PHARMACOLOGY · ANTICONVULSANT

NEUROLOGICAL · HYDANTOIN CLASS

Phenytoin (Dilantin)

A high-yield review of the classic anti-seizure drug — mechanism, toxicity thresholds, IV safety, classic side effects, and NCLEX traps every nursing student must master before exam day.

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> 📚 ***Source note:*** *Phenytoin is not covered in the uploaded personal reference notes. Content drawn from standard NGN NCLEX 2026 references: Saunders Comprehensive Review, ATI Pharmacology Made Easy, Lippincott's Pharmacology, and current FDA labeling.*

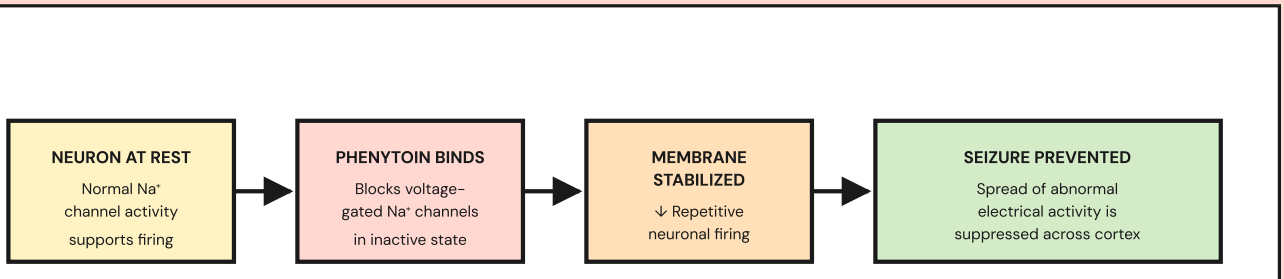
1

Definition & Overview

- **Phenytoin (Dilantin)** — a **hydantoin anticonvulsant** that stabilizes neuronal membranes to prevent and control seizures.
- **Primary uses:** tonic-clonic (grand mal) seizures, complex partial seizures, and **status epilepticus** (IV form).
- **Other uses:** trigeminal neuralgia, certain cardiac dysrhythmias (Class IB antiarrhythmic effect), and prevention of post-neurosurgical seizures.
- **Why it matters:** narrow therapeutic window, dangerous IV administration profile, and life-threatening drug interactions make it one of the most heavily tested anticonvulsants.

2

Mechanism of Action



Phenytoin works selectively on overactive neurons — sparing normal brain activity

3

Therapeutic & Toxic Levels

RANGE	LEVEL (MCG/ML)	WHAT YOU'LL SEE
Subtherapeutic	< 10	Seizures still occur
Therapeutic	10 – 20	Seizure control, no toxicity
Mild toxicity	20 – 30	Nystagmus, ataxia
Severe toxicity	> 30	Slurred speech, lethargy, coma

⚡ MEMORY HOOK

Therapeutic window is the same as **Theophylline (10–20)**. Both narrow therapeutic index drugs — both toxic above 20.

4

Signs of Toxicity

🟡 EARLY (MILD)

- **Nystagmus** (earliest sign)
- Ataxia / unsteady gait
- Drowsiness
- Slurred speech
- Diplopia (double vision)

🔴 LATE (SEVERE)

- **Confusion / lethargy**
- Hypotension
- Cardiac dysrhythmias
- Respiratory depression
- Coma

🚨 RED FLAG PEARL

Nystagmus is the **earliest** sign of phenytoin toxicity — always check eye movements on assessment.

5

Classic Side Effects

SYSTEM	EFFECT	WHY IT MATTERS / NURSING IMPLICATION
Oral / Dental	**Gingival hyperplasia** (overgrowth of gums)	Most classic side effect — meticulous oral hygiene, dental visits every 3 months
Integumentary	Hirsutism (excess hair growth)	Distressing — especially for female / pediatric clients
Skin (severe)	**Stevens-Johnson Syndrome** 🚨	STOP drug immediately if rash develops — life-threatening
Hematologic	Bone marrow suppression, folate deficiency	Monitor CBC; supplement folic acid
Hepatic	Hepatotoxicity	Monitor LFTs; report jaundice, dark urine
Urinary	Pink, red, or brown urine	**Harmless** — reassure the client (TEST TRAP)
CNS	Drowsiness, dizziness, cognitive slowing	No driving until stable response established
Endocrine	Decreases effectiveness of oral contraceptives	Backup non-hormonal birth control required

