END-TIDAL CO₂
Normal and Abnormal Capnogram Waveforms

**Normal Capnogram Waveform**
- **Indications:**
  - ET tube is correctly positioned
  - Proper ventilation is occurring

**Abnormal Capnogram Waveforms**

**Esophageal Intubation**
- **Observations:**
  - No CO₂ sensed
  - Small transient waveforms

**Increasing EtCO₂ Level**
- **Possible Causes:**
  - Decrease in respiratory rate and/or tidal volume (hypoventilation)
  - Increase in metabolic rate
  - Rapid rise in body temperature (malignant hyperthermia)

**Leak**
- **Possible Causes:**
  - ET tube cuff may be deflated or ruptured
  - ET tube in the vocal cords
  - Mask or Bag Mask Valve leak
  - Artificial airway is too small for patient

**Rebreathing**
- **Possible Causes:**
  - Mechanical dead space
  - Mechanical ventilator failure

**Muscle Relaxants (Curare Cleft)**
- **Possible Causes:**
  - Patient is mechanically ventilated
  - Depth of cleft is proportional to degree of drug activity

**Airway Obstruction**
- **Possible Causes:**
  - Partially kinked or occluded artificial airway
  - Presence of foreign body in the airway
  - Bronchospasm
    - Elevated end-tidal CO₂ valve
    - Loss of alveolar plateau

**Decreasing EtCO₂ Level**
- **Possible Causes:**
  - Increase in respiratory rate and/or tidal volume (hyperventilation)
  - Decrease in metabolic rate
  - Fall in body temperature

**EtCO₂ During Cardiac Arrest**
- EtCO₂ increases significantly with the return of effective heart function.
- **Observations:**
  - EtCO₂ drops during cardiac arrest
  - As rescue tires, a decrease in EtCO₂ is observed
  - Increases with effective chest compressions and heart function