Factors decreasing \( P_{\text{AO2}} \) curve shifts to left:
- Hypoventilation
- Increased \( P_{\text{CO2}} \)
- Increased \( P_{\text{O2}} \) (Decrease in \( P_{\text{O2}} \) decreases \( P_{\text{O2}} \) dissociation curve)
- Field hypoxia
- Carboxyhemoglobin
- Methemoglobin

Factors decreasing \( P_{\text{AO2}} \) curve shifts to right:
- Hyperventilation
- Decreased \( P_{\text{CO2}} \)
- Decreased \( P_{\text{O2}} \) (Increase in \( P_{\text{O2}} \) increases \( P_{\text{O2}} \) dissociation curve)
- Field hyperoxia

The best measure of pulmonary gas transfer is by the multiple inert gas elimination technique, although this is not normally available at the bedside.

- **PAO2** equation:
  \[ PAO2 = \left[ \text{FiO}_{2} \times (760 - 47) \right] - \text{PaCO2} / 0.8 \]

### Pulmonary Oxygen Transfer - Tension Based Indices

1. **A-a Gradient**
   - A calculation derived from the three-compartment model of the lung, the three compartments consisting of the ideal compartment (V/Q = 1), the perfused but unventilated alveoli (V/Q = 0), and the alveolar dead space (V/Q is infinite).
   - **Advantages**:
     - unaffected by barometric pressure
     - unaffected by alveolar hypoventilation
     - provided that intrapulmonary shunt is the dominant pathology it is stable across the entire range of FiO2 despite variations in CaO2-CvO2
   - **Disadvantages**:
     - need for a PA catheter
     - highly variable with FiO2 in V/Q mismatch

2. **PAO2/FiO2 ratio**
   - \( PAO2/FiO2 \) ratio forms part of the definition of acute lung injury and ARDS and it is also an input in SAPS II & lung injury scoring systems
   - at sea level normal value is >500mmHg. Unlike the A-a gradient, it cannot distinguish between alveolar hypoventilation and other causes of hypoxaemia.
   - **Advantages**:
     - unaffected by barometric pressure
     - unaffected by alveolar hypoventilation
     - provided that intrapulmonary shunt is the dominant pathology it is stable across the entire range of FiO2 despite variations in CaO2-CvO2
   - **Disadvantages**:
     - need for a PA catheter
     - highly variable with FiO2 in V/Q mismatch
     - alters with altitude
     - alters when FiO2 is varied in lungs with V/Q mismatch
     - alters when there are fluctuations in CaO2-CvO2

3. **VQI**
   - Estimated shunt fraction relies on CaO2-CvO2 being assumed to be constant, which it is not in critical illness.