

RVH IV MONOGRAPH

magnesium sulfate

OTHER NAMES MgSO ₄ (error-prone abbreviation)	CLASSIFICATION Electrolyte	pH 5.5 to 7	*HIGH ALERT DRUG * ELDER ALERT See Cautions
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ADMINISTRATION

MODE	DIRECT IV	INTERMITTENT INFUSION	CONTINUOUS INFUSION
	YES	YES	YES
WHO MAY GIVE	See IV Authorization for Nurses		
ADULT	<p>Cardiac Arrest; Dilute 1-2 g to 10 mL with NS and give over at least 1 to 2 min</p> <p>OR and PACU (Analgesic adjunct) : Anesthesia only 0.5 to 2 grams dilute to 10 mL with NS and give over at least 1 to 2 min</p>	<p>Infusion rate varies with indication: see DOSE Maximum rate 150 mg/min Standard Concentrations:: 1 gram in 50 mL NS or D5W 2 gram in 100 mL NS or D5W Doses greater than 2 g: in 100 mL to 250 mL NS or D5W</p> <p>Obstetrics: 4 g in 100 mL NS (BU ONLY) See RVH: PPO <i>Magnesium Administration in the BU for fetal Neuroprotection or Preeclampsia</i> and related Policies ^{20,21}</p> <p>OR and PACU (Analgesic Adjunct) 0.5 g to 2 g in 100 mL NS</p>	<p>Obstetrics: Standard solution 20 g in 500 mL RL. Infuse at ordered rate</p> <p>See RVH: PPO <i>Magnesium Administration in the BU for fetal Neuroprotection or Preeclampsia</i> and related Policies^{20,21}</p>
PEDIATRIC	<p>Pulseless torsade only: ¹⁷ give: over several minutes maximum concentration 200 mg/mL magnesium sulfate</p> <p>For torsade with pulses/or hypomagnesemia: over 10 to 20 minutes</p>	See pediatric mixing chart	Dilute to less than 100 mg/mL Infuse at ordered rate
NEONATE	See above	See NICU mixing chart	
REQUIREMENTS	Direct IV: Administer into tubing of running IV solution. Smart infusion pump for all intermittent and continuous infusions		

MONITORING REQUIRED

DIRECT IV: HR and cardiac monitoring

INFUSIONS: when infusion rates are greater than 2 g/hour:

- Baseline: BP, HR, RR, bilateral deep tendon reflexes (optional when used for control of tetany spasms), and level of consciousness
- Respirations q1h
- Bilateral deep tendon reflexes q1h or continuous BP and ECG monitoring when used for control of tetany spasms
- Fluid balance q1 to 4h or as ordered by physician
- Adults: notify physician if RR less than 12/min, or if urine output less than 120 mL/4 hours⁷
- Pediatrics: for infusions of 20 minutes or less: Monitor HR, BP, RR, and oxygen saturation, at baseline then every 15 minutes for 1 hour then every 30minutes for 1 hour
- Neonates (intermittent infusions): HR, BP, RR, oxygen saturation at baseline and during, ECG

Obstetrics: see *PPO Magnesium Sulphate Admin in Birthing Unit for Fetal Neuroprotection or Preeclampsia*

- BP, HR, RR, bilateral deep tendon reflexes, and level of consciousness; and fetal heart rate as per PPO
- Continuous pulse oximetry – notify physician if O₂ saturation is less than 95%
- Respirations and urine output q1h - notify physician if RR less than 12/min, or if urine output less than 60 mL/2 hours
- Continuously monitor fetal heart rate

Oncology Outpatients Pre and post hydration

- RR, HR, BP pre-infusion, and then prn

OR and PACU

- Cardiac monitoring, HR, BP, RR pre-infusion, and then prn

RECOMMENDED

- Baseline Mg, K+ and Ca++ serum levels: repeat levels as indicated by clinical condition and prior to subsequent doses

RECONSTITUTION

None required. Available 5 g/10 mL vial (500 mg/mL - 50%) **must be diluted to a solution of 20% (200 mg/mL) or less**

INDICATIONS FOR IV USE*HEALTH CANADA APPROVED¹*

- Treatment of hypomagnesemia
- As a CNS depressant, primarily in preeclampsia and eclampsia of pregnancy

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE:

- Torsades de pointes or VF/pulseless VT associated with torsades de pointes^{2,3}
- Fetal neuroprotection of the preterm infant⁴
- Asthma (acute severe exacerbations) unresponsive to 1 hour of intensive conventional therapy²
- Analgesic adjunct to decrease analgesic requirement post-operatively (opioid sparing) ^{18,19}

CONTRAINDICATIONS

➤ *Hypersensitivity to magnesium sulfate or any component of formulation*

- Heart block, myocardial damage^{1,2}

CAUTIONS

- * Elderly or patients with renal impairment: excreted renally¹
- Neuromuscular disease: use with extreme caution those with myasthenia gravis or other neuromuscular disease²
- **Ordering of dosage and labelling of vials may be in grams, milliequivalents or millimoles. Check carefully - see MISCELLANEOUS section for conversions**

