SPECIAL REGION (1)
Union of Myanmar

STANDARD OPERATING PROCEDURE

Diagnosis and Management of Hypocalcemia

Version: 1.0

Effective Date: 6 April 2026

Review Date: 6 April 2028

Approved by: Internal Medicine Unit

1. Purpose

To provide a standardized approach using corrected calcium for the diagnosis and management of hypocalcemia in clinical practice. This protocol ensures consistent, evidence-based care across all healthcare settings within the region.

2. Core Principle

> **Fundamental Rule**
>
> All clinical decisions must be based on **corrected calcium**, not raw total calcium measurements.

3. Definition

Hypocalcemia is defined as a corrected serum calcium level below the established clinical threshold.

> **Hypocalcemia = Corrected Ca < 8.5 mg/dL**

4. Corrected Calcium Formula

> **Corrected Ca = Measured Ca + 0.8 × (4 − Albumin)**
>
> *Where albumin is measured in g/dL and calcium in mg/dL*

Classification of Hypocalcemia

Mild	8.0 – 8.5 mg/dL

Moderate	7.0 – 7.9 mg/dL
Severe	**< 7.0 mg/dL**

5. Causes of Hypocalcemia

Most Common Causes

- Vitamin D deficiency
- Chronic kidney disease
- Hypomagnesemia

PTH-Related Causes

- Hypoparathyroidism (post-surgical)
- Pseudohypoparathyroidism

Acute Causes

- Acute pancreatitis
- Sepsis
- Massive transfusion

Drug-Induced Causes

- Bisphosphonates
- Loop diuretics
- Anticonvulsants: Enzyme-inducing anticonvulsants (phenytoin, phenobarbital, carbamazepine) carry a high risk of hypocalcemia; valproate has a mild or uncertain risk; newer agents such as levetiracetam and lamotrigine have minimal to no risk.

6. Clinical Features

Neuromuscular Manifestations

- Perioral numbness
- Muscle cramps
- Tetany

Clinical Signs

- Chvostek's sign
- Trousseau's sign

Central Nervous System

- Irritability
- Seizures

Cardiac Manifestations

- Prolonged QT interval
- Arrhythmias

Respiratory Manifestations

- Laryngospasm (*emergency situation*)

7. Red Flags

> **Critical Warning Signs**
>
> **Seizures, tetany, QT prolongation, and laryngospasm** require immediate intervention.
>
> *Do NOT wait for corrected calcium results if the clinical picture is obvious.*

8. Diagnostic Workup

Initial Mandatory Tests

- Total calcium
- Albumin (for correction calculation)
- Magnesium
- Phosphate
- Creatinine

Aetiology Workup

- Parathyroid hormone (PTH)
- Vitamin D level

9. Management

Management of Hypocalcemia (Direct Treatment)

Severe Hypocalcemia

- IV calcium gluconate 10 mL over 10 minutes
- If symptoms persist: repeat every 10–20 minutes (up to 2–3 doses)
- Maintenance calcium gluconate infusion:

- 50 mL of 10% calcium gluconate (≈ 450 mg elemental Ca), diluted in 500 mL normal saline or 5% dextrose
- Infusion rate: 50–100 mL/hour

Mild to Moderate Hypocalcemia

- Calcium carbonate: 1–2 g elemental Ca/day in divided doses

Magnesium Correction

> **Magnesium Sulphate Administration**
>
> **Dose:** 1–2 g IV over 1 hour
>
> **Without magnesium correction, calcium will not respond.**

Oral magnesium has a limited role in non-severe conditions. Use IV magnesium if any of the following apply:

- Mg < 1.2 mg/dL
- Seizures
- Arrhythmia
- Severe hypocalcemia
- ICU patient

> **Monitoring Protocol**
>
> Recheck calcium daily after initiation of calcium therapy; recheck magnesium and phosphate as clinically indicated.

Management of Underlying Conditions

Table 1 Etiology-Based Management of Hypocalcemia

CATEGORY	CAUSE	KEY MECHANISM	MANAGEMENT

Most Common	Vitamin D deficiency	Decreased Ca absorption	High-dose vitamin D + oral calcium
	Chronic kidney disease	Decreased calcitriol + increased phosphate	Calcitriol + phosphate binders + calcium
	Hypomagnesemia	Decreased PTH secretion/action	Magnesium replacement (IV/oral) ± calcium
PTH-Related	Hypoparathyroidism (post-surgery)	Decreased PTH	Calcium + calcitriol (active Vit D)
	Pseudohypoparathyroidism	PTH resistance	Calcium + calcitriol
Acute Causes	Acute pancreatitis	Calcium sequestration (saponification)	Supportive care ± IV calcium if symptomatic
	Sepsis	PTH resistance + redistribution	Treat sepsis + IV calcium if severe
	Massive transfusion	Citrate binds calcium	IV calcium with frequent monitoring
Drugs	Bisphosphonates	Decreased bone resorption	Calcium + vitamin D (may need IV Ca)
	Loop diuretics	Increased urinary Ca loss	Discontinue drug + calcium replacement
	Anticonvulsants	Increased vitamin D metabolism	Vitamin D + calcium ± switch drug

10. References

[1] Cooper MS, Gittoes NJL. Diagnosis and management of hypocalcaemia. *BMJ*. 2008;336(7656):1298–302.

[2] Bilezikian JP, Brandi ML, Cusano NE, Mannstadt M, Rejnmark L, Rizzoli R, et al. Management of hypoparathyroidism: present and future. *J Clin Endocrinol Metab*. 2016;101(6):2313–24.

[3] Shoback D, Sellmeyer D, Bikle D. Metabolic bone disease. In: Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, editors. *Harrison's Principles of Internal Medicine*. 21st ed. New York: McGraw-Hill; 2022.

[4] Kidney Disease: Improving Global Outcomes (KDIGO) CKD–MBD Work Group. KDIGO clinical practice guideline for the diagnosis, evaluation, prevention, and treatment of CKD–mineral and bone disorder (CKD-MBD). *Kidney Int Suppl*. 2017;7(1):1–59.

[5] Khan AA, Koch CA, Van Uum S, Baillargeon JP, Bollerslev J, Brandi ML, et al. Standards of care for hypoparathyroidism in adults. *J Endocr Soc*. 2019;3(5):1033–64.

[6] UpToDate. Evaluation of hypocalcemia in adults. Waltham (MA): UpToDate Inc.; 2025.

[7] UpToDate. Treatment of hypocalcemia. Waltham (MA): UpToDate Inc.; 2025.

[8] Agus ZS. Hypomagnesemia. *J Am Soc Nephrol*. 1999;10(7):1616–22.

[9] Tong GM, Rude RK. Magnesium deficiency in critical illness. *J Intensive Care Med*. 2005;20(1):3–17.

[10] Liamis G, Milionis HJ, Elisaf M. Medication-induced hypocalcemia: a systematic review. *QJM*. 2010;103(7):505–15.

[11] Pack AM. The association between antiepileptic drugs and bone disease. *Epilepsy Curr*. 2003;3(3):91–5.

[12] Holick MF. Vitamin D deficiency. *N Engl J Med*. 2007;357(3):266–81.

[13] Dickerson RN. Hypocalcemia in critically ill patients. *Crit Care Clin*. 2001;17(1):139–53.

[14] Bushinsky DA, Monk RD. Electrolyte quintet: calcium. *Lancet*. 1998;352(9124):306–11.