

A-a GRADIENT

THE BASICS.

The difference between alveolar & arterial oxygen.

$$PAO_2 - PaO_2$$

THE CALCULATION.

PAO_2 is calculated from the *alveolar gas equation*.

$$PAO_2 = PiO_2 - PaCO_2 / 0.8$$

Inspired O₂ (PiO_2)

- 1 $PiO_2 = FiO_2 \times (\text{barometric pressure} - \text{saturated vapour pressure of H}_2\text{O})$
- 2 $PiO_2 = 0.21 \times (760 - 47) - \text{sea level}$
- 3 $PiO_2 = 150\text{mmHg}$

NORMAL RANGE.

~ 7-14 mmHg @ room air.

- Normal A-a gradient = $(\text{Age} + 10) / 4$
- A-a increases 5 to 7 mmHg for every 10% increase in FiO_2

CLASSIFICATION of HYPOXIA.

Normal A-a Gradient.

1. Alveolar hypoventilation (elevated $PaCO_2$)
2. Low PiO_2 ($FiO_2 < 0.21$ or barometric pressure $< 760\text{mmHg}$)

Raised A-a Gradient.

1. Diffusion defect
2. V/Q mismatch
3. Right-to-left shunt (intrapulmonary or cardiac)
4. Increased O₂ extraction

PaO_2 / FiO_2 RATIO.

Normally 300-500.

- < 250 = clinically significant gas exchange
- < 300 = Acute Lung Injury
- < 200 mmHg = ARDS.