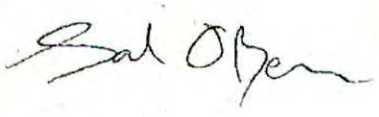
NHS Grampian

Guidance For The Management Of Hypomagnesaemia In Adult Patients By Healthcare Professionals Working Within NHS Grampian

Author:	Consultation Group:	Approver:
Lead Pharmacist Medicines Information	See Page 1	Medicines Guidelines and Polices Group

Signature:		Signature:
		

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Policy Statement:

It is the responsibility of all staff to ensure that they are working to the most up to date and relevant guideline, policies, protocols and procedures.

Version 6

Executive Sign-Off

This document has been endorsed by the Director of Pharmacy and Medicines Management

Signature: 

Replaces: NHSG/Hypomag/MGPG1252, Version 5

Document application: NHS Grampian Acute/Primary Care

Revision History:

Revision Date	Summary of Changes	Changes Made
February 2025	Introduction and Objectives section generated.	Section 1 and 1.1 (page 3)
February 2025	Causes updated and categorised.	Section 2 (page 3)
February 2025	Signs and symptoms updated and categorised. Further detail added.	Section 3 (page 4)
February 2025	Additional information added to treatment section, unlicensed options removed from oral treatments, intravenous information reformatted.	Section 4 (page 5)
February 2025	Slight re-structuring to adverse effect section. MHRA notice added.	Section 6 (page 8)
February 2025	Added guidance for renal impairment.	Section 4 (page 5)
February 2025	Changed placement of 'signs and symptoms' and causes, added investigations.	Section 2 and 3 (pages 3/4)
February 2025	Title change for new template.	Title

Consultative Group

Name:	Title:
Dr Alex Graveling	Clinical Lead for Endocrinology
Andrea O'Farrell	Rotational Pharmacist
Brian Porteous	Renal Pharmacist
Charity Shonge	Clinical Pharmacist
Mia Wood	Rotational Pharmacist

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1. Introduction

This guidance is for use within Primary or Secondary care in NHS Grampian.

The NHS Grampian reference range for magnesium in plasma is 0.70 to 1.0mmol/L.

The adult human body contains 25g of magnesium or 1,000mmol of magnesium. Most of the body's magnesium is located in bone, muscles and other soft tissues. About 1% is found in the serum.

1.1 Objectives

To support the identification and classification of hypomagnesaemia.

To support the treatment of hypomagnesaemia and appropriate monitoring of patients.

1.2 Inclusion Criteria

- Adult patients with hypomagnesaemia.

1.3 Exclusion Criteria

- Intravenous magnesium for the treatment of pre-eclampsia.
- Intravenous magnesium for the treatment of acute severe asthma.

2. Signs and Symptoms of Hypomagnesaemia

Most patients are asymptomatic until serum magnesium concentration is <0.5mmol/L, but some patients remain asymptomatic even with severe hypomagnesemia.

Hypomagnesaemia is often accompanied by hypokalaemia and hypocalcaemia, which may be responsible for many clinical features.

Early symptoms:

- Nausea, vomiting
- Loss of appetite
- Fatigue and weakness

As magnesium deficiency worsens, symptoms can include:

- Numbness
- Muscle tingling, contractions, and cramps
- Depression, agitation, psychosis, apathy
- Vertical nystagmus
- Vertigo
- Choreiform and athetoid movements

Severe hypomagnesaemia may lead to:

- Seizures
- Atrial arrhythmias, ventricular arrhythmias (may be life-threatening)
- Drowsiness, confusion, delirium, coma

3. Causes of Hypomagnesaemia

Please note, this list is not exhaustive.

