

ABG Interpretation Guide for Respiratory Therapy Students

A compact PulmoLearn reference for identifying acid-base disorders, compensation, oxygenation status, and clinical meaning.

Use the same sequence every time: pH -> PaCO₂ -> HCO₃ -> primary disorder -> compensation -> oxygenation -> clinical context.

What an ABG tells you

An arterial blood gas gives respiratory therapists a snapshot of ventilation, oxygenation, acid-base balance, and metabolic compensation. The key is to follow a consistent sequence so you do not jump to conclusions too early.

Clinical note

Normal ranges are starting points. Always interpret ABGs with FiO₂, oxygen device, diagnosis, baseline status, and bedside assessment.

Normal ABG values

Value	Typical adult range	What it reflects
pH	7.35-7.45	Overall acid-base status
PaCO ₂	35-45 mmHg	Ventilation / respiratory acid
HCO ₃	22-26 mEq/L	Metabolic buffer / renal component
PaO ₂	80-100 mmHg on room air	Oxygenation
SaO ₂	95-100%	Hemoglobin saturation with oxygen

The PulmoLearn ABG sequence

<p>1. Look at pH first Under 7.35 = acidosis. Over 7.45 = alkalosis. Normal pH can still hide a compensated disorder.</p>	<p>2. Check PaCO₂ PaCO₂ moves opposite the pH. High PaCO₂ pushes pH down; low PaCO₂ pushes pH up.</p>
<p>3. Check HCO₃ HCO₃ usually moves with the pH. Low HCO₃ supports metabolic acidosis; high HCO₃ supports metabolic alkalosis.</p>	<p>4. Name the primary disorder The value that best explains the pH is usually the primary problem.</p>
<p>5. Assess compensation If the non-primary system is moving in a helpful direction, compensation is present. Abnormal pH = partial. Normalized pH = compensated.</p>	<p>6. Evaluate oxygenation Interpret PaO₂ and SaO₂ using FiO₂, device, work of breathing, diagnosis, and trends.</p>

Quick pattern recognition

Pattern	pH	PaCO2	HCO3	Common clue
Respiratory acidosis	Low	High	Normal or high if compensated	Hypoventilation, COPD exacerbation, sedation, neuromuscular weakness
Respiratory alkalosis	High	Low	Normal or low if compensated	Hyperventilation, pain, anxiety, hypoxemia, early sepsis
Metabolic acidosis	Low	Normal or low if compensated	Low	DKA, lactic acidosis, renal failure, diarrhea
Metabolic alkalosis	High	Normal or high if compensated	High	Vomiting, diuretics, volume depletion, excess bicarbonate

Oxygenation categories

Oxygenation category	PaO2 range	Quick meaning
Severe hypoxemia	0-39 mmHg	Critical oxygenation problem; assess and escalate urgently.
Moderate hypoxemia	40-59 mmHg	Significant oxygenation problem; evaluate support and response.
Mild hypoxemia	60-79 mmHg	Below expected room-air range; interpret with FiO2 and clinical context.
Normal oxygenation	80-100 mmHg	Typical adult room-air range.

Practice examples

Exam ple	ABG	Interpretation
1	pH 7.28 PaCO2 58 mmHg HCO3 25 mEq/L PaO2 62 mmHg	Primary respiratory acidosis with mild hypoxemia. Low pH + high PaCO2 points to ventilatory failure. HCO3 is not elevated enough to suggest significant compensation.
2	pH 7.50 PaCO2 30 mmHg HCO3 23 mEq/L PaO2 88 mmHg	Primary respiratory alkalosis. High pH + low PaCO2 suggests excessive ventilation. Oxygenation is within the typical adult range on room air.

Common student mistakes

Do not interpret PaO2 without FiO2. Do not skip compensation. Do not treat the numbers only - ABGs should support bedside assessment, not replace it.

Next step: Practice 5 free guided ABG patient cases at pulmolearn.com/abg/ or preview the asthma sample module at pulmolearn.com/asthmasample.html.