



ABG's, Chest X-rays and Lab Values

ABG Normal Values

- pH = 7.35 – 7.45
- pCO₂ = 35 – 45
- HCO₃ = 22 – 26
- BE = -2 - +2
- PaO₂ = 80 – 100 mmHg
- SaO₂ = > 85 %

Problem	pH	pCO₂
Respiratory acidosis	Low	High > 45
Respiratory alkalosis	High	Low < 35

Problem	pH	HCO₃
Metabolic acidosis	Low < 7.35	Low < 22
Metabolic alkalosis	High > 7.45	High > 26

Respiratory Acidosis causes “Think” retaining CO₂ = apnea, COPD, respiratory difficulty, pulmonary edema

Respiratory Alkalosis causes “Think” blowing off CO₂ = situations where respiratory rate is increased (fever, anxiety), early salicylate poisoning, hypoxemia, pulmonary embolus, lung disease

Metabolic Acidosis causes “Think” poor perfusion = cardiac arrest, shock, diarrhea and renal tubular necrosis due decrease bicarbonate and certain poisonings (antifreeze – ethylene glycol), DKA due to increase organic acids

Metabolic Alkalosis causes “Think” electrolyte imbalance = vomiting, diarrhea, NG/OG suctioning, antacid poisoning, diuretics, steroid therapy, to much sodium bicarbonate administered, K⁺ deficiency

The Three Things That KILL COPD Patients Post-Intubation

- Hyperinflation reducing cardiac output
- Pneumothorax
- Metabolic acidosis

Acid-Base Imbalance	Ventilator Management	Other Treatment
Respiratory Acidosis	Increase tidal volume first, then the rate	Treat underlying cause
Respiratory Alkalosis	Decrease patient’s minute volume	Treat underlying cause, Control anxiety, meds
Metabolic Acidosis		Treat the cause, consider Bicarb Kg/4 x base deficit
Metabolic Alkalosis		Treat underlying cause, K ⁺ replacement

Three Killer in Flight

- Tension pneumothorax
- Cardiac tamponade
- Hypovolemia

Chest X-Ray Interpretation

- Adult Respiratory Distress Syndrome (ARDS)
 - Reveals widespread pulmonary infiltrates, **glassy in appearance**
 - RDS in neonates include reticular granular pattern and hypoexpansion
- COPD
 - Hyperinflation of the lungs, narrow and elongated heart shadow, increased anterior-posterior (AP) diameter and flattened hemidiaphragms in a lateral view
 - Most common cause of spontaneous pneumothorax is rupture of subpleural emphysematous BLEBS
- Pnuemonias
 - Lobar infiltrates/consolidation, typically right upper lobe, pleural effusion common, bronchopneumonias in lower lobes
- Congestive Heart Failure

- Reveals cardiomegaly and may show pulmonary vascular congestion and interstitial edema, S3 gallop may also be present with chest auscultation

KETAMINE (ketalar) is the drug of choice for intubation of an asthma patient, because of the drying affect of secretions. Indications to intubate an asthmatic is a pCO₂ of > 55 mmHg

A pleural friction rub with fever can be present with a patient having a pulmonary embolus

Do what ever you can NOT to intubate the COPD patient, only perform if absolutely necessary, refer to critical ABG values for intubation criteria

Acute respiratory failure is defined as pO₂ < 60 and pCO₂ > 50

Signs of hyperventilation and hypocalcemia may indicate Trousseau's sign

Lab Values

Sodium 135 – 145	< 120 can cause seizures, managed with hypertonic saline
Potassium 3.5 – 5.5	> 7 can cause ventricular dysrhythmias, peaked T waves > 5 mm on the ECG
Calcium 8.8 – 10.4	Trousseau's sign (carpal spasms when BP cuff is inflated) and/or Chvostek's sign (cheek tapping produces twitching)
Chloride 95-112	
CO ₂ 24 – 30	< 20 may indicate dehydration, look for acidosis
BUN 6 – 23	Elevated BUN may indicate blood in the gut, dehydration or renal failure
Creatinine 0.6 – 1.4	Elevated indicates renal failure
Glucose 70 – 110	Assess for changes in behavior, treat underlying cause
Serum Os 285 – 295	Maintain < 320 in the head injured/bleed patient to reduce ICP and maintain adequate CPP. The serum os can be decreased by administering Mannitol, hypertonic saline and Lasix
Anion Gap 12 +/- 4	> 16 indicates an underlying metabolic acidosis caused by MUDPILES: Methanol Uremia DKA Paraldehyde Isoniazide/Iron Lactate Ethylene Glycol Salicylate
Anion Gap Formula:	(Na + K) – (Cl + CO ₂)

Magnesium 1.5 – 2.5	Levels at 4 – 8 are indicated to prevent seizures in the pre-eclamptic OB patient. Levels greater than 10 can be toxic and may require the administration of Calcium
Hemoglobin 12 – 18	
Hematacrit 36 – 52 %	
Platelets 140 – 400	< 140, thrombocytopenia
WBC 4.5 – 10.5	
Ammonia	Increased with Reye’s syndrome; hepatic encepholopathy
Adult 15 – 45	Evacuate the bowel of blood (protein increases ammonia levels)
Peds 40 - 80	

>100 Brain Natriuretic Peptide (BNP) is a measurable peptide to help in the diagnosis of congestive heart failure but can be non-specific. > 500 CHF diagnosis Natracor (neseritide) is the synthetic version of BNP

CPK (muscle enzyme) levels greater than 20,000 are ominous and is indicative of later DIC, acute kidney failure and potentially dangerous hyperkalemia in the HEATSTROKE patient

Elevated hematacrit, BUN, serum protein and concentrated urine levels are classic signs of dehydration