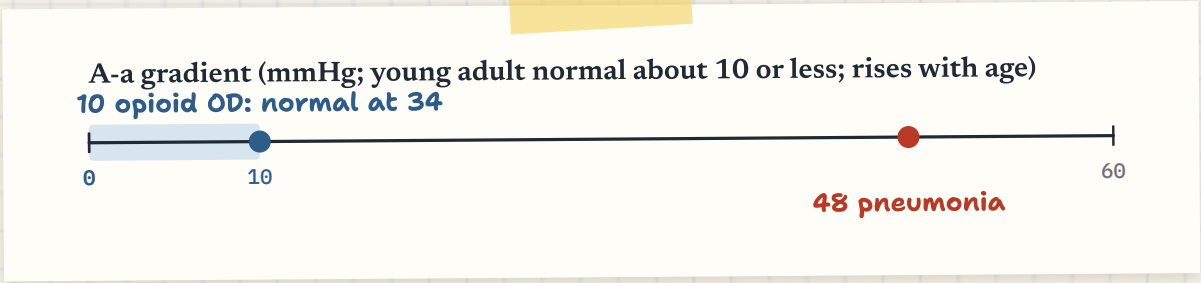
The A-a gradient

Sort the causes of hypoxaemia



Step by step

1. Take PaO_2 and $PaCO_2$ on room air
2. $PAO_2 = 150 - 1.25 \times PaCO_2$
3. Gradient = $PAO_2 - PaO_2$
4. Compare with expected: (age + 10) / 4
5. Normal: breathing or thin air; wide: lung

ALVEOLAR GAS EQUATION

$$PAO_2 = FiO_2(PB - PH_2O) - PaCO_2 / R$$

room air, sea level: $PAO_2 \approx 150 - 1.25 \times PaCO_2$; gradient = $PAO_2 - PaO_2$

Gradient	Cause
Normal	Hypoventilation
Normal	Low inspired O_2 (altitude)
Wide	V/Q mismatch
Wide	Shunt
Wide	Diffusion limitation

Reading the gradient

Rule of thumb

Normal gradient: hypoventilation or thin air

Wide gradient: the lung itself

Divide by R: 1 ÷ 0.8 = 1.25

Exam traps

- Multiplying $PaCO_2$ by R instead of dividing.
- Leaving out the $PaCO_2$ term.
- Forgetting to subtract PaO_2 after calculating PAO_2.
- The age rule varies by source: name your rule.

A-a gradient: the alveolar gas equation and the causes of hypoxaemia

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/respiratory-physiology/a-a-gradient-alveolar-gas-equation

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