

ALLEN HEALTH SYSTEMS - ALLEN HOSPITAL  
POLICY & PROCEDURE

Title:	Capnography
Department:	4 Surgical
Effective Date:	September 2022
Prepared by:	Director Surgical Services

**PURPOSE:** To provide best practices on safe and effective assessment, monitoring, and interventions for patients at risk for respiratory depression outside of the intensive care unit. Capnography should be used in conjunction with continuous pulse oximetry. Capnography monitoring is available in areas where the technology and staff with competency in the skill are available.

**POLICY:**

- A. Normal and abnormal ventilation (ETCO<sub>2</sub>) values are:
  - 1. Normal values
    - a. 35-45 mmHg
  - 2. Abnormal values
    - a. Less than 35 mmHg (hyperventilation/hypocapnia)
    - b. Greater than 45 mmHg (hypoventilation/hypercapnia)
  - 3. Note: refer to specific orders for when to call the provider
- B. Capnography is initiated with a provider order. If the RN feels Capnography is warranted, use the following guidelines as settings of when to call the attending provider:
  - 1. Respiratory Rate: <8 breaths per minute
  - 2. Apnea: >15 seconds
  - 3. CO<sub>2</sub>: >50 OR <15

**PROCEDURE:**

- A. General considerations for patients with known or suspected Obstructive Sleep Apnea (OSA)
  - 1. Promote oral pain medication, instead of IV when applicable.
  - 2. Suggest/ request NSAIDs, if not contraindicated.
  - 3. Use caution when combining sedatives/ hypnotics with opioids
  - 4. Avoid a PCA basal rate, if applicable.
  - 5. Pay attention to patient's respiratory status, specifically watching for reduced breathing, periods of apnea, or loud snoring.
  - 6. Elevate head of bed to 30 degrees and avoid supine positioning, when appropriate for patient condition.
- B. Preparing for the Patient on the Medical/Surgical Unit for Capnography
  - 1. The inpatient RN will notify RT when an order for capnography monitoring is obtained.
    - a. RT will be involved in patient care and available as a resource for the RN

2. The Phillips MP5 monitor is preferred and allows for centralized monitoring.
3. Obtain the Smart CapnoLine H Plus O2 oral/nasal sampling set with oxygen tubing, if not already initiated in PACU.
  - a. Long-Term (greater than 24 hours): Tubing with filter
  - b. Short-Term (less than 24 hours): Tubing without filter

C. Capnography Procedural Steps

1. Review order for Capnography ordered by provider in the Electronic Medical Record (EMR).
2. Assess patient, including baseline vital signs, SpO2, respiratory rate, and depth.
3. Connect patient to CapnoLine H Plus O2 oral/nasal sampling set with oxygen tubing to the Phillips MP5.
4. Position patient comfortably and encourage patient to breathe normally.
  - a. Be sure that nasal cannula is clear of obstructions.
5. Turn on monitor and observe the following:
  - a. CO2 and pulse waveform
  - b. Respiratory rate
  - c. SpO2
  - d. Audible beep
6. Adjust the alarm limits per provider orders and activate the alarm.
7. Once set-up with patient at the bedside, the syncing of the central monitoring station needs to be completed:
  - a. Identify device with number of bedside capnography monitoring device.
  - b. Patient identifiers: patient room number and patient name
  - c. Ensure connection (may take 1-3 minutes)

D. Baseline Parameters

1. Upon admission to the inpatient unit, document baseline pulse oximetry and ETCO2 values
2. Clinical respiratory goals should be individualized to the patient.
3. Determine the patient's baseline and consider adverse conditions affecting oxygen exchange. This may include:
  - a. Metabolic acidosis/ alkalosis
  - b. Chronic elevated CO2 levels (COPD)
  - c. Use of narcotics and sedatives
  - d. Pain level

E. Monitor Default Alarm Settings

1. While monitoring, ensure baseline values are maintained, and document adjusted alarm limits.
2. Alarms should not be adjusted from the recommended default alarm settings without permission from the ordering provider.
  - a. The recommended default alarm settings are consistent with current literature and practice.
3. Default Alarm Parameters:

ETCO2	High- 50 mmHg Low- 10 mmHg
Respiratory Rate	High- 40 breaths per minute Low- 10 breaths per minute

No breath delay	30 seconds
Pulse Oximetry	Less than 90% on room air

## F. Nursing Assessment

### 1. Vital signs:

- a. Temperature, heart rate, respirations, blood pressure, oxygen saturation, numerical ETCO<sub>2</sub>, pain assessment, and sedation level should be assessed with routine post-op checks every 30 minutes X 2, hourly X 4, then every four hours x4.
  - i. Include accurate respiratory rate, depth of breathing, presence of snoring, and verify that there are no periods of apnea, hypopnea, or labored breathing.
  - ii. Respiratory rate, numerical ETCO<sub>2</sub>, and oxygen saturation along with amount of oxygen being delivered, should be assessed and documented hourly, or as patient condition warrants

### 2. Level of consciousness:

- a. Within 30 minutes to 1 hour of administration of opioids, assess patient's respiratory status, sedation, and pain relief.
  - i. 30 minutes for IV opioids
  - ii. 1 hour for oral opioids

### 3. Apnea or Obstruction:

- a. Loud snoring with witnessed apnea greater than 10 seconds.
- b. Witnessed airway obstruction leading to desaturation less than 90% saturation on any FiO<sub>2</sub> and/or End Tidal CO<sub>2</sub> > 45.
- c. Hypoventilation: respiratory rate less than 12 per minute.

