

# HYPERMAGNESEMIA CAUSES, NURSING ASSESSMENT, AND TREATMENT

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**H**ypermagnesemia is a serious electrolyte imbalance that can lead to various complications, including cardiac and neuromuscular disturbances. Nurses are critical in recognizing and managing hypermagnesemia by performing a comprehensive nursing assessment, monitoring electrolyte levels and cardiac function, and initiating appropriate treatment interventions. Early recognition and treatment of hypermagnesemia can help prevent severe complications and improve patient outcomes.

## HYPERMAGNESEMIA

### NURSING ASSESSMENT AND INTERVENTIONS



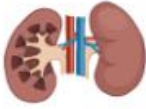
## NORMAL MAGNESIUM LEVELS & HYPERMAGNESEMIA

Normal magnesium levels can range from 1.9 to 2.2 mg/dL.

### MAGNESIUM LEVELS

- **Normal Levels:** 1.9 – 2.2 mg/dL
- **Mild Hypermagnesemia:** 2.5– 3.0 mg/dL
- **Moderate Hypermagnesemia:** 3.0 – 5.0 mg/dL
- **Severe Hypermagnesemia:** >5 mg/dL

Like with most electrolytes, the **kidneys play a crucial role in regulating magnesium levels** in the blood. You can read more about [how the body regulates magnesium here](#). Hypermagnesemia is not too common of an electrolyte abnormality and is pretty limited on what actually can cause this. This includes:



### KIDNEY DYSFUNCTION

The kidneys are responsible for filtering magnesium from the blood and excreting it through the urine. When the kidneys are not functioning properly, magnesium levels can build up in the blood, leading to hypermagnesemia. This can occur in patients with **chronic kidney disease** or **acute kidney injury**.

**Antacids** or **laxatives** with magnesium in them should be avoided in patients with End-stage Renal disease (ESRD) as it can cause a significant buildup of magnesium in the blood.



### EXCESSIVE MAGNESIUM INTAKE

One of the most common causes of hypermagnesemia is the excessive intake of magnesium-containing supplements or medications. This can occur when patients take **high doses of magnesium supplements** to treat conditions like constipation or migraines, or when they are administered magnesium-containing medications in hospital settings. This is **usually combined with Kidney failure** unless a massive quantity is taken in a person with normal kidney function.



### IV MAGNESIUM SULFATE DRIP

Pregnant women with pre-eclampsia are often placed on an IV magnesium sulfate drip to prevent seizures. This can increase their magnesium levels between 5-7 mEq/L.



### MAGNESIUM ENEMA

Epsom salt enemas are not recommended as they can raise the serum magnesium to dangerous levels, even as high as 6-16 mEq/L!!



### OTHER CONDITIONS

Mild hypermagnesemia (and asymptomatic) can occur in a variety of other medical conditions and scenarios including:

- Primary hyperparathyroidism
- DKA
- Tumor lysis syndrome
- Lithium
- Milk-alkali syndrome
- Adrenal insufficiency (Addison's disease)

## NURSING ASSESSMENT OF HYPERMAGNESEMIA

### SYMPTOMS

Symptoms of hypermagnesemia are directly correlated with the level of the magnesium in the blood.



### MAGNESIUM 4 — 6 MEQ/L:

- Nausea and vomiting
- Flushing
- Drowsiness or lethargy
- Decreased deep tendon reflexes



### MAGNESIUM 6 — 10 MEQ/L

- Somnolence
- Hypocalcemia
- Absent Deep tendon reflexes
- Hypotension
- Bradycardia
- ECG changes (discussed below)



### MAGNESIUM OVER 10 MEQ/L

- Muscle paralysis (flaccid quadriplegia)
- Apnea and respiratory failure
- Complete heart block
- Cardiac arrest



#### NOTE

High magnesium levels tells the parathyroid gland to stop secreting as much parathyroid hormone, which can lead to **low calcium levels (hypocalcemia)** which can also cause ECG changes.

## PHYSICAL ASSESSMENT

The physical assessment of a patient with hypermagnesemia will also depend on the severity of the magnesium levels and other factors.



