doses; rebound scurvy if abruptly discontinued; iron overload in hemochromatosis.
- ▶ **WHAT HARMS FIRST**: Kidneys (oxalate stones, hematuria) with chronic mega-dosing; GI symptoms earliest.
- ▶ **FIRST NURSING ACTION**: Assess renal function & stone history before initiating high-dose therapy; educate on adequate hydration (2–3 L/day) and gradual tapering.

♦ VITAMIN D (Cholecalciferol D3 / Ergocalciferol D2)

Fat-Soluble Hormone • Calcium & Bone Health

■ 1. DRUG OVERVIEW

- Generic: Cholecalciferol (D3), Ergocalciferol (D2), Calcitriol (active 1,25-OH₂ D)
- Class: Fat-soluble vitamin / Steroid hormone
- System: Skeletal, Endocrine, Renal

INDICATIONS:

- Vitamin D deficiency / insufficiency
- Rickets (children) / osteomalacia (adults)
- Osteoporosis prevention & treatment (with calcium)
- Hypoparathyroidism, hypocalcemia
- CKD — calcitriol for renal osteodystrophy

■ 2. MECHANISM OF ACTION

- Skin UVB → 7-dehydrocholesterol → Vitamin D3
- Liver: D → 25-OH vitamin D (storage form, measured form)
- Kidney: 25-OH D → 1,25-(OH)₂ D = CALCITRIOL (active)
- → ↑ GI calcium & phosphate ABSORPTION
- → ↑ Renal reabsorption of Ca²⁺ and PO₄³⁻
- → Stimulates bone mineralization & remodeling

■ 3. THERAPEUTIC EFFECTS

- 25-OH vitamin D level 30–100 ng/mL
- Normal serum calcium 9–10.5 mg/dL
- ↑ Bone density on DEXA scan
- Resolution of bone pain, muscle weakness
- Prevention of fractures in elderly
- Healing of rickets/osteomalacia

■ 4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Constipation
- Mild nausea
- Metallic taste
- Headache, drowsiness

⚠ SERIOUS (= Hypercalcemia)

- "Stones, Bones, Groans, Psych Overtones"
- Kidney stones, nephrocalcinosis
- Bone pain, pathologic fractures
- Anorexia, vomiting, constipation

- Confusion, depression, psychosis
- Cardiac: arrhythmias, ↑ digoxin toxicity

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS**: serum Ca, phosphate, 25-OH D level, renal function, parathyroid status
- → **MONITOR**: calcium q1–3 months; watch for hypercalcemia signs
- → **HOLD if**: Ca > 10.5 mg/dL, hypercalcemia, hypervitaminosis D, renal calculi
- → **NOTIFY HCP**: polyuria, extreme thirst, confusion, flank pain, palpitations
- **CONTRAINDICATIONS**: hypercalcemia, hyperphosphatemia, vit D toxicity, sarcoidosis, renal calculi
- **INTERACTIONS**: ↑ DIGOXIN toxicity (via hypercalcemia); thiazides ↑ Ca; cholestyramine ↓ absorption; phenytoin ↓ activation

6. LABS & DIAGNOSTICS

- **25-OH vitamin D**: <20 deficient; 20–29 insufficient; 30–100 optimal; >150 toxic
- **Serum calcium**: normal 9–10.5 mg/dL; >12 → urgent; >14 → emergency
- **Phosphate**: normal 2.5–4.5 mg/dL
- **PTH**: ↓ when vitamin D & Ca adequate
- **Alkaline phosphatase**: ↑ in osteomalacia; normalizes with therapy
- **Urinary calcium**: ↑ with toxicity → stone risk
- **CRITICAL**: Ca > 13 mg/dL → ECG changes (short QT, arrhythmias)

7. ADMINISTRATION & SAFETY

- **ROUTE**: Oral (capsule, tablet, liquid); D3 preferred (more potent than D2)
- **TIMING**: With fatty meal → maximizes absorption
- Weekly high-dose 50,000 IU ergocalciferol common in deficiency
- ⚠ **HIGH-ALERT** with digoxin — hypercalcemia ↑ dig toxicity risk
- Separate from cholestyramine and orlistat by ≥2 hours
- Store at room temp, protect from light