### 4. Respiratory Depression:

- a. Decreased respiratory rate
- b. Shallow respirations
- c. Pale skin coloring
- d. Snoring

## G. Interventions for Changes in ETCO<sub>2</sub>

1. With any significant change in ETCO<sub>2</sub> measurement, the first action will always be to assess the patient.
  - a. Ensure airway is open by repositioning head and neck.
  - b. Provide gentle stimulation if patient does not respond.
  - c. Reposition the Smart CapnoLine, if necessary.
  - d. If patient is immediately aroused and breathing normally, continue to monitor.
  - e. Administer O<sub>2</sub> therapy as needed per order and/or per emergency guidelines
  - f. If the patient does not respond with repeated stimulation, call for Rapid Response Team (RRT) team.
  - g. Consider using appropriate reversal agent per emergency guidelines.
  - h. Notify the provider immediately to report unanticipated changes in patient condition, required interventions, or abnormal assessment values.

## H. Discontinuation of Capnography

1. If the patient has had no complications during the first night post-operatively then the capnography can be discontinued on post-op Day 1 with an order. The

provider may also discontinue when deemed appropriate by writing an order to discontinue.

#### I. Documentation

##### 1. Nursing Documentation in the EMR:

- a. Vital signs with routine post-op checks at intervals described in E.1.a should be documented on the vital signs flowsheet in the EMR.
- b. The numerical ET<sub>CO</sub><sub>2</sub> value should be documented under 'Oxygen Therapy' on the same vital signs flowsheet.
- c. When respirations fall under 12 breaths per minute, the nurse should add a Significant Event Note to describe the episodes of hypopnea or obstruction and include whether they are reoccurring and associated with oxygen desaturations.
- d. Documentation in education flowsheet and care plans as appropriate.

#### J. Discharge Instructions for the Patient

1. Patients should be educated about their continued risk for respiratory compromise for one week postoperatively.
2. Educate the patient on the risks of taking more than the prescribed dose of pain or sedating medication, including over the counter medications.
3. Encourage patient to sleep on side, prone, or sitting position, if medically appropriate.
4. Provide a copy of OSA information to the patient at discharge.
  - a. This is intended to be used as a tool for the patient to take with them to their family provider to discuss the possible need for a sleep study due to the positive OSA screening at the hospital.
5. Review information with the patient and caregiver using teach-back method and chart in DC note.

#### K. Special Considerations for Measuring ET<sub>CO</sub><sub>2</sub> with CPAP or BiPAP

1. Use caution when increasing oxygen therapy on patient requiring Capnography. This may make it difficult to remove the CO<sub>2</sub>, possibly leading to hypercarbia
2. The CapnoLine Plus O<sub>2</sub> nasal/oral cannula can be used with a non-rebreather mask or a CPAP/BiPAP device.
3. The CPAP/BiPAP therapy used with capnography can cause "wash-out", resulting in artificially low CO<sub>2</sub> readings.
  - a. Default parameter alarm settings have been set to 10mmHg for this purpose.
  - b. If artificially low ET<sub>CO</sub><sub>2</sub> are suspected due to use of CPAP/BiPAP mask over the CapnoLine NC, a note should be documented in the EMR to reflect the purpose of the value, and an accurate ET<sub>CO</sub><sub>2</sub> levels should be measured at a frequency determined by the provider or with a change in clinical condition.

References:	American Society of Anesthesiologists. (2015). Practice guidelines for the perioperative management of patients with obstructive sleep apnea: An updated report by the American Society of Anesthesiologists task force on perioperative management of patients with obstructive sleep apnea. Retrieved from: <a href="http://asahg.org/resources/standards-and-guidelines/search?g=osa">http://asahg.org/resources/standards-and-guidelines/search?g=osa</a>
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	San Diego Patient Safety Council. (2014). Respiratory monitoring of patients outside the ICU toolkit. Retrieved from: <a href="http://www.hginstitute.org/sites/main/files/file-attachments/2013_resp_monitoring_patients_tool_kit_june2014_final-appendices_0.pdf">http://www.hginstitute.org/sites/main/files/file-attachments/2013_resp_monitoring_patients_tool_kit_june2014_final-appendices_0.pdf</a> Unity Point Health St. Luke's Hospital. Acute Adult Services Policy & Procedure- Capnography (2017)
Reviewed Date:	(only use if no revisions made)
Revised Date:	(add most recent date at end of date list)
Approvals:	Policy and Procedure Committee: