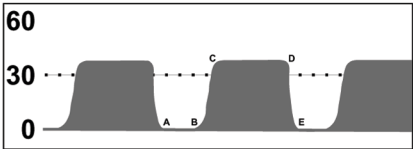


# Quick Guide for CO<sub>2</sub> Waveforms

**PROPAQ<sup>®</sup>** Vital Signs Monitors

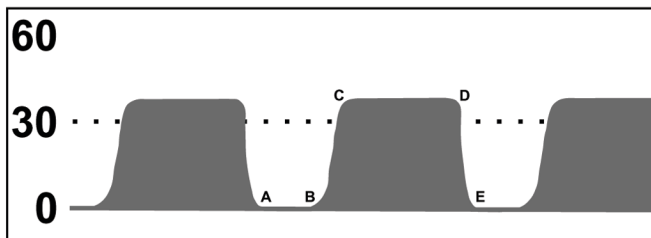
This Guide is intended for quick reference only. It is strongly recommended that clinicians new to capnography also refer to published educational literature on this subject.

All waveform illustrations in this guide apply to both **Mainstream CO<sub>2</sub>** and **Sidestream CO<sub>2</sub>** with intubated patients. Mainstream CO<sub>2</sub> waveforms tend to be slightly more defined, especially on the upstroke, plateau, downstroke; Sidestream CO<sub>2</sub> waveforms are more rounded.



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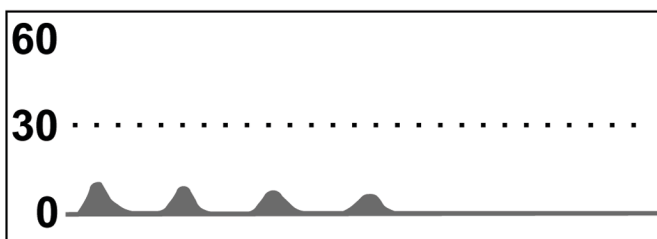
## The Normal CO<sub>2</sub> Waveform



The “normal” capnogram shape consists of the following:

- A-B**     **Zero baseline** – the beginning of exhalation
- B-C**     **Rapid, sharp rise** – anatomical dead space gas replaced by more distal airway gases that contain more CO<sub>2</sub>
- C-D**     **Alveolar “plateau”** – contains mixed alveolar gases
- D**        **End-Tidal CO<sub>2</sub>** – highest concentration of exhaled CO<sub>2</sub>
- D-E**     **Rapid, sharp downstroke** – inhalation phase; fresh gas rapidly replaces CO<sub>2</sub>

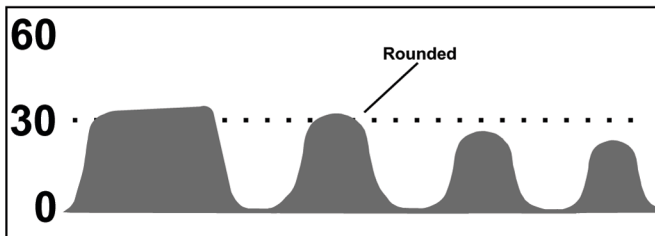
## Endotracheal Tube In Esophagus



If inadvertent esophageal intubation occurs, the capnogram indicates the endotracheal tube is incorrectly positioned and ventilation is not taking place. Look for:

- No CO<sub>2</sub> measured
- Only small, short-lived capnograms displayed

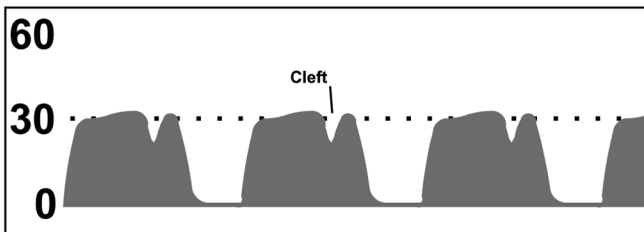
## Endotracheal Tube “Leaks”



If air leaks around the endotracheal tube cuff, the alveolar (end-tidal) CO<sub>2</sub> gas is diluted. The alveolar plateau is blunted, and it blends with the downstroke of the capnogram. Look for:

- A deflated or leaky endotracheal or tracheal tube cuff
- An artificial airway that is too small for the patient

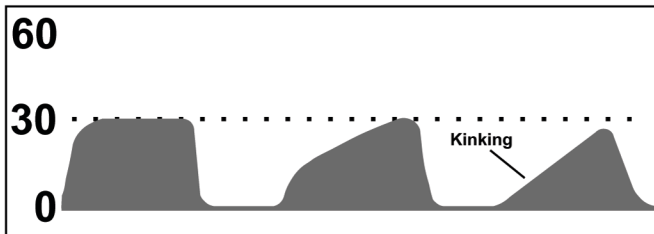
## Decreased Muscle Relaxant Effect Or Breathing Against Ventilator



The “cleft” in the far right portion of the alveolar plateau indicates that the diaphragm is moving and causing entrainment of fresh air. A cleft can occur in any part of the alveolar plateau when the patient attempts to breath against the ventilator. Look for:

- Clefts in the capnogram (may not be on every waveform)
- “Humped” waveforms (indicating attempts at spontaneous breathing)

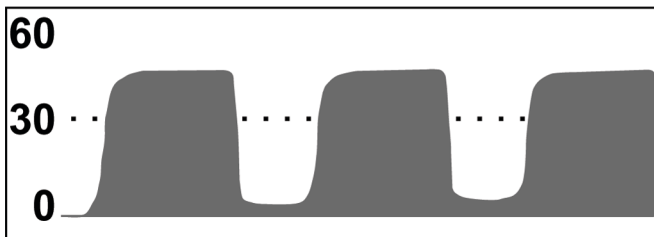
## Endotracheal Tube Kinked Or Airway Obstructed



If exhaled  $\text{CO}_2$  gas is completely or partially obstructed, the slope of the ascending limb of the capnogram has little or no alveolar plateau. Look for:

- Partially kinked or occluded artificial airway
- Herniated endotracheal or tracheal tube cuff
- Bronchospasm, chronic obstructive pulmonary disease
- Foreign body in the upper airway

## Rebreathing CO<sub>2</sub>



If the patient is rebreathing previously exhaled CO<sub>2</sub>, ETCO<sub>2</sub> values increase and the baseline elevates. The waveform does not return to zero at the end of inspiration. Look for:

- Inadequate expiratory time
- Malfunctioning inspiratory valve
- Other errors/malfunctions in breathing circuit
- Insufficient inspiratory flow rate



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