### VITAL SIGNS

- **Temp:** Normal
- **HR:** May be low in severe cases
- **BP:** May be Lower
- **SPO2:** Usually normal unless respiratory failure
- **Respirations:** usually normal



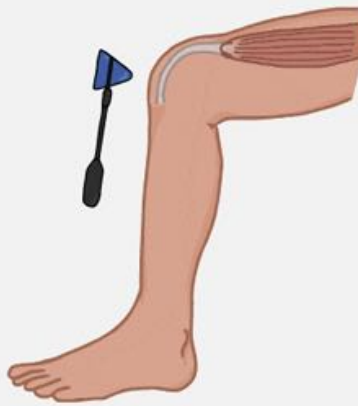
### INSPECTION

- May appear lethargic, drowsy, or weak
- May have facial flushing



## HOW TO CHECK DEEP TENDON REFLEXES

- 1 Position the patient:** Ask the patient to relax and sit or lie in a comfortable position. Have the patient place their legs hanging over the edge of the bed.
- 2 Locate the tendon:** Identify the tendon you want to test. Commonly tested tendons include the patellar tendon (knee jerk), Achilles tendon (ankle jerk), and biceps tendon (elbow jerk). We are going to be talking about the patellar tendon since that is the easiest and most common.
- 3 Strike the tendon:** Use a reflex hammer or your stethoscope to strike the tendon directly and briskly. Be sure to hit the tendon, not the muscle belly, as this can produce an inaccurate response.
- 4 Observe the response:** Observe the limb's movement and the magnitude and duration of the reflex response. Normal reflexes are typically brief and mild, with a quick contraction and relaxation of the muscle.
- 5 Interpret the response:** Interpret the response based on the degree of reflex contraction.
- 6 Repeat on the other side:** Repeat the test on the opposite side for comparison.



## TREATMENT FOR HYPERMAGNESEMIA

Treatment for hypermagnesemia aims to reduce serum magnesium levels and address any underlying causes. Treatment is going to depend on what their kidney function is. Common treatment strategies include:

1

### ASSESS THE PATIENT

Ensure they don't have any symptoms and are stable, including recent vital signs.

2

### STOP MAGNESIUM

Stop any magnesium infusions or medications if the patient is currently getting them.

3

### CARDIAC MONITOR

Make sure your patient is on the [cardiac monitor](#). Obtain an ECG if not already done.

4

### NOTIFY THE PROVIDER

Notify the provider of the magnesium levels, your assessment, and their cardiac rhythm.

5

### ENSURE IV ACCESS

Make sure the patient has good access with at least one good IV.

6

### ADMINISTER TREATMENT

Administer medications that are ordered (discussed below).

Treatment for hypermagnesemia aims to reduce serum magnesium levels and address any underlying causes. Treatment is going to depend on what their kidney function is. Common treatment strategies include:



## STOP MAGNESIUM

Stopping magnesium intake will typically bring levels back down to normal pretty quickly in the absence of renal failure.



## DIURETICS

Diuretics like Loop diuretics (Lasix) or thiazide diuretics can also be used to lower magnesium levels pretty safely



## ISOTONIC FLUIDS

IV isotonic fluids like Normal saline should be given in moderate cases of kidney failure to help restore kidney perfusion/function. Should not be given if the patient is anuric (and on dialysis).



## DIALYSIS

May be required if the patient is already on dialysis or if the above measures fail. This can lower magnesium to non-toxic ranges within 2-4 hours.



## IV CALCIUM GLUCONATE

Like hyperkalemia, giving IV calcium can help reverse hypermagnesemia's neuromuscular and cardiac effects. However, this is given in a **lower dose** and over a longer period, with a recommended 100-200mg of elemental calcium over 5-10 minutes.

For a 10% calcium gluconate infusion, that would be 1-2mL (as opposed to 10mL given for Hyperkalemia).

## MONITORING OF HYPERMAGNESEMIA

Monitoring patients with hypermagnesemia involves cardiac monitoring and trending the magnesium levels.



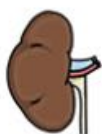
## MAGNESIUM LEVELS

Serum magnesium levels should be monitored frequently in patients with hypermagnesemia to assess the effectiveness of treatment and adjust interventions as needed. This is particularly important for patients with impaired kidney function or those receiving magnesium-containing medications, as they may be at increased risk for hypermagnesemia.



## OTHER ELECTROLYTES

Besides magnesium levels, nurses should monitor other electrolyte levels, including calcium, potassium, and sodium, which may be affected by hypermagnesemia or its treatment. Hypocalcemia, in particular, can be a serious complication of hypermagnesemia and should be closely monitored and treated as needed.



