

Patient safety

Capnography: New standard of care for sedation?

Capnography—is it the standard of care for patients having moderate sedation? Should capnographic monitoring be added for procedures performed under moderate sedation in areas like the preop holding area, GI endoscopy unit, and cath lab?

The issue is generating discussion following an update in the American Society of Anesthesiologists (ASA) Standards for Basic Anesthetic Monitoring, which took effect July 1, 2011. The standards call for continuous monitoring of exhaled CO₂ (ie, capnography) for moderate sedation (sidebar).

The update is a change from the 2005 standard, which said that during regional anesthesia and monitored anesthesia care, the adequacy of ventilation shall be evaluated by continual observation of clinical signs and/or monitoring for exhaled carbon dioxide.

The changes stand to have far-reaching effects.

Managers in endoscopy units, cath labs, radiology departments, emergency departments, and other treatment areas outside the OR are considering how to incorporate the changes into policies and procedures, staff training, nursing documentation, and budgeting for equipment and supplies.



Quality, safety the goals

“Our ultimate goal in updating the standards was to ensure quality patient care and patient safety,” Donald E. Martin, MD, a member of the ASA committee that wrote the update, told OR Manager.

“Historically, the use of pulse oximetry made a tremendous difference in patient safety, and the use of capnography in intubated patients made a tremendous difference. Now that level of safety is being extended to a large number of patients who are having more invasive procedures done with monitored anesthesia care,” says Dr Martin, professor of anesthesiology, Penn State University College of Medicine, Hershey, Pennsylvania.

Also, ASA closed claims analyses are finding that respiratory depression has become more common as more procedures that were once performed under general anesthesia in the OR began to be performed in other locations on older and sicker patients under deep and moderate sedation.

“The trend has been to increase monitoring, and it’s surely paid dividends,” he says.

New technology, including better, less expensive equipment, has made increased monitoring more practical.

Technology, costs

Capnography monitors use infrared spectroscopy (a beam of infra-red light passed across the gas sample onto a sensor) to measure the expired concentration of CO₂, a measure of effective ventilation. The end-tidal CO₂ level and respiratory rate are displayed on the monitor numerically as well as graphically by a time-based waveform

called a capnogram.

For a patient under moderate sedation, an accessory hose attached to the oxygen cannula captures the expired CO₂. During general anesthesia, expired CO₂ is captured in tubing attached near the end of the endotracheal tube or mask.

Monitors are available for \$3,000 to \$5,000. Depending on the type of monitor, single-use CO₂-measuring oxygen cannulas cost from \$2.50 to \$12, compared to about 40 cents for a regular nasal cannula.

Evidence for capnography

Studies support use of capnography compared with pulse oximetry for earlier and more reliable warning of respiratory depression, says Lisa Heard, BSN, RN, CPN, CGRN, nurse manager for endoscopy services at North Shore Medical Center, Salem, Massachusetts, and a past president of the Society of Gastroenterology Nurses and Associates (SGNA) (sidebar, p 18).

Key papers showing the effectiveness of capnography in moderate sedation are by Jennifer Lightdale, MD, and colleagues at Children's Hospital Boston and John Vargo, MD, and associates at the Cleveland Clinic. Before taking her current position, Heard spent 17 years at Children's Hospital, where she was involved in Dr Lightdale's studies.

"The results convinced us to use capnography on all of our pediatric patients receiving sedation," says Heard. "We found we could decrease poor outcomes because we were alerted by the capnogram to intervene quicker when patients had disordered breathing."

Heard says this experience prompted her to initiate its use in North Shore's 7 endoscopy rooms.

When the new ASA standard was issued, Heard enlisted the chief of anesthesia, who was already a proponent, as a champion. Another champion, the chief of medicine, is helping to expand capnography to areas that use patient-controlled analgesia (PCA) as well as to the emergency department and gastroenterology.

"Our main challenges are financial," says Heard, referring to the cost of implementing the standard. She also notes that a bad patient outcome that capnography could have been prevented would also be expensive.

