



MONOGRAPH

Magnesium

Scope (Staff):	Medical, Pharmacy, Nursing, Anaesthetic Technicians
Scope (Area):	All Clinical Areas

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [DISCLAIMER](#)

! HIGH RISK MEDICINE !

QUICKLINKS

Dosage/Dosage Adjustments	Administration	Compatibility	Monitoring
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DRUG CLASS

Electrolyte.¹

Magnesium is a [High Risk Medicine](#).

INDICATIONS AND RESTRICTIONS

Magnesium salts are used at PCH for the management of:^{1,2,3,4}

- Hypomagnesaemia.
- Severe acute asthma (use magnesium sulfate only). Magnesium administration is an adjunct and should only be considered after conventional therapies have been initiated.
- Torsade de Pointes (use magnesium sulfate only).
- Arrhythmias related to hypomagnesaemia (especially when also associated with hypokalaemia).
- Arrhythmia prevention in patients on cardio-pulmonary bypass (CPB) undergoing cardiac surgery. This should be administered only on the order of a Cardiologist, Anaesthetist or Surgeon. On transfer to Paediatric Critical Care (PCC), further magnesium doses are at the discretion of the PCC Consultant.

- Digoxin toxicity.⁵ The use of magnesium is only a component of management, which may also include decontamination, circulatory support, the use of digoxin immune Fab and correction of other electrolyte disturbances (particularly potassium). Advice from a Toxicologist is essential.
- Bowel preparation prior to colonoscopy.
- Magnesium sulfate paste is used topically in some dermatological conditions.

CONTRAINDICATIONS

- Hypersensitivity to magnesium or any component of the formulation.
- Hypermagnesaemia.³
- There is significant risk of accumulation and hypermagnesaemia in patients with severe renal failure who receive magnesium.⁶
- Patients with heart block.⁶

PRECAUTIONS

- The use of magnesium salts as laxatives is discouraged. Great care should be taken in giving oral magnesium to patients with a colostomy/ileostomy, intestinal obstruction, impaction, perforation, appendicitis and abdominal pain.
- Use with caution in patients with myasthenia gravis.³

FORMULATIONS

Listed below are products available at Perth Children's Hospital (PCH), other formulations may be available, check with pharmacy if required:

Oral formulations:

- Magnesium aspartate 500 mg tablets (37.4 mg elemental magnesium, and which is equivalent to 1.54 mmol/tablet of magnesium)
- Magnesium chloride oral solution (1 mmol/mL of magnesium)
- Magnesium carbonate hydrate 7.4 g/sachet of Picoprep Orange[®], which is equivalent to 72 mmol of magnesium (in combination with sodium picosulfate and citric acid). Other brands may **not** contain the same amount of magnesium. On administration, magnesium carbonate reacts with the citric acid to form magnesium citrate.
- Magnesium alginate 87.5 mg/sachet of Gaviscon Infant[®] (in combination with sodium alginate)

Parenteral formulations:

- Magnesium sulfate ampoules (2 mmol/mL of magnesium)

Standard (premixed) intravenous solutions:

- Magnesium chloride 5 mmol, potassium chloride 20 mmol in sodium chloride 0.45% and glucose 5% 1000 mL (hypertonic). Use of this preparation is covered by the [PCH potassium monograph](#).

Topical formulation:

- Magnesium sulfate paste [Magnoplas[®]] (48%)

Imprest location: [Formulary One](#)

DOSAGE & DOSAGE ADJUSTMENTS**Neonates:** [Refer to Neonatal Medication Protocols](#)

Magnesium doses can be expressed as either units of weight or as millimoles (mmol).

It is also available as a number of different salts, with each having varying amounts of magnesium. In addition, magnesium may be expressed as the total weight of a magnesium salt or as the corresponding weight of elemental magnesium alone.

Care, therefore, must be exercised in interpreting dosing references and in prescribing magnesium.

For this reason, intravenous and intramuscular magnesium must be ordered as mmoles of magnesium (with the preferred magnesium salt specified in brackets).

Oral doses should specify the specific magnesium salt (e.g. magnesium aspartate) required. The prescriber must clearly specify what the dose relates to, that is, either magnesium salt or elemental magnesium.

Hypomagnesaemia

NOTE: Mild hypomagnesaemia may be managed using oral magnesium supplements.

