

END TIDAL CARBON DIOXIDE (ETCO₂) MONITORING (USED WITH PATIENT CONTROLLED ANALGESIA OR OPIOIDS)

- PURPOSE:** To outline the management of patients who are receiving End Tidal Carbon Dioxide (EtCO₂) monitoring in conjunction with Patient Controlled Analgesia (PCA) or opioids.
- SUPPORTIVE DATA:** End Tidal Carbon Dioxide (EtCO₂) or capnography monitoring provides a method in which to continuously measure the respiratory rate and exhaled CO₂ concentration of a patient over a period of time.
- The non-invasive EtCO₂ monitoring device is for non-intubated patients. It is a type of nasal cannula with prongs especially designed to measure EtCO₂. The measurement takes place at the peak of expiration. The normal EtCO₂ level for most patients is 35-45 mmHg. Both elevated and low EtCO₂ levels may be associated with sedation-related hypoventilation. The module will alarm for high and low EtCO₂ levels, for high and low respiratory rates, and for apnea. In addition, at a respiratory rate of less than 6 the PCA pump will automatically pause until restarted by the nurse. Patients with asthma, Chronic Obstructive Pulmonary Disease (COPD), and sleep apnea have a higher risk of hypoventilation and in particular would benefit from EtCO₂ monitoring.
- All patients receiving PCA therapy require EtCO₂ monitoring via the Alaris™ EtCO₂ module, except for the following:
- Patients receiving palliative care for a terminal illness
 - Patients in the ICU and Progressive Care Unit setting
 - Pediatric Patients (17 years or younger)
- Patients with the following should have **both** EtCO₂ monitoring and continuous oxygen saturation monitoring:
- COPD
 - Documented diagnosis of sleep apnea
 - Documented history of Venous thromboembolism (VTE) or patients considered at high risk for VTE.
- EtCO₂ monitoring may be used per provider's order to monitor patients who are receiving opioids on the High Alert Medication List
- Continuous oxygen saturation monitoring for Acute Care Unit (non-ICU, non-Progressive Care Unit) patients requires a provider's order.
- SCREENING:**
1. Validate that the patient is an appropriate candidate for EtCO₂ monitoring using the following criteria:
 - Patient is appropriate candidate for PCA (Refer to PCA Standard).
 - Patient is receiving an opioid on the High Alert Medication List
 - Do not apply for the following patients if:
 - Receiving palliative care for a terminal illness
 - In the ICU or Progressive Care Unit
 - Is 17 years or younger (pediatric)
- PRIOR TO ADMINISTRATION:**
2. Assess the following within 30 minutes prior to initiation of therapy
 - Vital Signs, including depth of respiration

- Level of Consciousness (LOC) Need for oxygen therapy as indicated per provider's order
 - Oxygen saturation via pulse oximetry
 - PCA order validated for completeness
3. Verify that the alarm is on and settings of the EtCO₂ module are as follows:
 - EtCO₂ value: 20-50 mmHg
 - Respiratory Rate: 8 - 30 breaths per minute
 - No breath (apnea) period: 15 seconds
 - Presence of EtCO₂ Waveform
 - Pause Rate (The PCA will stop): Respiratory Rate of less than 6
 - Note: Alarm limits may be changed per provider's order only

INITIAL
ASSESSMENT:

4. Assess EtCO₂ value and oxygen saturation reading at the time of initiation of therapy.

ONGOING
ASSESSMENT:

5. Assess the following within **15-30 minutes** into therapy, every 4 hours (Acute Care Units):
 - EtCO₂ value
 - Vital Signs including depth of respiration
 - LOC
 - Oxygen saturation via pulse oximetry
6. Assess EtCO₂ alarm limits and presence of waveform settings within one hour of the beginning of each shift.
7. Ensure patient is on continuous oxygen saturation monitoring, if ordered by the provider.

MAINTENANCE

8. Change cannula a minimum of daily.
9. Discontinue monitoring temporarily for activities of daily living (ADLs).

COLLABORATION:

10. Collaborate with provider regarding the need for the following:
 - Oxygen therapy
 - Continuous oxygen saturation monitoring

ALARM
ACTIVATION:

11. Address EtCO₂ alarms as follows:
 - Stop PCA and document EtCO₂ value after verifying that the patient has one of the following:
 - Respiratory rate less than 6 breaths per minute
 - Deterioration in mental status/lethargy
 - Shallow respirations
 - Verify that EtCO₂ equipment is properly applied (e.g. cannula is correctly applied to patient's nose)
 - Verify presence of EtCO₂ waveform

REPORTABLE
CONDITIONS:

12. Notify Provider for the following change in condition:
 - Deterioration in mental status/ vital signs
 - Respiratory distress or shallow respirations or respiratory rate less than 10 breaths per minute
 - Continuous alarm activation for EtCO₂ module values outside of alarm limits
13. Do the following if a significant event occurs:
 - Disconnect and sequester IV Point of Care Unit (brain), PCA and EtCO₂ modules from patient
 - Module must remain plugged in, but can be powered down.
 - Notify supervisor
 - Complete Patient Safety Intelligence (SI) report
 - Notify Bio-Med of event

- During off-shifts –or when Bio-Med is not available the charge nurse and supervisor will sequester the module in a secure location.

PATIENT/
CAREGIVER
EDUCATION:

- Instruct on the following:
 - Purpose and function of the EtCO₂ monitoring.
 - Notify the nurse immediately for the following:
 - Shortness of breath
 - Alarm activation
 - Feeling of lightheadedness
 - Feelings of anxiety
 - Too Sleepy
 - Somnolent
 - Lethargy
 - Shallow breathing

ADDITIONAL
STANDARDS:

- Implement the following protocols:
 - Patient Controlled Analgesia (PCA)
 - Pain Management
 - Oxygen Therapy (if applicable)
 - Intravenous Therapy

DOCUMENTATION :

- Document in Orchid under PCA Navigator band, under EtCO₂ document EtCO₂ level and assessment in accordance with “documentation standards.”
- Document verification of EtCO₂ alarms and presence of waveform as specified in the standard

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References:

Beddoe, A, Balderrama, D. (2017). End-Tidal Carbon Dioxide Detection and Monitoring: Patients who are Non-Intubated. Nursing Reference Center Plus. Cinahl Information Systems.
Policy #920; Management of controlled substances
Policy #910; High Alert Medications