8. PATIENT EDUCATION

- Food sources: fatty fish (salmon, tuna, mackerel), egg yolks, fortified milk/cereal, mushrooms
- Sun exposure: ~15 min/day (arms + legs) — but balance with skin cancer risk
- Dark-skinned individuals and elderly need more vitamin D
- Take **WITH** a meal containing fat
- Weight-bearing exercise + calcium enhances benefit
- Report: excessive thirst, urination, confusion, palpitations, flank pain
- Don't double up — stick to prescribed dose

9. NCLEX TEST TRAPS ⚠

- **TRAP:** Vit D + digoxin → HYPERCALCEMIA increases dig toxicity (watch for N/V, visual halos, bradycardia)
- **TRAP:** CKD patients need CALCITRIOL (active), not plain vitamin D (kidneys can't activate)
- **TRAP:** Sarcoidosis patient on vitamin D → severe hypercalcemia (granulomas activate D)
- **TRAP:** Asking 'how much sun?' — answer is moderate; don't say 'none' or 'unlimited'
- **TRAP:** Thiazide diuretic + vitamin D = ↑ Ca (additive)

10. MEMORY BOOSTERS

- **"D for Dem BONES":** bone mineralization
- **Hypercalcemia mnemonic 'STONES, BONES, GROANS, PSYCH OVERTONES'**
- **"Sunshine Vitamin":** made in skin from UVB light
- **D activation trail:** SKIN → LIVER → KIDNEY (3 organs, mnemonic 'S-L-K')
- **"D3 > D2":** D3 (cholecalciferol) is more potent



CLINICAL JUDGMENT SNAPSHOT

- ▶ **#1 PRIORITY RISK:** HYPERCALCEMIA — can cause cardiac arrhythmias, kidney stones, and digoxin toxicity.
- ▶ **WHAT HARMS FIRST:** Cardiac (arrhythmias with Ca > 13) and renal (nephrocalcinosis, stones); neuro confusion early.
- ▶ **FIRST NURSING ACTION:** Verify baseline calcium BEFORE starting; hold drug and notify HCP if Ca > 10.5 mg/dL. In dig + vit D patient — assess for dig toxicity signs (N/V, visual halos, bradycardia) with any new symptom.

VITAMIN E (Tocopherol)

Fat-Soluble • Antioxidant • ⚠️ Bleeding Risk

1. DRUG OVERVIEW

- Generic: Alpha-tocopherol
- Class: Fat-soluble vitamin / Antioxidant
- System: Hematologic, Integumentary, Neuromuscular

INDICATIONS:

- Vitamin E deficiency (rare; cystic fibrosis, abetalipoproteinemia, malabsorption)
- Hemolytic anemia in premature infants
- Antioxidant / skin support (supportive, weak evidence)
- Some evidence for age-related macular degeneration (with AREDS formula)

2. MECHANISM OF ACTION

- Antioxidant → breaks free-radical chain reaction
- → Prevents LIPID PEROXIDATION of cell membranes
- → Protects RBC membranes, neurons, vascular endothelium
- High doses → inhibit vitamin K-dependent clotting factors → ↑ BLEEDING

3. THERAPEUTIC EFFECTS

- Normal serum α -tocopherol 5–20 mcg/mL
- Resolution of hemolytic anemia in premature infants
- Improved neurologic function in ataxia from E deficiency
- ↓ Oxidative damage markers

4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Nausea, abdominal pain
- Fatigue, weakness
- Headache
- Blurred vision
- Diarrhea

⚠️ SERIOUS

- BLEEDING / HEMORRHAGE (esp. with anticoagulants)
- HEMORRHAGIC STROKE (high-dose chronic)
- ↑ All-cause mortality (>400 IU/day in some trials)
- Rash, angioedema (rare)
- Interference with vitamin K