6

IV Administration — High-Stakes Safety Rules

DILUENT & COMPATIBILITY

- Mix **ONLY with 0.9% Normal Saline**
- **NEVER mix with D5W** — phenytoin **precipitates** in dextrose
- Use an **in-line filter**
- Flush line with NS **before and after**
- Do NOT mix with any other medication

RATE & MONITORING

- Max rate: **50 mg/min** (adult)
- Elderly / cardiac: **25 mg/min**
- **Continuous cardiac monitoring** required
- Monitor BP every 15 min during infusion
- Have resuscitation equipment ready

PURPLE GLOVE SYNDROME

- Caused by **IV infiltration / extravasation** of phenytoin
- Skin discoloration → edema → potential tissue necrosis
- **Stop infusion immediately**, do NOT remove catheter, elevate limb, notify HCP

CARDIAC RISKS

- **Hypotension** (most common)
- Bradycardia, heart block, dysrhythmias
- Cardiac arrest if pushed too rapidly
- **Slow the rate** if BP drops or HR slows

7

Priority Nursing Interventions (ABCs first)

A AIRWAY / BREATHING

- **Assess** respiratory rate and depth before/during IV push
- **Monitor** for respiratory depression with toxicity
- Have suction and oxygen at bedside

C CIRCULATION

- **Continuous cardiac monitoring** during IV administration
- **Monitor BP** q15 min — slow rate if hypotensive
- Assess for dysrhythmias, bradycardia

S SAFETY

- **Seizure precautions:** padded side rails up, bed low, suction & O_2 ready
- Fall precautions (ataxia, dizziness)
- **Never abruptly discontinue** — taper to avoid status epilepticus

M MONITORING

- **Serum phenytoin levels** (10–20 mcg/mL)
- **CBC** (bone marrow suppression)
- **LFTs** (hepatotoxicity)
- Albumin level (low albumin → ↑ free drug → toxicity)
- Assess for nystagmus, ataxia each shift

8

Critical Drug Interactions

INTERACTION	EFFECT	NURSING ACTION
Warfarin	↑ bleeding risk (initially); levels may shift	Monitor INR closely
Oral contraceptives	↓ effectiveness — unplanned pregnancy risk	Use backup non-hormonal contraception
Other anticonvulsants (valproic acid, carbamazepine)	Altered levels of both drugs	Monitor serum levels of all anticonvulsants
Alcohol (acute)	↑ phenytoin level → toxicity	No alcohol use
Alcohol (chronic)	↓ phenytoin level → seizure risk	Honest assessment of intake
Tube feedings (enteral)	↓ absorption → subtherapeutic levels	Hold feeds 1–2 hrs before and after dose
Antacids, calcium, dairy	↓ absorption	Separate by at least 2 hours
Folic acid supplements	May ↓ phenytoin level	Monitor levels when starting/stopping

9

NCLEX Test Traps ⚠

✗ TRAP	✓ TRUTH
"I'll dilute the phenytoin in D5W for the IV push."	Phenytoin precipitates in dextrose — **ONLY 0.9% Normal Saline** is compatible.
"My urine is reddish-brown — I'm going to the ER."	Pink/red/brown urine is a **harmless** side effect — reassure the client; no intervention needed.
"I felt great this week so I stopped taking my phenytoin."	**Never abruptly discontinue** — can trigger **status epilepticus**. Must be tapered.
"My birth control pill and phenytoin are both daily — easy."	Phenytoin **decreases the effectiveness of oral contraceptives** — backup method required.
Push IV phenytoin rapidly to control the seizure faster.	Rapid IV push → **hypotension, dysrhythmias, cardiac arrest**. Max 50 mg/min (25 mg/min elderly).
"Nystagmus? Probably just tired — keep dosing."	Nystagmus is the **earliest sign of toxicity** — hold dose, draw level, notify HCP.
"Continue tube feeds right through the phenytoin dose."	Tube feedings **significantly reduce absorption** — hold feeds 1–2 hours before & after the dose.

