Magnesium sulphate Intravenous for Adults

Who can administer

May be administered by registered competent doctor or nurse/midwife (see below re restrictions for pain management)

Important information

- **Dilute the 50% ampoules** before use - see below re maximum concentrations advised for Central vs Peripheral use
- Note: 50% = 1g in 2ml = 4mmol/2ml (ref 1)
- Up to 50% of an IV dose may be eliminated in the urine, therefore, **slower administration may improve retention** (maximum rate: 1 g/hour in asymptomatic hypomagnesemia) (ref 3)
- In patients not in cardiac arrest, **hypotension and asystole may occur with rapid** administration (ref 3)
- **Take care when calculating doses, rates and volumes** (ref 1)
- For Y-site compatibility see below

Available preparations

Magnesium sulphate	50%	1g	2ml	4mmol Mg in 2ml	Â
Magnesium sulphate	50%	5g	10ml	20mmol Mg in 10ml	
Magnesium sulphate	8%	4g	50ml	16mmol Mg in 50ml	Stocked in Maternity for use as per Q pulse guidelines (loading doses) Also available for use in Haematology/Oncology wards
Magnesium sulphate	4%	20g	500ml	80mmol Mg in 500ml	

Reconstitution

Already in solution

Draw up using a 5 micron filter needle

Infusion fluids

Sodium Chloride 0.9% or Glucose 5%

Methods of intravenous administration

Intermittent intravenous infusion (PREFERRED ROUTE) (administer using an electronically controlled infusion device)

- The 50% solution **MUST** be further diluted before use - mix very thoroughly to avoid layering (ref 1)
- Can add required dose to a suitable volume of infusion fluid (see below re dilutions for central/peripheral line)
- **If a 50ml volume** is used, the residual volume in the infusion line **must be flushed through at the**

same rate to avoid significant underdosing
- Various regimens are used - depending on indication see under 'dose' for examples
- Pre-eclampsia - refer to Q pulse document: 'Hypertensive disorders in pregnancy' **CLN LW 032**

Slow intravenous injection (prevention and treatment of seizures in eclampsia, emergency treatment of severe arrhythmias)(Intravenous **infusion** is preferred in most other situations)

- The 50% solution **MUST** be further diluted before use
- See under DOSE for rates of administration
- In patients not in cardiac arrest, **hypotension and asystole may occur with rapid** administration (ref 3)
- Pre-eclampsia - refer to Q pulse document: 'Hypertensive disorders in pregnancy' **CLN LW 032**

Peripheral line (ref 1)

- **Usual maximum concentration 5%** i.e. 5g (20mmol) in at least 100ml - **suggested practice is to add 1 to 2g to 100ml, or 5g to 250ml** infusion fluid
- If **fluid restricted,** can use a concentration of 10% - i.e. 5g (20mmol) in 50ml. While a central line is preferred for this concentration, a large peripheral line may be used if central line access is unavailable. Monitor for phlebitis. Resite cannula at first signs of inflammation (ref 1, 5)
- **Administer at a rate of 1g (4mmol) per hour**
- **Maximum** rate of administration (except in emergencies) is 2g (8mmol) per hour
- Higher rates of administration (up to 9g (36mmol)per hour) have been used in critical care or emergencies. ECG and close monitoring of adverse reactions is required. Decrease rate of administration if bradycardic
- **Slower administration may improve retention** as up to 50% of a dose administered IV may be eliminated in the urine(ref 3)

Central line

- In most situations, consider using the same dilutions as listed above for peripheral use
- If required, the maximum concentration is 20%- each 1ml of 50% injection solution with 1.5ml diluent (e.g. 4g (16mmol)to 20ml)
- **Administer at a rate of 1g (4mmol) per hour**
- **Maximum** rate of administration (except in emergencies) is 2g (8mmol) per hour
- **Higher rates** of administration (up to 9g (36mmol) per hour) have been used in critical care or emergencies. ECG and close monitoring of adverse reactions is required. Decrease rate of administration if bradycardic
- **Slower administration may improve retention** as up to 50% of a dose administered IV may be eliminated in the urine (ref 3)

