

# Calcium disorders

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## Rationale

In patients with hypocalcemia, tetany and/or seizures may develop, particularly if the onset is acute. Severe or prolonged hypercalcemia may cause irreversible end-organ damage and may be life-threatening.

## Causal Conditions

(list not exhaustive)

- Hypocalcemia
  - a. Loss of calcium from the circulation
    - Hyperphosphatemia (e.g., renal insufficiency)
    - Pancreatitis
    - Osteoblastic metastases
    - Drugs (e.g., ethylenediaminetetraacetic acid [EDTA])
    - Rhabdomyolysis
  - b. Decreased vitamin D production or action
    - Kidney injury
    - Rickets
    - Malabsorption
    - Neonatal
  - c. Decreased parathyroid hormone production or action

- Postoperative (e.g., postparathyroidectomy)
  - Autoimmune
  - Diminished response
- d. Low magnesium
- Hypercalcemia
    - a. Increased intestinal absorption
      - Increased intake (e.g., milk-alkali syndrome)
      - Vitamin D mediated (e.g., sarcoidosis)
    - b. Increased bone resorption
      - Malignancy
      - Hyperparathyroidism
      - Hyperthyroidism
      - Immobilization
    - c. Diminished excretion (e.g., diuretics)

## Key Objectives

Given a patient with either hypocalcemia or hypercalcemia, the candidate will diagnose the cause, severity, and complications and will initiate an appropriate management plan.

## Enabling Objectives

Given a patient with hypocalcemia, the candidate will

- list and interpret critical clinical findings, including
  - a. differentiation between hypocalcemia related to renal disease and hypocalcemia due to other causes; and
  - b. signs and symptoms of tetany;
- list and interpret critical clinical investigations, including

- a. ionized calcium and/or total calcium levels corrected for albumin to assess severity; and
  - b. phosphate, magnesium, parathyroid hormone, and vitamin D levels and renal function assessment; and
- construct an effective initial management plan, including
    - a. administering intravenous calcium if the patient has symptomatic hypocalcemia; and
    - b. determining whether the patient needs specialized care.

Given a patient with hypercalcemia, the candidate will

- list and interpret critical clinical findings, including
  - a. differentiation between hypercalcemia caused by malignancy and hypercalcemia due to other causes;
  - b. volume status of the patient; and
  - c. common physical examination findings associated with hypercalcemia;
- list and interpret critical clinical investigations, including
  - a. ionized calcium and/or total calcium levels corrected for albumin to assess severity; and
  - b. laboratory and imaging investigations to determine the causal condition(s); and
- construct an effective initial management plan, including
  - a. administering fluid resuscitation with or without medications if the patient has severe hypercalcemia; and
  - b. determining whether the patient needs specialized care.