The American Society of Anesthesiologists (ASA) produces the Standards for Basic Anesthetic Monitoring for appropriate patient monitoring during basic anesthesia (1). The standards document is periodically revised and updated, and includes recommendations for the use of moderate and deep sedation. As a number of nonanesthesiology specialists, including gastroenterologists, orthopedic surgeons, cardiologists, gynecologists, emergency room physicians, dentists, and, of course, interventional radiologists, use moderate sedation for procedures, most hospitals and clinics incorporate the ASA guidelines into sedation credentialing. Therefore, any significant change in the ASA standards for moderate and deep sedation will have a downstream impact on most interventional radiologists’ practices.

In their last revision to the Standards for Basic Anesthetic Monitoring (2), the ASA did make a significant change. In October 2010, the ASA House of Delegates approved the following modification of Standard 3.2.4 under Ventilation, Methods:

“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” (2).

By contrast, the 2002 ASA Standards document reads:

“During regional anesthesia in monitored anesthesia care the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and/or monitoring for the presence of exhaled carbon dioxide” (3).

In other words, according to the ASA standards, CO2 capnography is now a requirement (except for the precluded/invalidated situations mentioned), whereas, in the previous version, it was optional (with observation of clinical signs as the alternative). This change became effective July 1, 2011 (2). Notably, the American Heart Association also newly recommends the use of capnography in the context of Advanced Cardiac Life Support for endotracheal tube assessment, postcardiac and -respiratory arrest care, ventricular fibrillation/pulseless ventricular tachycardia, and cardiopulmonary resuscitation (4).

The underlying motivation for the change to the ASA’s standards are the potential benefits of CO2 capnography over oximetry. CO2 capnography involves the monitoring and graphical display of the concentration of CO2 in the patient’s respiratory gases, which can be measured by using the principle that CO2 absorbs infrared radiation (5). The end-tidal CO2 is approximately equal to the arterial blood CO2, so it is a noninvasive and convenient way of estimating arterial CO2. Because hypoventilation and apnea precede hypoxia, the concentration of CO2 in a sedated patient’s exhalation should be affected before that of their blood oxygen (6), and, as a result, appropriate intervention (which may include paging anesthesiology personnel) can be performed earlier. CO2 capnography may detect disordered respiration 30–90 seconds earlier than oximetry (7,8), and, as a result, its use can lower the risk of desaturation by providing earlier warning (9–12). In a recent metaanalysis (13), the authors found that cases of respiratory depression were 17.6 times more likely to be detected if capnography was used (95% confidence interval, 2.5–122.1; \( P < .004 \)). This is particularly true if patients are receiving oxygen, which can maintain blood oxygen levels slightly longer despite hypoventilation or apnea. The ASA states that, by relying only on oximetry, there is a smaller “margin of safety” because of a delayed detection of hypoventilation, airway obstruction, or apnea from any cause (2).

The change to the ASA’s standards has not come without some controversy. For example, in a joint statement from the American Society for Gastrointestinal Endoscopy, the American Gastroenterological Association, and the American College of Gastroenterology (14), the authors rebut the change to the ASA standards on the basis of a lack of evidence. The statement claims that, by adding CO2 capnography, there will be additional cost and inefficiency incurred without prior scientific due process to adequately demonstrate its benefit. There has also been some evidence that the use of capnography is far from universal. For example, a survey of pediatric emergency physicians (15) found that 45% of respondents did not use CO2 capnography, despite guidelines recommending its routine use, and despite a significant amount of research on the benefits of capnography in sedation having previously been performed specifically on pediatric populations. An earlier similar survey study of pediatric emergency departments performed several years earlier (16)

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**STANDARDS OF PRACTICE**

**Society of Interventional Radiology Position Statement on Recent Change to the ASA’s Moderate Sedation Standards: Capnography**

Mark Otto Baerlocher, MD, Boris Nikolic, MD, MBA, James E. Silberzweig, MD, Thomas B. Kinney, MD, Michael D. Kuo, MD, and Steven C. Rose, MD

The American Society of Anesthesiologists (ASA) produces the Standards for Basic Anesthetic Monitoring for appropriate patient monitoring during basic anesthesia (1). The standards document is periodically revised and updated, and includes recommendations for the use of moderate and deep sedation. As a number of nonanesthesiology specialists, including gastroenterologists, orthopedic surgeons, cardiologists, gynecologists, emergency room physicians, dentists, and, of course, interventional radiologists, use moderate sedation for procedures, most hospitals and clinics incorporate the ASA guidelines into sedation credentialing. Therefore, any significant change in the ASA standards for moderate and deep sedation will have a downstream impact on most interventional radiologists’ practices.

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found that only 20% of respondents “always” or “often” use capnography.

Regardless of slow acceptance from some specialty societies, the bottom line is that the ASA now includes CO2 capnography as a requirement in the majority of moderate and deep sedation cases. As the ASA standards form the basis of the sedation credentialing process for the majority of hospitals, the following recommendations are made.

1. Interventional radiologists performing cases utilizing moderate sedation consider becoming familiar with CO2 capnography, including the basis of how it works, its benefits over oximetry, and how to use it in clinical practice; and

2. Interventional radiologists performing cases utilizing moderate sedation consider inquiring into obtaining the necessary equipment to perform CO2 capnography, and to incorporate it into their practice.

Because many, and potentially the majority, of interventional practices do not currently use CO2 capnography, this document is not intended to be used in any method as a medicolegal standard, nor to imply that practices that do not currently use the technology are in any way below the standard of care. Rather, the intent of this document is make interventional radiologists aware of the change to the ASA standards for moderate sedation, and to encourage practitioners to consider the benefits of CO2 capnography over oximetry.

REFERENCES


