

5 Causes of Hypoxemia:

(numbered in order of what's most common)

Hypoxemia

PaO₂ < 60mmHg, +/- low O₂ Sat, +/- Cyanosis

Normal A-a Gradient (<15mmHg)

(Normal Gas Exchange)

2. Hypoventilation

→ low RR, low V_T, or high V_D
 → Result: High PaCO₂
 (>> 40mmHg)

5. Low inspired ppO₂

(FiO₂ ↓ at higher altitude)
 → Lowers P_AO₂ AND PaO₂!
(RARE)
 → Normal PaCO₂!

Central

→ Drugs (i.e. morphine)
 → Coma
 → Hypothyroidism

Chest Wall disorder

→ Obesity
 → Kypho-scoliosis
 → Neuro-muscular dx

Damaged Lung Structure

(more dead space; ↑ V_D)
 → Status asthmaticus (advanced asthma pt unresponsive to SABAs)
 → Advanced COPD

High A-a Gradient (>15mmHg)

(Bad gas exchange: less O₂ transferred from alveoli into blood)

Improves w/ 100% O₂

1. V/Q mismatch (95%)

(not extreme)
 → Airway dx: Asthma, COPD
 → Vascular (i.e. PE)
 → Alveolar: Pneumonia, edema

4. Thickened diffusion barrier

(RARE) at rest, may be problematic only during exertion - ↓ RBC transit time
 → Interstitial Lung Disease (i.e. Asbestosis)
 → Alveolar Disease
 → Pulmonary Vascular Disease

Does NOT improve w/ 100% O₂

3. Right-to-Left Shunt

(V <<< Q; some blood perfusing unventilated regions. Ventilated blood cannot further ↑ O₂ content (Hgb already 100% saturated), so 100% doesn't help)

Alveolar Shunt

(alveoli blocked from ventilation)
 → Intra-alveolar filling (Severe Pneumonia, pulmonary edema)
 → Atelectasis

Vascular shunt within lungs

(blood flow from pulm artery to pulm vein w/out oxygenation at alveoli capillary bed)
 → Arteriovenous malformation

Intracardiac Shunt

(blood not reaching lungs at all)
 → Ventricular septal defect
 → Atrial septal defect

Note: V/Q mismatch happens in normal lungs to a small degree:

