

Intravenous - ADULT

Magnesium sulfate

There is potential for medication error as labelling of the strength of magnesium sulfate injections varies between products/suppliers. See below for further information.

Take extra care when calculating doses/volumes required.

MEDICINE NAME:

Magnesium sulfate

TRADE NAME(S):

PRESENTATION OF MEDICINE:

Magnesium sulfate 10% (100mg/mL), contains magnesium **0.4mmol/mL**

- Ampoules containing:
 - **200mg (0.2g) in 2mL** magnesium sulfate, equivalent to magnesium **0.8mmol in 2mL**.^(1a)
 - **1g in 10mL** magnesium sulfate, equivalent to magnesium **4mmol in 10mL**.^(1a,b)
- Vials (available as an NHS 'Special') containing:
 - **5g in 50mL** magnesium sulfate equivalent to magnesium **20mmol in 50mL**.^(9a)

Magnesium sulfate 20% (200mg/mL), contains magnesium **0.8mmol/mL**

- Ampoules containing:
 - **2g in 10mL** magnesium sulfate equivalent to magnesium **8mmol in 10mL**.^(1c)
- Vials (available as an NHS 'Special') containing:
 - **4g in 20mL** magnesium sulfate equivalent to magnesium **16mmol in 20mL**.^(9a)
 - **10g in 50mL** magnesium sulfate equivalent to magnesium **40mmol in 50mL**.^(9a)

Magnesium sulfate 50% (500mg/mL) contains magnesium **2mmol/mL**

- Ampoules containing:
 - **1g in 2mL** magnesium sulfate equivalent to magnesium **4mmol in 2mL**.^(1d,e)
 - **2.5g in 5mL** magnesium sulfate, equivalent to magnesium **10mmol in 5mL**.^(1d,e)
 - **5g in 10mL** magnesium sulfate, equivalent to magnesium **20mmol in 10mL**.^(1d,e)
- Vials containing:
 - **10g in 20mL** magnesium sulfate, equivalent to magnesium **40mmol in 20mL**.^(1e)
 - **25g in 50mL** magnesium sulfate equivalent to magnesium **100mmol in 50mL**.^(1e)
 - **50g in 100mL** magnesium sulfate equivalent to magnesium **200mmol in 100mL**.^(1e)

METHOD OF ADMINISTRATION

Doses may be expressed as grams (or milligrams) of magnesium sulfate or mmols of magnesium. 1g magnesium sulfate is equivalent to 4mmols magnesium.

Hypomagnesaemia

IV infusion: Give using a controlled infusion device (preferably a syringe pump).⁽⁵⁾ Local practice varies, but it is common to give the infusion over 2 to 6 hours. An infusion rate of 1g magnesium sulfate (4mmol magnesium) per hour is recommended.⁽¹⁴⁾

A maximum infusion rate (except in emergencies) of 2g magnesium sulfate (8mmol magnesium) per hour is used in most clinical scenarios.

Higher infusion rates of up to 9g magnesium sulfate (36mmol magnesium) per hour, may be given⁽⁵⁾ e.g. in critical care, or in the management of emergencies at ward level. ECG and close monitoring of adverse effects (see below) is required. The rate should be reduced if the patient becomes bradycardic.

Magnesium sulfate 50% must ALWAYS be diluted before use (refer to dilution section below).

Other indications

Regimens vary between hospitals; refer to local guidelines. The BNF recommends the following:⁽⁵⁾

- **Severe acute asthma, continuing respiratory deterioration in anaphylaxis (unlicensed)**
IV infusion: 1.2-2g magnesium sulfate (4.8-8mmol magnesium) over 20 minutes.
- **Emergency treatment of serious arrhythmia**
IV infusion: 2g magnesium sulfate (8mmol magnesium) over 10-15 minutes.
- **Treatment and prevention of seizures in pre-eclampsia**
Initially by IV injection (loading dose:) 4g magnesium sulfate (16mmol magnesium) over 5-15 minutes followed by:
IV infusion (maintenance dose): 1g magnesium sulfate (4mmol magnesium) per hour for 24 hours.