10

Patient & Family Education

DAILY LIVING

- **Take with food** to reduce GI upset
- **Same time daily** — do not skip or double up
- **Never stop abruptly** — status epilepticus risk
- Wear a **medical alert bracelet**
- Do not drive until response is stable
- Avoid alcohol entirely

SELF-MONITORING

- **Excellent oral hygiene** — brush, floss, dental visits every 3 months (gingival hyperplasia)
- Report **any rash** immediately (Stevens-Johnson)
- Report sore throat, fever, easy bruising (bone marrow suppression)
- Report jaundice, dark urine, RUQ pain (hepatotoxicity)
- **Pink/brown urine is normal** — no alarm needed
- Use **backup birth control** (non-hormonal)
- Take **folic acid** supplement as prescribed
- Keep all lab appointments for serum levels

11

Memory Mnemonic — "PHENYTOIN"

PHENYTOIN

P **P**ink/brown urine (harmless — reassure)

H **H**yperplasia of gums (gingival overgrowth → oral hygiene)

E **E**nds contraceptive effectiveness (backup birth control)

N **N**ystagmus = earliest toxicity sign

Y **Y**ellow skin/eyes (jaundice → hepatotoxicity)

T **T**oxic above 20 mcg/mL (therapeutic 10–20)

O **O**nly Normal Saline for IV (precipitates in D5W)

I **I**nteractions many (warfarin, OCPs, alcohol, tube feeds)

N **N**ever stop suddenly — status epilepticus risk

🧠 QUICK ASSOCIATION

"Phenytoin = Pink urine, Puffy gums, Purple glove" — the 3 P's of Dilantin.

🧠 TOXIC THRESHOLD TRIO

Phenytoin and Theophylline both share the therapeutic range of **10–20**. Toxic at >20.

12

NCJMM Clinical Judgment Scenario

Scenario

A 52-year-old client with a history of tonic-clonic seizures is admitted for new-onset breakthrough seizures. The HCP prescribes IV phenytoin 1000 mg loading dose. The client takes phenytoin 300 mg PO daily at home along with warfarin and an oral contraceptive. On arrival: BP 138/82, HR 88, RR 18, alert but reports "blurred and doubled vision" and "feeling clumsy this past week." Phenytoin level on admission:

24 mcg/mL

. The nurse is preparing to set up the IV.

1

RECOGNIZE CUES

Relevant: phenytoin level 24 mcg/mL (toxic), diplopia, ataxia ("clumsy"), home meds include warfarin & oral contraceptive, breakthrough seizures, IV loading dose ordered. **Irrelevant:** stable BP and HR (no current cardiac compromise).

2

ANALYZE CUES

Client is already exhibiting **signs of phenytoin toxicity** (nystagmus features — diplopia and ataxia at level >20). Giving an additional loading dose now could push the level dangerously higher → cardiac dysrhythmias, hypotension, coma. Drug interactions with warfarin (INR fluctuation) and oral contraceptives (failure → unplanned pregnancy) also require attention.

3

PRIORITIZE HYPOTHESES

#1 priority: phenytoin toxicity with risk for cardiac and respiratory compromise if loading dose given. **#2:** ineffective seizure management (breakthrough activity). **#3:** drug-interaction-related complications (bleeding, contraception failure).

4

GENERATE SOLUTIONS

Hold the IV loading dose and clarify the order with the HCP. **Notify** HCP of toxic level and symptoms. **Monitor** cardiac rhythm, BP, neurologic status, and INR. **Implement** seizure & fall precautions. **Educate** the client about backup birth control and reporting any new rash.

5

TAKE ACTION

(1) **Hold** the IV phenytoin loading dose. (2) **Notify** the HCP of toxic level 24 mcg/mL with diplopia and ataxia. (3) **Place client on continuous cardiac monitoring**. (4) **Initiate seizure precautions** (side rails padded, suction & O_2 at bedside). (5) **Draw repeat level** as ordered. (6) Document findings and SBAR communication.

6

EVALUATE OUTCOMES

Expected: phenytoin level trends toward 10–20 mcg/mL with held doses, diplopia and ataxia resolve, no further seizures, no cardiac dysrhythmias, INR remains in therapeutic range, client verbalizes understanding of contraception backup and skin/oral assessment.

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