Not a 'magic pill'

"Capnography is not a magic pill," says Heard. "You can't say that because you use capnography, you are going to save lives. What it does is to tell you when a patient's ventilation changes before any other monitoring device."

For example, if a patient's oxygen saturation drops to 95, 92, and 88, a pulse oximeter alerts the nurse to intervene by repositioning the airway. In contrast, the capnometer alerts the nurse of a problem with the patient's ventilation before the oxygen saturation starts dropping, allowing the nurse to intervene and prevent a drop in oxygen saturation.

Capnography adds information.

"We're not saying, don't use pulse oximetry and just use capnography. We're saying that used together they result in safer patient care," Heard says.

VA weighs capnography

The Department of Veterans Affairs (VA) is considering the new ASA standard as it revises its moderate sedation directive, "but we are not sure which way they will go," says Cindy Taylor, MSA, BSN, RN, CGRN, nurse manager for GI endoscopy/

Standards for Basic Anesthetic Monitoring

Effective July 1, 2011, these standards from the American Society of Anesthesiologists apply to all general anesthetics, regional anesthetics, and monitored anesthesia care.

Standard II

During all anesthetics, the patient's oxygenation, ventilation, circulation, and temperature shall be continually evaluated.

Ventilation

3.1 Objective:

To ensure adequate ventilation of the patient during all anesthetics.

3.2 Methods:

3.2.4 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.

www.asahq.org/For-Health-care-Professionals/~media/For%20Members/documents/Standards%20Guidelines%20Stmts/Basic%20Anesthetic%20Monitoring%202011.ashx

bronchoscopy at Hunter Holmes McGuire VA Medical Center, Richmond, Virginia. The VA system presently does not require capnography for moderate sedation, and Taylor questions whether the VA will update the directive because of the lack of outcomes data and the cost of new equipment.

"Outcomes data is the first thing the VA may look at," says Taylor, "and right now outcomes data is not there to substantiate the cost of the capnography."

But Dr Martin notes that a randomized controlled trial is unlikely to be conducted. He says the type of injury from hypoventilation and oversedation described in the ASA closed claims data is rare, making it hard for researchers to conduct a study with enough patients to show a difference in outcomes.

"If facilities are looking for an outcomes study with hundreds of thousands of patients that separates out the benefits from capnography in addition to pulse oximetry in moderate sedation patients, it is true they won't find one," he says.

He adds that anesthesiologists would hesitate to participate in a randomized trial comparing patients with monitoring to those without monitoring because of the potential risk to unmonitored patients, making it unlikely such a study will be done.

GI endoscopy guideline

The American Society for Gastrointestinal Endoscopy (ASGE) in its 2008 guideline on Sedation and Anesthesia in GI Endoscopy states: "Extended monitoring techniques may provide sensitive measures of a patient's ventilatory function (capnography) and level of sedation (BIS index monitoring); however, there is insufficient evidence in the literature to support the routine use of extended monitoring devices during moderate sedation."

Taylor says practitioners may interpret this to mean that monitoring ventilation with a pulse oximeter and signs and symptoms is sufficient.

Ahead of the curve

Phoebe Putney Memorial Hospital in Albany, Georgia, began implementing capnographic monitoring for moderate/deep sedation and for patients with postoperative PCA pumps over a year ago. Many new monitors were purchased.

"The ASA standard will begin pushing other institutions to add capnography for moderate sedation patients and others," says Carol Wright, BSN, RN, CNOR, director of the OR, SCP, anesthesia, and perfusion. "We were ahead of the curve."

Studies: Capnography use during moderate sedation

Study in children

In a study analyzing 163 children having GI endoscopy procedures with moderate sedation, capnography improved the standard of care by allowing early detection of respiratory compromise.

Lightdale J R, Goldmann D A, Feldman H A, et al. Pediatrics. 2006;117:e1170-1178.

Meta-analyses

A meta-analysis concluded that during procedural analgesia and anesthesia, respiratory depression was 28 times more likely to be detected when patients were monitored by capnography rather than by traditional methods (pulse oximetry, visual inspection).

