End-Tidal CO2 Monitoring

1 Goals/Introduction:
1.1 End Tidal CO2 monitoring (ETCO2) via waveform capnography should be used to confirming correct placement of the endotracheal tube and/or measure the adequacy of ventilation
1.2 For patients in cardiac arrest, end tidal CO2 is a useful adjunct to treatment
   1.2.1 Note: After profound circulatory collapse, the end tidal CO2 may not be detected even if the ET tube is in the trachea.

2 Indications:
2.1 All patients with endotracheal intubation or an advanced alternative airway such as a King Airway

3 Absolute Contraindications:
3.1 None

4 Equipment
4.1 Appropriate monitoring equipment for waveform capnography such as integrated module on a cardiac monitor
4.2 Appropriate inline sampling sensor circuit for continuous monitoring

5 Procedure
5.1 For Intubated Patients
   5.1.1 A self test may take up to one minute to assure the display is on the screen
   5.1.2 Connect the 15 mm airway adapter of the sampling sensor to the ET adapter. The airway adapter will allow connection of a standard ventilation device
   5.1.3 Normal exhalation moisture will not affect the sampling. However, if bronchial secretions or vomit surrounds the sampling device, erroneous readings will occur
   5.1.4 A strip should be printed out for the intubation record.
5.2 For Non-Intubated Patients (when available)
  5.2.1 Normal exhalation moisture will not affect the sampling
  5.2.2 Attach the nasal cannula ETCO2 prongs to the patient

6 Special Information and Complications
6.1 When CO2 is not detected, three factors must be quickly evaluated for possible causes
  6.1.1 Loss of Airway Function
    6.1.1.1 Improper tube placement
    6.1.1.2 Apnea
  6.1.2 Loss of circulatory function
    6.1.2.1 Massive PE
    6.1.2.2 Cardiac Arrest
    6.1.2.3 Exsanguination
  6.1.3 Equipment Malfunction
    6.1.3.1 ETT extubation
  6.1.4 Obstruction
6.2 The CO2 module will not recognize a breath where the ETCO2 value is less than 8 mm Hg.
  6.2.1 Note: waveform remains valid and can be used to determine the ETCO2 measurement and the presence, if any, of respiration.
  6.2.2
6.3 Waveform examples: The following are examples of ETCO2 waveforms that should be used to establish a baseline and to track the patient over time.
  6.3.1 Normal: square and boxlike
  6.3.2 Hypoventilation: can be due to sedation/analgesia, drug or alcohol intoxication, postictal states, head trauma, CVA, CHF, meningitis/encephalitis
6.3.3 Hyperventilation: anxiety, panic attack, respiratory distress (well compensated)

6.3.4 Bronchospasm: diagnose the presence of bronchospasm, assess the severity of asthma and COPD and gauge the response to treatment

6.4 ETCO2 goals
6.4.1 Head injury: 34-38
6.4.2 All others: 35-45

6.5 Use of Nasal Cannula
6.5.1 If available, a special nasal cannula can monitor end-tidal CO2 for non-intubated patients to evaluate ventilatory status in respiratory and cardiac emergency situations

7 Complications
7.1 Missed esophageal intubation due to inaccurate assessment of waveform
8 Documentation
8.1 The use of ETCO2 as well as the measured readings
8.2 A printed strip of the end tidal CO2 recording for all intubated patients to be included in the patient’s chart.

9 Transport Considerations
9.1 ETCO2 should be evaluated after every patient move and at transfer of care to the receiving facility
9.2 Notify the receiving facility of the prehospital ETCO2 readings during patient turnover report