## KIDNEY FUNCTION

Patients with hypermagnesemia should be monitored for signs of kidney dysfunction, particularly those with pre-existing kidney disease or impaired renal function. Creatinine and BUN should be monitored regularly (at least daily while in the hospital).





## CARDIAC MONITORING

Patients with hypermagnesemia should be closely monitored for signs of cardiac arrhythmias, particularly those caused by prolonged QT intervals (see ECG changes below).



## RESPIRATORY STATUS

Monitor for signs of respiratory depression, particularly those with severe hypermagnesemia or impaired respiratory function. Patients may require [intubation](#), mechanical ventilation, or other interventions to maintain adequate oxygenation and ventilation.



## NEURO STATUS

Patients with hypermagnesemia may experience neuromuscular irritability or depression, which can manifest as muscle twitching, cramping, or weakness. These patients are fall risks and should not be getting up without assistance!

# HYPERMAGNESEMIA ON THE ECG

Magnesium is a critical electrolyte that is crucial in regulating cardiac function, particularly in maintaining normal cardiac rhythm. However, hypermagnesemia can disrupt cardiac conduction and lead to various cardiac arrhythmias, including:

- **Bradycardia:** Excessive magnesium can cause a slowing of the heart rate, which can manifest as bradycardia on ECG.
- **Heart block:** Hypermagnesemia can interfere with the normal conduction of electrical impulses in the heart, leading to heart block, manifesting as a widened QRS complex on ECG.
- **Cardiac arrest:** In severe cases of hypermagnesemia (levels > 15 mg/dL), the excessive accumulation of magnesium can cause complete cardiac arrest.

On ECG, hypermagnesemia can manifest in the following ways:

- **P waves:** Flattened
- **PR interval:** Prolonged (> 200ms)
- **QRS complex:** Widened (>120ms)
- **QT Interval:** Prolonged (>500ms)
- **T waves:** Peaked

It is important to note that hypermagnesemia can also exacerbate cardiac arrhythmias caused by other electrolyte imbalances, such as hyperkalemia, hypokalemia, or hypocalcemia.

### PQRST CHANGES WITH HYPERMAGNESEMIA



- P WAVE FLATTENING
- PR INTERVAL PROLONGED
- QRS COMPLEX WIDENED
- QT INTERVAL PROLONGED
- T WAVES PEAKED

Hypermagnesemia is a complex condition that can have serious consequences for patients, particularly those with impaired renal function or those taking magnesium-containing medications or supplements.

Nurses play a critical role in recognizing the signs and symptoms of hypermagnesemia, monitoring electrolyte levels and cardiac function, and initiating appropriate treatment interventions.

With proper nursing assessment and timely treatment, hypermagnesemia can be effectively managed to prevent severe complications such as cardiac arrhythmias, respiratory depression, and neuromuscular irritability or depression. By staying vigilant and proactive in their care, nurses can help promote optimal patient outcomes and improve the overall quality of care for patients with hypermagnesemia.

Also check out:

- [Managing hypomagnesemia: A complete guide to nursing assessment and treatment of low magnesium levels](#)
- [Nursing Interventions for Hypokalemia: A Comprehensive Guide for Nurses](#)
- [Treatment for Hyperkalemia: A nurse's comprehensive guide to high potassium levels](#)
- [How to Read an EKG Rhythm Strip](#)
- [Intravenous Fluids: Types of IV Fluids](#)
- [The Ultimate ABGs Blood Gas Guide you Need to Calm Your Nerves](#)
- [AFIB RVR on EKG: Management of Atrial Fibrillation](#)

## REFERENCES

### UPTODATE & OTHER DATABASE SOURCES:

- [Hypermagnesemia: Causes, symptoms, and treatment \(UTD\)](#)
- [Hypermagnesemia \(FPNotebook\)](#)
- [HYPERMAGNESEMIA \(LITFL\)](#)

### TEXTBOOKS

- [Medical-surgical nursing: Assessment and management of clinical problems | 9th edition](#)
- [ELECTROLYTE DISORDERS AND ARRHYTHMOGENESIS \(JOURNAL OF INNOVATIONS IN CARDIAC RHYTHM MANAGEMENT\)](#)
- ECG POCKET BRAIN 2014 EXPANDED VERSION (6TH ED.)