



ELECTROLYTE EMERGENCIES

Potassium · Sodium · Magnesium · Phosphate · Calcium

RATE

kills

POTASSIUM (K⁺)

HYPERKALAEMIA

$K \geq 6.5$ or any ECG change = emergency

Step	Aim	Agent & dose
1 PROTECT	Stabilise myocardium	Calcium gluconate 10% 10 mL IV over 2-3 min ($K \geq 6.5$ or ECG change)
2 SHIFT	Drive K into cells	Insulin 10 U + 25 g glucose IV; salbutamol 10-20 mg neb; bicarbonate only if acidotic
3 REMOVE	Eliminate K	Haemodialysis (definitive in AKI); loop diuretic if urine; binders. Stop K & ACEi/ARB

ECG: peaked T → wide QRS → sine wave. **HYPOKALAEMIA:** max 10 mEq/h peripheral (≤ 40 mEq/L), 10-20 central; ALWAYS replace Mg first.

SODIUM (Na⁺) - rate, not target, is what harms

HYPONATRAEMIA

protect against ODS

- **Max correction** - 8-10 mEq/L / 24 h (≤ 8 if high-risk: Na ≤ 105 , hypokalaemia, alcohol, liver)
- **Acute symptomatic** - 3% saline 100-150 mL IV over 10 min, repeat $\times 2-3$
- **Overcorrecting** - 5% dextrose $\pm$ desmopressin (DDAVP clamp)

HYPERNATRAEMIA

water deficit

- **Correction rate** - chronic: ≤ 0.5 mEq/L/h and $\leq 8-10$ / 24 h (avoid cerebral oedema)
- **Free-water deficit** - $TBW \times [(Na / 140) - 1]$; $TBW = \text{weight} \times 0.6$ (♂) / 0.5 (♀)
- **Replace with** - oral / enteral water, 5% dextrose, or 0.45% saline

MAGNESIUM · PHOSPHATE · CALCIUM - the forgotten electrolytes

MAGNESIUM

normal 1.7-2.2 mg/dL

LOW (common): torsades / arrhythmia, refractory $\downarrow K$ & $\downarrow Ca$, seizures, weakness. Causes: diuretics, GI loss, alcohol, refeeding

Rx: MgSO₄ 1-2 g IV over 15-60 min; torsades 2 g IV push

HIGH (renal + load): $\downarrow$ reflexes, hypotension, respiratory depression. Rx: IV calcium, stop Mg, dialysis

PHOSPHATE

normal 2.5-4.5 mg/dL

LOW: muscle & diaphragm weakness (hard to wean), haemolysis, rhabdo, confusion. Causes: refeeding, DKA Rx, alcohol, sepsis

Rx: IV sodium / potassium phosphate 15-45 mmol over 6-12 h; oral if mild

HIGH: renal failure, tumour lysis, rhabdo. Rx: binders, treat cause, dialysis; watch $Ca \times PO_4$

CALCIUM

ionised 1.1-1.3 mmol/L (total 8.5-10.5 mg/dL) - correct total for albumin, but treat the ionised

LOW: tetany, Chvostek / Trousseau, long QT, seizures, hypotension. Causes: massive transfusion (citrate), pancreatitis, sepsis, $\downarrow Mg$, hypoparathyroid. Rx: calcium gluconate 10% 10 mL IV (CaCl₂ if central / arrest).

HIGH: stones, bones, groans, psychic moans; short QT. > 14 mg/dL = emergency. Rx: 0.9% saline 200-300 mL/h, then calcitonin + IV zoledronate; treat malignancy / hyperparathyroid.

PEARLS & PITFALLS

- Hypokalaemia and hypocalcaemia will not correct until magnesium is replaced - check Mg first.
- A falling phosphate in the first 72 h of feeding is refeeding syndrome until proven otherwise.
- Never give calcium and bicarbonate through the same line - they precipitate.
- For sodium, rate not target kills: too-fast correction causes ODS (hypo) or cerebral oedema (hyper).