DRUG INTERACTIONS: Non-depolarising muscle relaxants - potentiation of relaxant effect¹;

gentamicin - respiratory arrest in unventilated newborn exposed to magnesium sulfate immediately before birth⁵

PREGNANCY/BREASTFEEDING: Consult pharmacy or specialised on-line references for most recent information

COMPATIBILITY/STABILITY

- Stable in dextrose, saline and lactated Ringer solutions for 24 hours, at room temperature⁸
- Products prepared by pharmacy are individually labelled with an expiry date and storage instructions
- For drug-drug compatibility, consult pharmacy or specialised on-line references

ADVERSE EFFECTS ⁹⁻¹¹ Related to serum level: **N.B. adverse effects may occur within therapeutic range**

<u>Serum Level</u> mmol/L	<u>Adverse Effect</u>
~ 2 to 3	lethargy, drowsiness, flushing, nausea, vomiting, diminished deep tendon reflex
~ 3 to 5	somnolence, loss of deep tendon reflexes, hypotension, bradycardia, prolonged PR interval, prolonged QRS interval
~ greater than 5	respiratory paralysis, paralysis, refractory hypotension, AV block, cardiac arrest, coma, death

- Respiratory support, followed by intravenous calcium, is given in magnesium overdose¹

DOSE

- When IV magnesium is given, an abrupt but temporary elevation in plasma magnesium concentration will partially inhibit stimulus to magnesium reabsorption. Up to 50% of infused magnesium will be excreted in urine. Also magnesium uptake by cells is slow and so adequate repletion requires sustained correction of hypomagnesemia¹²

ADULT**Obstetrics for eclampsia or severe pre-eclampsia:**^{7, 13}

- 4 g over 20 minutes, followed by infusion 1 g to 2 g/hour for 24 hours or until 24 hours after delivery – whichever is the later
- **Recurrent seizures:** 2 g over 30 minutes and increase infusion rate to 1.5 g/hour

Obstetrics for fetal neuroprotection of preterm infant: ⁴

- 4 g over 30 minutes, followed by infusion 1 g/hour until birth or until delivery is no longer imminent or a maximum of 24 hours of therapy has been administered

Cardiology:³**Torsades de pointes with pulse (not in cardiac arrest):** 1 to 2 g (in 50 to 100 mL D5W over 15 minutes (range 5 to 60 minutes), may follow with IV infusion of 0.5g to 1 g /hour titrated to effect.

- For ventricular fibrillation/pulseless ventricular tachycardia due to suspected hypomagnesemia or torsades de pointes (cardiac arrest): 1 to 2 g (diluted in 10 mL D5W) as a bolus over at least 1 to 2 minutes.

Hypomagnesemia: ²

- **Mild-to-moderate** (serum concentration 0.5 to 0.69 mmol/L): 1-2 g (up to 0.125 g/kg), over 1 to 2 hours or slower if asymptomatic; do not exceed 12 g over 12 hours.¹¹ Additional supplementations may be required after initial dose with replenishment occurring over several days
- **Severe** (less than 0.5 mmol/L): 4 g administer at 1 to 2 g/hour or slower if asymptomatic¹¹

Asthma (severe exacerbation unresponsive to 1 hour of intensive conventional therapy)

- 2 g IV over 20 to 30 minutes

Oncology¹⁴

Oncology outpatient's pre and post hydration: 4 g (provided as 2 x 2 g/50 mL) given over 30 minutes each 2 g/50 mL bag, Y-sited to a litre bag of infusion solution.

Anaesthesia (analgesic adjunct) ^{17, 18}

- 0.5 g to 2 g pre-op, intra-op or post-op as per anaesthesia

ELDERLY

- Refer to adult dosing²

PEDIATRIC or NEONATE

- RVH dosing: refer to current edition of *SickKids Handbook and Formulary* OR *Lexicomp® – Pediatric and Neonatal Lexi-Drugs*

RENAL IMPAIRMENT ADJUSTMENTS

- **Hypomagnesemia:** reduce dose by 50%.¹¹ Use with caution; monitor for hypermagnesemia
- **Preeclampsia/eclampsia:** severe renal impairment: Per the manufacturer, do not exceed 20 g during a 48 hour period²

HEPATIC IMPAIRMENT ADJUSTMENTS None required**HEMO/PERITONEAL DIALYSIS**

- Magnesium sulfate is removed by dialysis

MISCELLANEOUS

Equivalents: 1 g = 4 mmol = 8.1 mEq

20% solution = 0.2 g/mL = 200 mg/mL = 0.8 mmol/mL = 1.6 mEq/mL

Conversions: mg/dL ÷ 2.4 = mmol/L mEq/L ÷ 2 = mmol/L

- Can be give IM – but is painful
- Subcutaneous – no information available at this time

magnesium sulfate - references

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