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS**: bleeding history, anticoagulant/antiplatelet use, upcoming surgery
- → **MONITOR**: PT/INR, aPTT if on warfarin; CBC; bruising/bleeding
- → **HOLD**: at least 1–2 weeks BEFORE surgery; if active bleeding
- → **NOTIFY HCP**: any unusual bleeding, bruising, black/tarry stools, severe headache
- **CONTRAINDICATIONS**: active bleeding, vitamin K deficiency, hemorrhagic stroke history
- **INTERACTIONS**: WARFARIN, aspirin, clopidogrel, NSAIDs, fish oil → ↑ bleeding; orlistat ↓ absorption

6. LABS & DIAGNOSTICS

- **Serum α-tocopherol**: normal 5–20 mcg/mL
- **PT/INR**: monitor closely if on warfarin — vitamin E ↑ INR
- **aPTT**: monitor if suspected bleeding
- **CBC / Hgb / Hct**: watch for anemia from occult bleeding
- **Cholesterol**: needed for E absorption evaluation
- **CRITICAL**: INR > 3 on warfarin + vitamin E → hold and notify HCP

7. ADMINISTRATION & SAFETY

- **ROUTE**: Oral capsule; IM for severe deficiency (rare)
- **TIMING**: With fatty meal; absorption requires pancreatic enzymes + bile
- **TYPICAL dose**: 15 mg/day adult RDA; therapeutic up to 400 IU/day
- **UPPER LIMIT**: 1,000 mg/day (1,500 IU natural; 1,100 IU synthetic)
- ⚠ **STOP** 1–2 weeks before scheduled surgery
- Separate from orlistat and cholestyramine by ≥2 hours

8. PATIENT EDUCATION

- **Food sources**: vegetable oils, nuts, seeds, spinach, avocados, wheat germ
- **Disclose vitamin E** to ALL providers — especially surgeons & dentists
- **If on warfarin** → avoid additional vitamin E supplements
- **Use soft toothbrush**, electric razor; watch for unusual bruising
- **Avoid high-dose 'megavitamin' regimens** (>400 IU/day)
- **Report**: nosebleeds, gum bleeding, black stools, sudden severe headache

9. NCLEX TEST TRAPS ⚠

- **TRAP**: Patient on warfarin starts 'just vitamin E' → INR climbs → major bleed
- **TRAP**: Pre-op patient with 'supplement list' — vitamin E must be held 1–2 weeks pre-op
- **TRAP**: More is NOT better — high-dose vitamin E ↑ mortality in trials
- **TRAP**: Vitamin E ≠ Vitamin K — opposite effects on clotting (E ↑ bleed; K clots)
- **TRAP**: Preterm neonate with hemolytic anemia → vitamin E is therapy, not contraindication

10. MEMORY BOOSTERS

- **"E for Easily BLEEDS"**: remember bleeding risk
- **"E cancels K"**: E antagonizes vitamin K-dependent clotting
- **Tocopherol = 'to carry offspring'** (Greek) — originally discovered for fertility in rats
- **"Hold 1–2 weeks pre-op"**: same rule as aspirin
- **Pair mnemonic**: Vit E = Extra Bleeding; Vit K = Kill the Bleed



CLINICAL JUDGMENT SNAPSHOT

- ▶ **#1 PRIORITY RISK**: BLEEDING/HEMORRHAGE — especially in patients on warfarin, antiplatelets, or pre-operative.
- ▶ **WHAT HARMS FIRST**: GI and mucosal surfaces (gum bleeding, nosebleeds, black stools); severe → hemorrhagic stroke.
- ▶ **FIRST NURSING ACTION**: Screen ALL patients for anticoagulant/antiplatelet use and upcoming surgery BEFORE administering. If on warfarin → check INR; hold supplement and notify provider if any bleeding signs.