3.1 Redistribution of Magnesium from Extracellular to Intracellular Compartment

- Refeeding syndrome
- Hungry bone syndrome after parathyroidectomy
- Treatment of diabetic ketoacidosis
- Acute pancreatitis
- Alcohol withdrawal syndrome

3.2 Decreased Intestinal Absorption of Magnesium

- Inadequate dietary intake (unlikely to be sole cause, but may exacerbate in presence of other risk factors)
- Anorexia nervosa
- Alcohol use disorder
- Acute or chronic diarrhoea
- Malabsorption and steatorrhea
- Small bowel bypass surgery
- Vomiting and nasogastric suction
- Gastrointestinal fistula
- Laxative abuse
- Medication (e.g. proton pump inhibitors)
- Short bowel syndrome

3.3 Increased Urinary Excretion of Magnesium

- Hypercalcaemia
- Medications (e.g. loop and thiazide diuretics, digoxin, amphotericin B, aminoglycosides, foscarnet, cisplatin, cetuximab, tacrolimus, ciclosporin)

3.4 Endocrine Conditions Associated With Hypomagnesaemia

- Diabetes mellitus
- Hyperthyroidism
- Hyperaldosteronism
- Hypoparathyroidism

3.5 Other Causes

- Recovery phase of acute tubular necrosis.
- Severe burns
- Pregnancy (due to increased magnesium demand and volume status)

4. Investigations

- Serum magnesium
- Urea and electrolytes
- Serum calcium

Depending on the clinical presentation and patient history, consider:

- ECG
- Serum phosphate
- Thyroid function tests
- Glucose
- Urinalysis (in pregnancy)

The above list is not exhaustive.

5. Treatment of Hypomagnesaemia

The specific regimen for magnesium supplementation is dependent upon the magnesium level and the clinical presentation of the patient. See Figure 1 for guidance.

Investigate and address underlying causes, where applicable.

Correct hypocalcaemia and hypokalaemia, if present.

Figure 1:

Magnesium level (mmol/L)	Management required
<0.4	IV Magnesium Admission to hospital required.
0.40 to 0.49 **and** symptomatic	IV Magnesium Admission to hospital required.
0.40 to 0.49 **and** asymptomatic	Oral Magnesium required.
0.50 to 0.70 **and** symptomatic	Oral Magnesium required.
0.50 to 0.70 **and** asymptomatic	No management required. Consider oral supplementation and ongoing monitoring.
>0.70	No management required.

5.1 Oral Magnesium Supplementation

Normal Dose: 15 to 24mmol/day in divided doses

See Figure 2 for information on options for oral magnesium supplementation.

Please note: Oral magnesium supplements are contraindicated in severe renal impairment (eGFR <30mL/min) due to the risk of magnesium accumulation and severe hypermagnesaemia. No dose adjustment is necessary in patients with mild to moderate renal impairment. If treatment is required in patients with severe renal impairment, consider seeking specialist advice. Due to the lack of information in this patient group and the manufacturer's contraindication, treatment should only be prescribed if absolutely necessary, at 50% of the usual dose, with close monitoring, and should be de-prescribed promptly once hypomagnesaemia has resolved.

Monitoring: Magnesium levels should be monitored, and therapy should be reviewed on a weekly basis. Discontinue treatment if levels are stable and within the normal therapeutic range.

Figure 2: Oral Magnesium Supplementation

1st Line				
Medication	**Magnesium content**	**Dose**	**Directions for administration**	**Additional information**
Magnesium aspartate dihydrate (Magnaspartate®)	10mmol (243mg) per sachet	1 to 2 sachets per day.	Dissolve the contents of each sachet in 50 to 200mL of water, tea or orange juice and take immediately.	Licensed for administration via gastric, duodenal, and nasal feeding tubes.
2nd Line				
Magnesium citrate (Magnesium Kora Healthcare Tablets)	4mmol (97mg) per tablet	1 to 2 tablets given 3 times per day.	Oral use.	The tablets may be broken in half using the score line. The score line is present only to facilitate breaking for ease of swallowing and not to divide into equal doses.
Magnesium Glycerophosphate (Neomag®)	4mmol (97mg) per tablet	1 to 2 tablets given 3 times per day.	Oral use.	The tablets may be broken into quarters and chewed or swallowed whole with water. The score line is present only to facilitate breaking for ease of swallowing and not to divide into equal doses.

