2008a(16): Discuss the physiological causes of early post-operative hypoxaemia.

**General:** hypoxaemia is defined as subnormal oxygenation of arterial blood short of anoxia. The normal value for PaO₂ in arterial blood ranges from 75-100mmHg. Hypoxaemia is significant because it represents an abnormally low PaO₂ of arterial blood which can lead to tissue hypoxia and adverse effects on tissue function.

**Causes:**

- **Low inspired oxygen concentration**
  - FiO₂ may be insufficient to meet the metabolic demands of the patient
    - may have been ↑ due to recent surgery

- **Hypoventilation**
  - may be due to:
    - pain
    - respiratory depression 2° drugs (opioids, barbiturates)
    - paralysis of respiratory muscles
    - damage to chest wall
    - high resistance to breathing
  - results in ↓PaO₂ and ↑PaCO₂
  - easily reversed by increasing FiO₂
  - along with V/Q scatter are the major causes of post-operative hypoxaemia

- **V/Q Ratio Differences**
  - V/Q scatter refers to areas of low ventilation compared with perfusion
    - atelectasis
  - V/Q mismatch refers to areas of low perfusion compared with ventilation
    - severe hypotension
    - PE

- **Shunt**
  - refers to blood that enters the arterial system without going through ventilated areas of lung
  - cannot be abolished by an ↑FiO₂
  - may be anatomical or physiological

- **Increasing oxygen consumption**
  - may be due to:
    - pyrexia (fever)
    - shivering
    - hypermetabolic states (thyrotoxicosis, malignant hyperthermia)

- **Diffusion barrier**
  - very minor role in healthy patients (likely to be present pre-op though)
  - PaO₂ usually very close to PAO₂ but never quite equal
o PaO₂ will decrease with blood-gas barrier thickening as it ↑ the diffusion distance between the alveolar gas and pulmonary capillary blood
  ▪ Fick’s Law of Diffusion

Increasing Age:
  - the PaO₂ ↓ with ↑ age from about 20 years of age
  - this is due to closing capacity being greater than FRC
blood draining from these alveoli has a lower PO₂