VITAMIN K (Phytonadione)

Fat-Soluble • Clotting • ⚠️ Warfarin Antidote

1. DRUG OVERVIEW

- Generic: Phytonadione (K1), Menaquinone (K2)
- Brand: AquaMEPHYTON, Mephyton
- Class: Fat-soluble vitamin / Clotting cofactor
- System: Hematologic

INDICATIONS:

- WARFARIN (Coumadin) REVERSAL / ANTIDOTE — supratherapeutic INR or bleeding
- Hemorrhagic disease of the newborn — routine IM prophylaxis at birth
- Vitamin K deficiency (malabsorption, prolonged antibiotics, chronic liver disease)
- Reversal of clotting factor deficiency pre-procedure

2. MECHANISM OF ACTION

- Cofactor for hepatic γ -carboxylation of CLOTTING FACTORS 2, 7, 9, 10
- Also activates proteins C and S (anticoagulants)
- → Restores clotting cascade
- → Reverses warfarin effect (warfarin blocks vitamin K epoxide reductase)
- ⚠️ Does NOT reverse heparin (protamine does that)

3. THERAPEUTIC EFFECTS

- INR normalizes (goal 2–3 for most warfarin indications)
- Cessation of bleeding
- Onset: oral 6–10 h; IV 1–2 h; full correction 24–48 h
- Newborn: prevents Vitamin K Deficiency Bleeding (VKDB)
- PT normalizes in deficiency states

4. SIDE EFFECTS & ADVERSE REACTIONS

COMMON

- Flushing, altered taste
- Injection site pain/redness (IM)
- Dizziness
- Transient hypotension

SERIOUS

- ANAPHYLAXIS with IV → give SLOWLY in saline
- Cardiac arrest with rapid IV push
- Warfarin RESISTANCE after reversal (may need heparin bridge)
- Hemolytic anemia in G6PD deficiency (high dose)

- Hyperbilirubinemia in neonates (high dose menadione — now obsolete)

5. PRIORITY NURSING CONSIDERATIONS

- → **ASSESS**: bleeding signs, INR, PT, current anticoagulant use, allergy history
- → **MONITOR**: INR q6h after reversal; VS during IV infusion (BP, HR, respirations)
- → **ROUTE PRIORITY**: oral > subQ > IM > IV (IV only for life-threatening bleed, SLOW over 30 min)
- → **HOLD if**: hypersensitivity; warfarin just initiated w/o bleeding (check INR threshold)
- → **NOTIFY HCP**: dyspnea, chest pain, hypotension, rash during IV infusion (anaphylaxis)
- **INTERACTIONS**: ANTAGONIZES warfarin; broad-spectrum antibiotics ↓ gut K; orlistat/cholestyramine ↓ absorption

6. LABS & DIAGNOSTICS

- **INR**: therapeutic on warfarin 2–3 (or 2.5–3.5 mechanical valves); >4 = bleed risk; >5 with bleeding = give K
- **PT**: normal 11–13 sec; prolonged with K deficiency
- **aPTT**: normal 25–35 sec (NOT the warfarin marker)
- **CBC / Hgb / Hct**: watch for drop from bleeding
- **CRITICAL VALUES**: INR > 5 with bleeding → urgent K reversal ± FFP/PCC

7. ADMINISTRATION & SAFETY

- **NEONATE**: 0.5–1 mg IM once at birth (vastus lateralis) — standard prophylaxis
- **ADULT warfarin reversal (minor)**: 1–2.5 mg ORAL
- **ADULT life-threatening bleed**: 5–10 mg IV SLOW over 30 min + FFP or PCC
- ⚠️ **IV WARNING**: anaphylaxis/cardiac arrest if given too fast — DILUTE and infuse slowly, have epi at bedside
- **AVOID IM** in patients with active bleeding (hematoma risk) — use subQ/oral when possible
- Stable subQ injection sites: abdomen, upper arm

8. PATIENT EDUCATION

- Food sources: GREEN LEAFY VEGETABLES (spinach, kale, broccoli, brussels sprouts), liver
- ⚠️ If on WARFARIN: CONSISTENT green-leafy intake — do NOT avoid, do NOT mega-eat (keep steady)
- Report any unusual bleeding or bruising to HCP
- Expect 24–48 h for full INR correction after reversal dose
- Newborn injection prevents life-threatening brain bleed — essential
- Carry medical alert card if on warfarin