For peripheral administration a maximum concentration of magnesium sulfate 5% is recommended.⁽⁸⁾ For prevention and treatment of seizures in pre-eclampsia, magnesium sulphate 10% or 20% solution is frequently used due to fluid restriction.

Concentrations over 5% have a high osmolarity and may cause venous irritation and tissue damage in cases of extravasation.⁽⁸⁾ If a central venous access device is unavailable, administer via a large peripheral vein monitoring insertion site closely using a recognised phlebitis scoring tool. Re-site cannula at first signs of inflammation.

INSTRUCTIONS FOR DILUTION AND SUITABLE DILUENT

Magnesium sulfate 50% must ALWAYS be diluted before use.^(1d,e)

- Dilute with glucose 5% or sodium chloride 0.9%.⁽⁵⁾
- Mix thoroughly, inverting the syringe or bag at least 5 times to avoid 'layering'.

A maximum concentration of **magnesium sulfate 5% (50mg/mL)** is recommended for peripheral administration.⁽⁸⁾

- Dilute each 1mL of magnesium sulfate 50% with at least 9mL of diluent; for example a dose of 5g magnesium sulphate (20mmol magnesium) in at least 100mL of diluent.⁽¹⁰⁾
- Suggested practice is to dilute up to 5g magnesium sulfate (20mmol magnesium) in 250mL of diluent.⁽¹⁰⁾

To prepare a 10% solution (100mg/mL):

- Dilute each 1mL of magnesium sulfate 50% with 4mL of diluent.
- Suggested practice is to dilute 5g magnesium sulphate (20mmol magnesium) in 50mL of diluent.⁽¹⁰⁾

The **maximum concentration** suitable for IV administration is magnesium sulfate 20% (200mg/mL; 0.8mmol/mL magnesium).⁽⁵⁾

To prepare a 20% solution (200mg/mL):

- Dilute each 1mL of magnesium sulfate 50% with 1.5mL of diluent.
- For example, dilute 4g magnesium sulphate (16mmol magnesium) in 20mL of diluent.
- **Refer to local specialist or critical care guidance before using a concentration of 20%.**

FLUSHING:

IV injection or infusion: Flush with sodium chloride 0.9% or glucose 5%

ADVERSE EFFECTS WHICH MAY BE CAUSED BY INJECTABLE ADMINISTRATION AND SUGGESTED MONITORING:

Adverse effects

- Hypermagnesaemia (signs include flushing, thirst, respiratory depression, nausea and vomiting, loss of patellar reflexes, drowsiness, double vision, slurred speech, hypotension, bradycardia and coma).^(1,3,5)
- Hypocalcaemia.^(1,3,5)
- Phlebitis.

Monitoring:

- **Hypomagnesaemia:** Monitor blood pressure, respiratory rate, heart rate, ECG, urinary output, and signs of hypermagnesaemia.^(3,5)
- **Severe acute asthma:** Monitoring of blood pressure and heart rate during administration is advised due to the risk of hypotension.
- In patients with underlying cardiac issues, ECG monitoring should also be in place.

OTHER COMMENTS:

1. Store between 2°C and 25°C.⁽¹⁾

PRODUCTS THAT POSE A HEIGHTENED RISK OF ERROR DUE TO SIMILARITY IN PRESENTATION/PACKAGING OR UNCLEAR LABELLING:

There is potential for medication error associated with injectable magnesium sulfate products because the labelling of the strength of magnesium sulfate injections varies between products/suppliers, and may be expressed as different combinations of the following:-

% magnesium sulfate
mmol of magnesium ions
mg of magnesium sulfate
grams of magnesium sulfate
mg of magnesium ions
mEq of magnesium

This information may be given as per mL and/or per container. This variation is known to have resulted in medication errors. Please take extra care when calculating doses/volumes required.

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