However, the use of intravenous magnesium should be considered in patients with moderate to severe hypomagnesaemia (where a serum magnesium level of < 0.4 mmol/L is generally considered severe).⁷

- ≥ 4 weeks -18 years: IV / Intraosseous: 0.1 - 0.2 mmol/kg/dose [up to 0.4 mmol/kg/dose in severe hypomagnesaemia¹] (maximum 8 mmol/dose) up to 6 hourly, according to blood magnesium concentrations.^{1,2}
- IM: As for IV (Use magnesium sulfate ONLY).²
- ≥ 4 weeks -18 years: Oral: Initially 0.1–0.2 mmol/kg 3 times daily. This may be increased to 0.4–0.8 mmol/kg up to 4 times daily if required.¹

Note: absorption after oral administration is poor and incomplete.⁴ Therefore, this dose should serve as a guide only. The amount of magnesium that can be given orally is often limited by its laxative effects.

Asthma

- > 2 years: IV / Intraosseous: 0.1 - 0.2 mmol/kg (maximum 8 mmol/dose) over 20 minutes¹.

Torsade de Pointes

- ≥ 4 weeks -18 years: IV / Intraosseous: 0.1 – 0.2 mmol/kg/dose (maximum 8 mmol/dose) over 10 - 15 minutes.⁴ However, if the patient is pulseless it is given over 3 to 5 minutes.¹
- If necessary, the dose may be repeated once.⁴

Arrhythmia

- ≥ 4 weeks -18 years: IV / Intraosseous: 0.1 – 0.2 mmol/kg/dose (maximum 8 mmol/dose) over 10 - 15 minutes.⁶

Patients on cardio-pulmonary bypass undergoing cardiac surgery

- ≥ 4 weeks -18 years: IV: 0.1 - 0.2 mmol/kg^{8,9,10} (maximum 8 mmol/dose)⁸ over 10 - 20 minutes, once the aortic cross-clamp is released.

Digoxin toxicity

In patients with identified hypomagnesaemia use:

- ≥ 4 weeks -18 years: IV / Intraosseous: 0.2 mmol/kg/dose (maximum 20 mmol/dose) over 30 to 60 minutes.⁵

Bowel preparation prior to colonoscopy

Refer to the [PCH Colonoscopy Care and Management Guideline](#).

Renal impairment: In severe renal failure due to the significant risk of hypermagnesaemia.⁶

- [eGFR calculator](#)

Hepatic impairment: No dose adjustments required.²

RECONSTITUTION & ADMINISTRATION**IV: Magnesium sulfate**

- Dilute using a compatible fluid to 0.8 mmol/mL, or weaker.¹¹

IV Administration times:

- **Hypomagnesaemia:** Administer at 0.5 mmol/kg/hour (or slower) over no less than 1 hour.
- **Asthma:** 20 minutes¹
- **Torsade de Pointes:** 10 to 15 minutes^{2,4}. Give over 3 to 5 minutes if the patient is pulseless.¹
- **Other arrhythmias:** 10 to 15 minutes⁶
- **Patients on CPB undergoing cardiac surgery:** 10 to 20 minutes
- **Digoxin toxicity:** 30 to 60 minutes⁵

IM: use magnesium sulfate ONLY

- Dilute to 0.8 mmol/mL using a compatible fluid.¹¹
- Magnesium (as sulphate) may be given intramuscularly; however, it is a painful procedure and is only indicated where parenteral administration is required but intravenous access is unavailable.
- The PCH procedure for IM drug administration should be observed and is found here; [Intramuscular injections](#).

Topical:

- Magnesium sulfate paste (Magnoplasm®) is applied (approximately 5 mm thick) to the affected area and covered with a non-adhesive dressing which should be changed after 12-24 hours.¹²

COMPATIBILITY (LIST IS NOT EXHAUSTIVE)**Compatible fluids:** ¹¹

Glucose 5%

Sodium chloride 0.9%

Glucose 5% and Sodium chloride 0.9%

Magnesium **sulfate** is also compatible with Compound Sodium Lactate (Hartmann's) solution¹¹

The following compatibility lists refer to magnesium sulfate only.**Compatible at Y-site:** ¹¹

Amifostine, amikacin, ampicillin, aztreonam, caspofungin, cefotaxime, cefoxitin, ceftazidime, dexmedetomidine, ephedrine sulfate, esmolol, fluconazole, gentamicin, glyceryl trinitrate, heparin sodium, insulin (Novorapid), isavuconazole, labetalol, lidocaine, linezolid, meropenem, metronidazole, micafungin, morphine sulfate, piperacillin-tazobactam, remifentanyl, trimethoprim-sulfamethoxazole, tobramycin, vancomycin.