Waugh J, Khodneva Y, Epps C. Anesth Analg. 2008;106(4 Suppl):S27.

A meta-analysis of clinical studies concluded that during procedural sedation and analgesia, cases of respiratory depression were 17.6 times more likely to be detected in cases monitored by capnography than in cases not monitored by capnography.

Waugh J B, Epps C A, Khodneva Y A. J Clin Anesth. 2011;23:189-196.

Early warning sign

In 247 patients having elective endoscopic retrograde cholangiopancreatography and endoscopic ultrasonography under moderate sedation, researchers found capnographic monitoring acts as an early warning system, reducing the frequency of hypoxemia, severe hypoxemia, and apnea.

Qadeer M A, Vargo J J, Dumot J A, et al. Gastroenterology. 2009;136:1568-1576.

Randomized trial

In a randomized controlled trial of 132 patients receiving propofol sedation in the emergency department, adding capnography to standard monitoring (pulse oximetry, cardiac function, and blood pressure) resulted in a decrease in hypoxia and identified all hypoxic events before onset.

Deitch K, Miner J, Chudnofsky C R, et al. Emerg Med. 2010;55:258-264.

Capnographic monitoring is now standard for every patient at Phoebe Putney who receives procedural sedation no matter where that occurs.

Wright says she and her colleagues struggled with how to implement capnography in the preoperative holding area, where regional anesthetic blocks are performed and lines inserted, because they also administer medications for anxiolysis. To make it easier for the preop nurses, the decision was made that any patient having any procedure in the preoperative holding area would be monitored.

The biggest pushback was from surgeons and proceduralists, who believed it was the anesthesia provider's responsibility to assess a patient's airway, not theirs. Wright says they learned it was their responsibility when no anesthesiologist was present, and this was the new standard of care.

Capnography is invaluable in areas that don't have anesthesia coverage, Wright says. "We see capnography as imperative for patient safety. It alerts us to reduced ventilation before we have a larger problem on our hands."

CMS requirement coming?

Jennifer Haines, BSN, business manager for surgical services at Chester County Hospital and Health System in West Chester, Pennsylvania, calls the new ASA standard a "good idea that adds an additional level of safety for patients." She is in the process of acquiring new monitors for the endoscopy unit and cath lab.

"This is a big deal for all of us. We are going to have to do a lot of education and buy a lot of new expensive equipment. We are figuring out what we need to be ready because we expect CMS to require capnography for moderate sedation in the next year or so," she says, referring to the Centers for Medicare and Medicaid Services.

John R. Rosing, MHA, FACHE, who consults with hospitals on Joint Commission and CMS matters, says the Joint Commission told him in September 2011 that it is studying the capnography issue.

"I can't predict what CMS or the Joint Commission is going to do about the ASA standard," he says. "The best we can say right now is that we don't know what CMS is thinking because its interpretive guidelines regard moderate sedation as analgesia, not anesthesia. The Joint Commission, on the other hand, regards moderate sedation to be along the continuum of anesthesia and thus may be leaning to require [capnography]." Rosing is vice president and principal, Patton Healthcare Consulting.

Haines says she believes many institutions will wait for CMS to adopt a standard before getting on board. She says many are interpreting a phrase in the ASA standard that says, "unless precluded or invalidated by the nature of the patient, procedure, or equipment," to mean, "If you don't have the equipment, you don't have to do it." In other words, they see the standard as a recommendation and not a requirement.

Educating clinicians

When capnography use is expanded, clinicians have to be trained to interpret the capnogram wave forms and the kinds of waves that indicate apnea or hypoxia.

Nurses must document the patient's capnographic readings on the procedural record. In addition to writing a single number from the capnometer, Heard recommends adding an end-tidal CO₂ column on the patient flow sheet to allow the nurse to indicate a normal waveform. If there is an abnormality in the capnogram, the nurse should describe it in the patient note with the intervention performed (eg, repositioned airway, suctioned oropharynx) and the result.

"That is the best way to show not only that the nurse was monitoring the capnogram but that when a change was recognized, it was documented," she says. ❖

—Judith M. Mathias, MA, RN

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