Dose in adults

Hypomagnesaemia

Usual dose

- Dose is guided by daily magnesium levels
- Up to 40g (160mmol), **given over a period of up to five days** (ref 2)
- Dose given depends on the amount required to replace the deficit (allowing for urinary losses) (ref 2)

Initial doses (ref 3)

Mild to moderate deficiency (0.4 to 0.6mmol/L)

- Give 1 to 4g (4 to 16mmol)
- Administer at a maximum rate of 1g per hour if asymptomatic
- **Maximum** rate of administration (except in emergencies) is 2g per hour

Severe deficiency (less than 0.4mmol/L)

- Give 4 to 8g (16 to 32mmol)
- Administer at a maximum rate of 1g per hour if asymptomatic
- Rate may be increased if patient is symptomatic
- **Maximum** rate of administration (except in emergencies) is 2g per hour (in emergencies- up to 9g per hour has been given- ECG monitoring is required in this situation)
- **Subsequent doses:** guided by levels and the patient's clinical condition. Repeated doses may be needed - up to 40g (160mmol) may be needed **over up to a five day period** (allowing for urinary losses) (ref 2,4)

Severe acute asthma or continuing respiratory deterioration in anaphylaxis (ref 2)

- Give 1.2 to 2g over 20 minutes
- ECG monitoring is required

Emergency treatment of severe arrhythmias

- Give 2g over 10 to 15 minutes
- Dose may be repeated once if necessary
- ECG monitoring is required

Eclampsia, Fetal neuroprotection

- See Q pulse document: **CLN LW 032**, **CLN LW 0055**

As part of parental nutrition regimen

- Approximately 10 to 20mmol (2.5 to 5g) per day
- Note: GUH purchases parenteral nutrition bags which already contain some magnesium - check the parenteral nutrition bag for exact quantities
- Magnesium must be given separately to PN - addition to PN bag is not permitted without written pharmacy advice in patient's notes

For use in pain management (Prescribed by Anaesthetics or Pain team only) (ref 6,7)

- **Bolus dose:**
  - Up to 2g over 30 minutes (critical care areas only for this rate)
  - Up to 2g over 60 minutes (all ward areas)
- **Subsequent doses (all ward areas)**
  - Repeat doses of 1g every eight hours as required, while monitoring magnesium levels
- Monitor blood pressure, heart rate, respiratory rate and saturations
- Patient must be on bedrest for the duration of the infusion

Renal dose (ref 4)

- Doses may need to be reduced in renal impairment
- Contraindicated in renal failure.
- Monitor magnesium levels closely

Hepatic impairment

- Hepatic coma: Do not use in hepatic coma if there is a risk of renal failure.

- Hepatic failure/encephalopathy: Contraindicated

Monitoring

- Monitor blood pressure, respiratory rate, heart rate, urinary output and for signs of overdose (ref 1)
- Monitor magnesium, calcium and other electrolyte levels
- **Signs of toxicity:** Flushing, thirst, hypotension, drowsiness, nausea, vomiting, confusion, loss of tendon reflexes due to neuromuscular blockade, muscle weakness, respiratory depression, cardiac arrhythmias, coma and cardiac arrest.
- Neuromuscular blockade associated with magnesium may be reversed with calcium gluconate at a dose of 2.5 to 5mmol calcium

Storage

Store below 25^{0}C

References

1: Injectable medicines administration guide Medusa, accessed online 26th Feb 2019

2: BNF accessed online13th March 2019

3. Uptodate, accessed online 13th March 2019

4: Martindale accessed online 13th March 2019

5. Injectable Drugs guide- downloaded via http://www.medicinescomplete.com/ April 24th, 2019

6. Expert opinion Dr Olivia Finnerty, Anaesthetics Oct 1st 2019

7. Magnesium - a versatile drug for anesthesiologists, Korean j Anaesthesiol 2013 July 65

Therapeutic classification

Electrolyte