Only commonly used drugs are listed below. This is not a complete list of incompatible drugs.

[Compatibilities of IV drugs](#) must be checked when two or more drugs are given concurrently.

INCOMPATIBLE drugs: ¹¹

Aminophylline, anidulafungin, azathioprine, calcium chloride, calcium salts, cefepime, ceftriaxone, cefuroxime, ciprofloxacin, clindamycin, dexamethasone, fosaprepitant, ganciclovir, haloperidol lactate, methylprednisolone sodium succinate, pentamidine, potassium phosphates, sodium bicarbonate, sodium phosphates.

Do not mix with any medicine that contains carbonates, bicarbonates or phosphates.

MONITORING

- Blood pressure, pulse, respiratory rate and oxygen saturation should be measured before commencing, after 10 minutes and thereafter every 30 minutes until one hour after administration is completed.
- Continuous cardiac monitoring is to be done at the discretion of the treating Consultant, in which case it is done during the infusion and continued until the magnesium level has corrected (minimum of 2 hours post infusion cessation).
- Renal function
- Blurred vision
- Slurred speech
- Deep tendon reflexes (specifically loss of patellar reflexes)^{3,6}

NOTE: The magnesium infusion **must be stopped** should any of the above parameters become abnormal (which are indicative of hypermagnesaemia).

The **hypermagnesaemia** should then be managed as follows:¹³

- IV sodium chloride 0.9% (to achieve urine output of at least 1 mL/kg/hour)
- IV frusemide (furosemide) boluses (as necessary)
- Dialysis (in patients with renal impairment)
- IV calcium:

Used only in those cases where there is severe neurological or cardiovascular toxicity, or where the above measures are inadequate. The effects of calcium are often transient only. Refer to the [Calcium Monograph](#) for dose and administration guidelines.

Consultation with PCC is mandatory prior to commencing calcium.

Oral and other non-IV magnesium orders must be withheld, and a medical review performed should any of the above parameters become abnormal.

Blood magnesium levels – An initial level should be taken 1 hour after magnesium administration has been completed. Further levels, if necessary, should be taken 4 to 6 hourly.

Calcium and phosphate levels should be measured as necessary following the parenteral administration of magnesium.

Hypomagnesaemia may be associated with tetany, muscle weakness, cardiac arrhythmias, neuropsychiatric changes, convulsions and hypertension.³

ADVERSE EFFECTS

NOTE: Administration of excessive magnesium leading to hypermagnesaemia may result in hypotension, bradycardia, respiratory depression, loss of deep tendon reflexes, poor suck, thirst, drowsiness, confusion, slurred speech and muscle weakness.^{3,4,6}

Common: Diarrhoea, nausea, vomiting when given orally.

Infrequent: See note above with regards to hypermagnesaemia.

Rare: See note above with regards to hypermagnesaemia.

STORAGE

Store at room temperature.

Do not refrigerate due to the risk of precipitation.

INTERACTIONS

This medication may interact with other medications; consult PCH approved references (e.g. [Clinical Pharmacology](#)), a clinical pharmacist or PCH Medicines Information Service on extension 63546 for more information.

Please note: The information contained in this guideline is to assist with the preparation and administration of **Magnesium**. Any variations to the doses recommended should be clarified with the prescriber prior to administration

Related CAHS internal policies, procedures and guidelines

[PCH Colonoscopy Care and Management Guideline](#)

[PCH Emergency Department Intraosseous access](#)

[PCH High Risk Medicines Policy](#)

[PCH/KEMH Neonatal Medication Monographs - Magnesium sulfate](#)

[PCH Intramuscular \(IM\) Injections Procedure](#)

[PCH Calcium Monograph](#)

[PCH Parenteral Nutrition Prescribing and Administration Guideline](#)




References

1. Magnesium monograph. In Australian Medicines Handbook – Children's Dosing Companion. 2024. [accessed 6/12/2024]
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