

Magnesium Sulfate — $MgSO_4$

An electrolyte with three lives: anticonvulsant in preeclampsia, tocolytic in preterm labor, and a CNS depressant with a very narrow therapeutic window. Know the toxicity signs — they are tested heavily.

OB / MATERNITY

ELECTROLYTES

PHARMACOLOGY

HIGH ALERT MEDICATION

01 Definition & Overview

♦ WHAT & WHY

WHAT IT IS

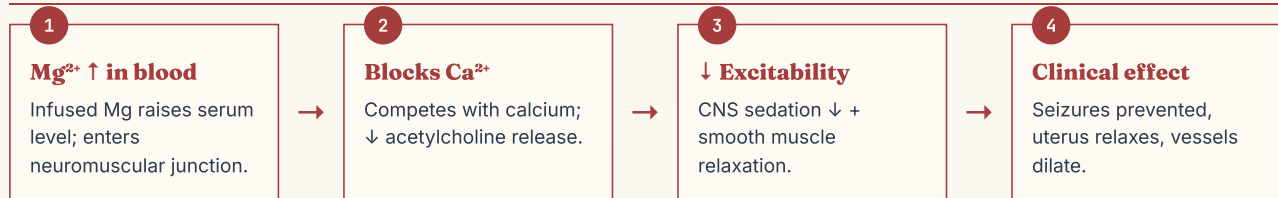
- ▶ An electrolyte that functions as a **CNS depressant**, anticonvulsant, and smooth-muscle relaxant.
- ▶ A **high-alert IV medication** with a narrow therapeutic window — toxicity & death possible.
- ▶ Antagonizes calcium at the neuromuscular junction → blocks acetylcholine release.

WHY IT MATTERS (USES)

- ▶ **Preeclampsia / eclampsia** — prevent & treat seizures
- ▶ **Preterm labor** — tocolytic (uterine relaxation)
- ▶ **Torsades de pointes** — IV push
- ▶ **Severe asthma exacerbation** — bronchodilation
- ▶ **Hypomagnesemia** — replacement

02 Pathophysiology — Simplified

♦ MECHANISM OF ACTION



Key concept: Because Mg^{2+} antagonizes Ca^{2+} , the **antidote for toxicity is calcium gluconate** — it directly reverses the neuromuscular blockade. Remember: *Calcium Antagonizes Magnesium*.

03 Signs & Symptoms of Toxicity

♦ EARLY VS LATE

NORMAL MG	THERAPEUTIC (OB)	TOXICITY BEGINS	CARDIAC ARREST
1.5 – 2.5 mEq/L	4 – 7 mEq/L	> 7 mEq/L 🚩	> 15 mEq/L

♦ EARLY / MILD

THERAPEUTIC RANGE OR SLIGHT EXCESS

- **Diminished DTRs** — the earliest reliable sign
- Warmth & flushing during infusion
- Nausea, mild headache
- Slight drowsiness / lethargy
- Diaphoresis, blurred vision

🚩 LATE / SEVERE RED FLAGS

TOXICITY — STOP INFUSION

- 🚩 **Absent DTRs** (patellar reflex gone)
- 🚩 **Respirations < 12 /min** — respiratory depression
- 🚩 **Urine output < 30 mL/hr** — renal compromise
- 🚩 Hypotension, bradycardia
- 🚩 ↓ LOC, confusion, slurred speech
- 🚩 Cardiac / respiratory arrest