9. NCLEX TEST TRAPS ⚠️

- **TRAP:** Vitamin K reverses WARFARIN, NOT heparin. Heparin → PROTAMINE sulfate.
- **TRAP:** Warfarin patient told to 'avoid all green vegetables' = WRONG. Teach CONSISTENCY.
- **TRAP:** IV push rapidly = anaphylaxis/cardiac arrest. Always dilute, infuse slowly.
- **TRAP:** Newborn refusing K shot — not optional; explain hemorrhagic disease risk (serious bleeding)
- **TRAP:** Broad-spectrum antibiotics ↓ gut flora → ↓ vit K → ↑ INR in warfarin patients
- **TRAP:** Liver disease → low clotting factors. Vit K only helps if liver can synthesize (may need FFP instead)

10. MEMORY BOOSTERS

- **"K for KLOTting & KOUMADIN reversal"**
- **Factors activated:** "1972" → factors 10, 9, 7, 2 (and proteins C, S)
- **Antidote pairs:** Warfarin → VIT K • Heparin → PROTAMINE • Benzos → FLUMAZENIL • Opioids → NALOXONE
- **"Green leafy = steady":** consistency beats avoidance with warfarin
- **"Newborn Needs K":** sterile gut = no vit K production at birth



CLINICAL JUDGMENT SNAPSHOT

- ▶ **#1 PRIORITY RISK:** ANAPHYLAXIS/cardiac arrest with rapid IV administration; bleeding if deficient; warfarin resistance after over-reversal.
- ▶ **WHAT HARMS FIRST:** Respiratory/cardiac collapse in minutes if IV given too fast; intracranial bleed in untreated newborn or severe deficiency.
- ▶ **FIRST NURSING ACTION:** Choose SAFEST route (oral > subQ > IM > IV). If IV required: DILUTE, infuse SLOWLY over ≥30 min, have epinephrine at bedside, monitor VS q5min. For newborn: administer IM in vastus lateralis within 1 hour of birth per protocol.



ALL VITAMINS — AT-A-GLANCE COMPARISON

Last-minute NCLEX review (<60 seconds)

Vitamin	Key Role	Source	Deficiency	Toxicity	#1 NCLEX Pearl
A (Retinol)	Vision, skin, immunity	Liver, carrots, dairy	Night blindness, xerophthalmia	Hepatotox, teratogenic	Cat X in pregnancy
B1 Thiamine	Carb metabolism, CNS	Whole grains, pork	Wernicke's, beriberi	Low	GIVE BEFORE GLUCOSE
B9 Folate	DNA synthesis	Leafy greens, fortified	NTDs, megaloblastic	Masks B12 def	PRE-conception daily
B12 Cobalamin	RBC + myelin	Meat, fish, eggs, dairy	Pernicious anemia, neuropathy	Low	IM lifelong if pernicious
C Ascorbic	Collagen, antioxidant	Citrus, peppers, berries	Scurvy	Kidney stones	↑ iron absorption
D Calciferol	Calcium, bones	Sun, fatty fish, fortified milk	Rickets, osteomalacia	HYPERCALCEMIA	↑ dig toxicity
E Tocopherol	Antioxidant	Oils, nuts, seeds	Hemolytic anemia (preemie)	BLEEDING	Hold pre-op 1–2 wks
K Phytonadione	Clotting factors 2,7,9,10	Green leafy, liver	Bleeding, hemorrhagic disease NB	Low	Warfarin antidote; IV SLOW

★ TOP 10 NCLEX HIGH-PRIORITY PEARLS

- 1. THIAMINE (B1) BEFORE GLUCOSE in alcoholics — prevents Wernicke's
- 2. Vitamin K reverses WARFARIN (not heparin — that's PROTAMINE)
- 3. IV Vitamin K must be DILUTED and infused SLOWLY — anaphylaxis risk
- 4. Isotretinoin = Category X — 2 forms of contraception, monthly pregnancy tests
- 5. Vitamin D + Digoxin → ↑ dig toxicity via hypercalcemia
- 6. B12 deficiency masked by folate → irreversible neuro damage
- 7. Pernicious anemia → LIFELONG B12 injections (no intrinsic factor)
- 8. Vitamin E + warfarin → bleeding; hold vitamin E 1–2 weeks pre-op
- 9. Folic acid PRE-conception prevents neural tube defects
- 10. Warfarin patients → CONSISTENT green leafy intake, not avoidance

— End of Infographic —

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