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Acid-Base, Fluids, Lytes Pocketcard Set

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Acid-Base Disorders Basics

Parameter	Normal range		Simple acid-base disorders			
	Arterial	Venous	Met acid	Resp acid	Met alk	Resp alk
pH	7.35-7.44	7.33-7.43	7	7	7	7
pCO ₂	35-44 mmHg	36-46 mmHg	1	0	0	1
HCO ₃ ⁻	21-27 mEq/L	23-29 mEq/L	0	1	0	1
pO ₂	75-100 mmHg	37-47 mmHg				
O ₂ sat	>95%	90%-95%				
BE	-2 to 2					

Examples: • Diarrhea • COPD • Vomiting • Dehydration
• CHF • Resp alk • Diarrhea • Dehydration

Algorithm for Determining Acid-Base Status

Measure blood pH, HCO₃⁻, PaCO₂, SaO₂, and O₂

Flowchart logic:
1. pH < 7.35 (Abnormal) → Metabolic Acidosis → Metabolic Acidosis → Compensation: PaCO₂ ↓ 1.2 mmHg for every 10 mEq/L ↓ in HCO₃⁻ → Calculate Anion Gap (AG) → Causes of non-anion gap metabolic acidosis (DK, M, A, P, L, E, S) and Causes of anion gap metabolic acidosis (DK, M, A, P, L, E, S).
2. pH 7.35-7.44 (Normal) → Normal OR mixed acid-base disorders → Respiratory Acidosis → Compensation: HCO₃⁻ ↑ by 1 mEq/L for each 10 mmHg ↑ PaCO₂ → Causes of anion gap metabolic acidosis (DK, M, A, P, L, E, S).
3. pH > 7.45 (Abnormal) → Respiratory Alkalosis → Compensation: HCO₃⁻ ↓ by 2 mEq/L for each 10 mmHg ↓ PaCO₂ → Causes of anion gap metabolic acidosis (DK, M, A, P, L, E, S).

DK, M, A, P, L, E, S (Anion gap increased)

- DK - Diarrhea (↓ loss of HCO₃⁻ ↑ serum low anion AG)
- M - Renal tubular acidosis (RTA)
- A - Drugs: acetazolamide or topiramate (serum HCO₃⁻ ↓, metabolic) lactic acid or methanol (MMA)
- P - Dehydrat. syndrome
- L - Other: Recovery from hypernatremia (low HCO₃⁻ after pH_i ↑, renal excretion without rapid dilution of serum HCO₃⁻ by H₂O added)
- E - Ethanol, Ethanol metabolism
- S - Sulfonamide antibiotics

DK, M, A, P, L, E, S (Anion gap increased)

- DK - Diabetic ketoacidosis
- M - Renal failure
- A - Methanol
- P - Paraldehyde, propylene glycol, paracetamol acid or 5-oxoproline, acetaminophen toxicity, the common culprit
- L - Lactic acid
- E - Ethylene glycol, ethylene glycol
- S - Starvation ketoacidosis

*Normal values: pH = 7.35-7.44, PaCO₂ = 35-44 mmHg, HCO₃⁻ = 21-27 mEq/L (arterial), 23-29 mEq/L (venous), SaO₂ = 95-100%, O₂ = 75-100 mmHg, BE = -2 to 2.
†Compensation: Respiratory acidosis: HCO₃⁻ ↑ by 1 mEq/L for each 10 mmHg ↑ PaCO₂.
‡Compensation: Respiratory alkalosis: HCO₃⁻ ↓ by 2 mEq/L for each 10 mmHg ↓ PaCO₂.
§Anion gap = [Na⁺] + [Cl⁻] + [Ca²⁺] + [Mg²⁺] - [HCO₃⁻] - [Cl⁻] - [Ca²⁺] - [Mg²⁺].
||Lactate is the most common cause of lactic acidosis. Lactic acidosis is usually symptomatic due to low pH and compensated pH < 7.35 and O₂.
¶Dehydrat. syndrome: metabolic acidosis, increased anion gap, and with increasing severity: tremor, tachycardia, hypotension, and coma with ↑ intracranial pressure and papilloedema in severe cases.
‡Ethylene glycol: usually symptomatic due to low pH and compensated pH < 7.35 and O₂.
§Paraldehyde: usually asymptomatic, but may cause lactic acidosis, a range of degrees of renal, and with increasing severity: tachycardia and arrhythmias with Cheyne-Stokes sign or respiratory arrest in severe cases. Lactate may show hypernatremia, hypernatremia, and mild acute hypernatremia. AG = anion gap increased.

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Synopsis

This quick reference guide contains essential and systematically arranged information to determine the acid-base status of a patient in a stepwise manner. It also contains a section on normal fluid and electrolyte distribution and its management in case of depletion. Highlights: Acid-base normal values and abnormalities chart. Determination of acid-base status in a step by step approach. Formula for anion gap, estimation of fluid requirement in burn (Parkland formula), algorithm explaining diagnostic workup in metabolic alkalosis, hypernatremia, and hyponatremia. Diagnostic algorithms of acidosis, alkalosis, electrolyte abnormalities. Assessment and common causes of acid-base disorders. Diagrammatic representation of body water and electrolyte distribution, and information on electrolyte repletion. Information on fluid and electrolyte management the 4-2-1 rule, electrolyte formulations, and typical fluid intake and output values. For physicians, physician assistants, nurses, students, and all other healthcare professionals.

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