04 Priority Nursing Interventions

◆ ABC • SAFETY • PRIORITIZATION

01 ASSESS respirations every 15–30 min during loading dose, then hourly. **Hold if < 12/min.**

02 KEEP calcium gluconate at bedside — the antidote must be ready BEFORE the infusion starts.

03 MONITOR DTRs (patellar reflex) q1–2h — the earliest indicator of toxicity.

04 MEASURE urine output hourly — Mg is renally excreted; hold if < 30 mL/hr.

05 ADMINISTER via infusion pump — never IV push for maintenance; use continuous monitoring.

06 CHECK serum magnesium levels per protocol (typically q4–6h); maintain 4–7 mEq/L for OB.

07 ASSESS fetal heart rate & contractions continuously if OB; watch for ↓ FHR variability.

08 MAINTAIN seizure precautions — padded rails, suction, O₂, dim lights, quiet room.

09 MONITOR BP & LOC — hypotension and lethargy signal rising Mg.

10 ASSESS for pulmonary edema — auscultate lungs; fluid overload risk.

● HOLD & NOTIFY PROVIDER IF ANY OF THESE 4 OCCUR

< 12

RESP RATE
/MIN

< 30

URINE OUTPUT
ML/HR

0

DEEP TENDON
REFLEXES

> 7

SERUM MG
MEQ/L

05 Pharmacology

◆ DRUG PROFILE

Magnesium Sulfate (MgSO₄)

ELECTROLYTE • ANTICONVULSANT • Tocolytic

MECHANISM

Depresses CNS and blocks peripheral neuromuscular transmission by ↓ acetylcholine release; antagonizes calcium; relaxes smooth muscle.

TYPICAL OB DOSING

- Loading: 4–6 g IV over 15–30 min
- Maintenance: 1–2 g / hr IV via pump
- Always diluted; continuous monitoring

COMMON SIDE EFFECTS

- Flushing, warmth, diaphoresis
- Nausea, headache
- Blurred vision, drowsiness
- Hypotension

NURSING CONSIDERATIONS

- Infusion pump is mandatory
- Continuous cardiac + fetal monitoring
- Strict I&O; Foley often placed
- Serum Mg q4–6h; DTRs q1–2h

Antidote for toxicity → **Calcium Gluconate**

1 g IV over 3 min • keep at bedside

06 NCLEX Test Traps

◆ DON'T FALL FOR THESE

⚠ **First sign of toxicity is LOSS OF DTRs** — NOT respiratory depression. Respiratory depression comes later.

⚠ The antidote is **calcium gluconate**, not naloxone (opioids) or protamine (heparin). Know your antidotes.

⚠ **Check DTRs BEFORE every dose** and throughout the infusion — not just when the patient looks sleepy.

⚠ Warmth & flushing at infusion start is **expected**, not an allergy. Don't stop the drip for this alone.

⚠ **Urine output < 30 mL/hr = HOLD.** Mg is cleared by kidneys; poor output = rising serum Mg = toxicity.

⚠ Don't confuse with oral **magnesium for constipation** — different route, dose, and goal entirely.

⚠ Hyper- vs Hypomagnesemia: **HYPER = sedated, ↓ DTRs, ↓ RR**. HYPO = Trousseau/Chvostek, hyperreflexia, seizures.

⚠ If the patient is on Mg AND receiving a calcium channel blocker → **watch for profound hypotension** — additive effect.

07 Patient Education

◆ TEACH BEFORE & DURING

✓ Expect **warmth, flushing, and a burning sensation** when the infusion starts — this is normal.

✓ **Report immediately:** trouble breathing, chest pain, severe weakness, or inability to urinate.

✓ **Remain on bed rest** with call light in reach; rise slowly if permitted — orthostatic hypotension.

✓ Expect **frequent DTR checks, BP, and blood draws** — they protect you from toxicity.

✓ Report **blurred vision, double vision**, or feeling unusually drowsy.

✓ For OB: **contractions may slow or stop** — this is the intended effect in preterm labor.

✓ A **urinary catheter** is often placed to measure output accurately — it is not permanent.

✓ Environment will be **quiet & dimly lit** for preeclampsia — to reduce seizure risk.

08 Memory Boosters

◆ MNEMONICS & PATTERNS

The 4 R's — when to HOLD Mag

R Reflexes **absent** (no DTRs)

R Respirations < 12 / min

R Renal output < 30 mL/hr

R Really **low BP** (hypotension)

ANTIDOTE CUE

"CALM her down" — **CALcium Magnesium** — **calcium antagonizes magnesium, so it's the antidote.**

PATTERN RECOGNITION

"Mag makes you sag" — **sluggish reflexes, sleepy, slow breathing, soft BP.**

HYPER VS HYPO

HYPER-mag = hypo-everything (↓ DTRs, ↓ RR, ↓ BP). **HYPO-mag = hyper-everything** (↑ reflexes, seizures, Trousseau / Chvostek).