5.2 Intravenous Magnesium Supplementation (Acute Setting Only)

<table>
<tr><th colspan="2">Magnesium sulphate injection 50%w/v* (50%w/v = 500mg/mL = 2mmol/mL)</th></tr>
<tr><td colspan="2">1mmol magnesium is contained in approximately 250mg magnesium sulphate (0.5mL of 50%w/v injection)</td></tr>
<tr><td>Contraindications</td><td>Heart block (class I-III), myocardial damage and myasthenia gravis, hepatic encephalopathy, severe renal impairment (eGFR <25mL/min), anuria.</td></tr>
<tr><td rowspan="2">Dose and administration

Note: The contents of the infusion bag must be mixed thoroughly, inverting the bag at least 5 times to avoid 'layering'.</td><td>1st 24 hours:

Dilute 10mL of 50% solution (5g; 20mmol) in at least 250mL sodium chloride 0.9% or glucose 5%, and administer as an intravenous infusion over 3 hours. This dose may be repeated once during the first 24 hours, guided by serum magnesium levels.

Please note: In patients with renal impairment, it has been suggested to give 25 to 50% of the normal dose.</td></tr>
<tr><td>24 hours onward:

Dilute up to 12mL of 50% solution (6g; 24mmol) in at least 250mL sodium chloride 0.9% or glucose 5%, and administer as an intravenous infusion over 6 hours.

Repeat dose daily, with daily monitoring until magnesium is normal. A total of 5 days therapy may be required.

Please note: In patients with renal impairment, it has been suggested to give 25 to 50% of the normal dose.</td></tr>
<tr><td>Maximum concentration</td><td>Peripheral administration: 50mg/mL (5%, 0.2mmol/mL)

Central administration: 200mg/mL (20%, 0.8mmol/mL)</td></tr>
<tr><td>Infusion rate</td><td>Recommended infusion rate: 1g magnesium sulphate (4mmol magnesium) per hour.

Maximum infusion rate (excluding emergencies): 2g magnesium sulphate (8mmol magnesium) per hour (to minimise urinary excretion).

Absolute maximum infusion rate (for use in critical care or in the management of emergencies at ward level): 9g magnesium sulphate (36mmol magnesium) per hour.</td></tr>
<tr><td>Monitoring</td><td>ECG monitoring is recommended, especially in the elderly.
Blood pressure, respiratory rate, heart rate, urinary output, monitor for signs of hypermagnesaemia, and monitor magnesium, calcium and other electrolyte plasma levels.

Extravasation may cause tissue damage.</td></tr>
</table>

*****Alternative intravenous preparations (e.g. magnesium 10%w/v) are available and may be used in some specialist areas only (e.g. ITU, HDU, theatres) and are not covered in this guidance.

6. Adverse Effects Related To Magnesium Administration

- Diarrhoea (following oral administration)
- Effects associated with hypermagnesaemia
- Nausea
- Vomiting
- Flushing
- Thirst
- Hypotension
- Drowsiness
- Confusion
- Loss of tendon reflexes due to neuromuscular blockade
- Respiratory depression
- Slurred speech
- Double vision
- Muscle weakness
- Cardiac arrhythmias
- Coma
- Cardiac arrest

If any of these signs/symptoms are observed, magnesium levels should be rechecked and treatment reviewed.

Maternal administration of magnesium sulfate for longer than 5 to 7 days in pregnancy has been associated with hypocalcaemia, hypermagnesaemia, and skeletal side-effects in neonates (MHRA 2019)

7. References

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8. Responsibilities for implementation

Organisational:	Chief Executive and Management Teams
Corporate:	Senior Managers
Departmental:	Heads of Service/Clinical Leads
Area:	Line Managers
Hospital/Interface services:	Group Clinical Directors
Operational Management Unit:	Unit Operational Managers