Beyond Critical Care: Expanded Use of Capnography and Procedural Sedation Protocols

During procedural sedation, sedatives or narcotics administered to allow the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function can result in respiratory compromise and cardiovascular adverse events. If inadequate oxygen levels are not recognized immediately, the patient can become hypoxic. American Society of Anesthesiologists (ASA) Guidelines now require that during moderate or deep sedation, the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and monitoring for the presence of exhaled carbon dioxide unless precluded or invalidated by the nature of the patient, procedure or equipment. The guidelines address the growing use of procedural sedation beyond critical care and by non-anesthesiologists, including the expanded use of procedural sedation in the cath lab, emergency department (ED), and for interventional radiology (IR) and gastrointestinal (GI) procedures.

Monitoring respiratory status provides an early warning of respiratory compromise, allowing clinicians the opportunity to employ corrective measures before the onset of respiratory depression (RD), potentially leading to bradypnea, apnea, hypoxia or death. Furthermore, mechanical ventilation or other intervention secondary to RD can result in increased length of stay, risk of hospital-acquired infections, and associated costs.

A growing body of evidence supports this expanded use of capnography to monitor respiratory status—guided by a set of standard protocols and professional guidelines—offering clinicians the opportunity to provide care sooner and intervene more quickly to improve safety, save lives and lower costs during procedural sedation.

With the addition of ventilation to the ASA basic monitoring requirements, the ASA recognizes the importance of timely notification of this metric via capnography, before changes in oximetry or respiratory rate occur. An ASA database review of 8,954 closed insurance claims resulting from anesthetic mishaps demonstrate that legal claims associated with cases outside of the operating room lead more frequently to severe injury and have a higher proportion of death. Additionally, the ASA concluded that 62 percent of events could have been prevented with better monitoring. Hospitals, outpatient surgery centers and even office-based practices are implementing or augmenting capnography to boost patient safety, reduce current costs and enhance cost avoidance.

Medtronic is committed to the highest standards of patient safety through the effective implementation and use of capnography, which provides essential monitoring of patients at risk of RD. This monitoring includes measurement of a patient’s respiratory carbon dioxide gas concentration over the respiratory cycle, and the respiration rate based on the CO₂ wave form over...
time. Capnography can be one of the key clinical measurements that physicians, nurses, respiratory therapists and other clinicians use when assessing a patient’s condition.

Microstream™ capnography monitoring, used in conjunction with clinical acumen, can help hospitals, outpatient and office-based facilities improve patient safety and deliver cost savings. It can be used with both intubated and non-intubated patients, across virtually all patient populations, from neonate to adult, and in virtually all clinical environments, including general care floor, ED, critical care units, pre-hospital/EMS and during procedural sedation in IR, CVIR and GI suites.

Broad implementation of ASA capnography guidelines has been successful for patients, anesthesiologists and hospitals. It is typically achieved through:

- Identifying internal champions and stakeholders to drive the process
- Raising awareness through education
- Assessing technology
- Proposing solutions
- Staff training and education
- Adherence to the guidelines and establishing a set of standard protocols

The following general steps for establishing a patient’s capnography needs have been implemented at several hospitals, including Mount Carmel St. Ann's Hospital and the Poudre Valley Health System hospitals: These steps are provided as considerations for facilities implementing a capnography monitoring solution and developing policies to support its use. This information is intended for general guidance only and should not be interpreted as specific medical, diagnostic, or therapeutic recommendations. For more information on creating capnography policy and procedures, [view our online guide](#).

**STEP 1: Classify the Patient**

The following patient classes require capnography monitoring:

I. Moderate sedation/analgesia patients
II. Patients with opioid use
III. Pregnant or post-partum patients
IV. Other considerations
V. Patients requiring emergency care

**STEP 2: Implement a Patient Care Process**

I. Assess for Risk Factors – Assess the patient for the presence of identified risk factors using standardized and validated tools
II. Identify Risk Level – Categorize and identifies the patient’s risk level for respiratory depression as Very Low, Low to Moderate, Moderate to High, or Very High
III. Monitor – Knowing the patient’s risk level, references the Respiratory Monitoring Risk Level table and determines if the patient should be monitored
IV. Determine Monitoring Method – If the patient should be monitored and based on the patient’s risk level, identify how the patient should be monitored, including the monitoring type, frequency, location, etc.
V. Educate/Engage/Coach – Engage the patient and family/care partner by educating and coaching them on the monitoring device (e.g., proper use, alarms, and warning signs), procedures and expectations

VI. Monitor Patient – Monitors the patient’s oxygenation and ventilation for airway obstruction or respiratory depression

VII. Intervene – During the care process, in the event of an alarm or early indication of respiratory deterioration, evaluate monitored data and respond to the data as appropriate

VIII. Document, Communicate, and Evaluate – Determine whether to continue monitoring of patient by periodically evaluating the patient’s risk level with measurable criteria

Medtronic encourages you to engage your colleagues across the hospital to learn more about capnography. Our Respiratory and Monitoring Solutions (RMS) team has designed a framework that supports clinical champions and stakeholders developing a rationale for capnography use in procedural sedation. Microstream capnography courses are available by area of care, including pre-hospital/EMS, emergency department/resuscitation team, critical care, and general care floor.

2. ASA Standards for Basic Anesthetic Monitoring, Committee of Origin: Standards and Practice Parameters (Approved by the ASA House of Delegates on October 21, 1986, and last amended on October 20, 2010 with an effective date of July 1, 2011)
8. Capnography Procedure, Medical Center of the Rockies, Effective Date: April 2011.