Monitoring Exhaled Carbon Dioxide: Understanding the Implications of the Revised ASA Standards

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Just this past October, the ASA House of Delegates (HOD) amended the ASA Standards for Basic Anesthetic Monitoring\(^1\) to include monitoring for the presence of exhaled carbon dioxide (CO\(_2\)) during moderate or deep sedation. At first blush, this change seems simple enough, but it will have some very far-reaching effects on many levels, for a range of practitioners, in diverse settings. To appreciate its implications, a little peek into the realm of ASA Practice Parameters—the what, the who, and the how, as regards our common fundamentals of anesthetic practice—seems like a good place to start.

Standards and Other Practice Parameters

Parameters are factors or characteristics, often used to define limits, boundaries, or an acceptable range of values, or guidelines, as in “the parameters of our foreign policy.”\(^2\) Practice Parameters, as used by the ASA, intend to provide guidance for a range of behavior by practitioners “to improve decision-making and promote beneficial outcomes for the practice of anesthesiology.”\(^3\) These Practice Parameters may be either evidence-based (standards, guidelines, or advisories) or consensus-based (policies concerning professional conduct or statements concerning clinical care). Of the evidence-based parameters,\(^4\) standards are essentially rules or minimum requirements that may be modified only in rare situations such as dire emergencies or when equipment is unavailable. Standards are supported scientifically with multiple clinical trials and meta-analyses (Category A, Level I evidence).\(^5\) Guidelines and advisories are also supported scientifically, but with lesser levels of evidence; they may be modified or rejected for clinical reasons, and local institutional policies can overrule them. Statements reflect the opinions and expertise of the ASA HOD, Board of Directors (BOD), or senior leadership.

Practice parameters are written, updated, and revised by the ASA Committee on Standards and Practice Parameters (CSPP),\(^6\) then brought to the ASA BOD, and eventually to the ASA HOD for ratification or rejection. There they must be either voted up or down, or referred for revision; no modification is permitted. There is a rigorous standardized process\(^7\) that includes both scientific and
consensus-based evidence: analysis of the literature, expert opinion, surveys of ASA members, feasibility data, and open forum commentary.

It was just 20 years ago, in 1991, that the ASA embarked upon the development of evidence-based practice parameters, and this was after the only three existent and enduring ASA standards (Basic Standards for Preanesthetic Care, Standards for Basic Anesthetic Monitoring, and Standards for Postanesthesia Care) had already been written. Going forward, all new standards will require the highest levels of evidence, but as those now in effect are considered for modification (every five years, as stipulated by ASA policy), the process may well be more akin to that of creating consensus documents, i.e., based upon science but lacking the availability of Class A, Level I evidence. This accounts for the fact that there are still only three ASA standards. All other practice parameters to date are not supported by a sufficient level of science to qualify as standards. If and when more scientific studies become available—that is, when there is more rigorously derived scientific evidence—then the standards will likely be rewritten to reflect that level of evidence. For this reason, we are left with the counterintuitive curiosity (essentially an artifact of history and organizational evolution) that at present the ASA parameters that are most prescriptive, our specialty’s only three standards, essentially rules of conduct, were not developed with as rigorous attention to evidence as are our present guidelines or advisories.

General Anesthesia, Endotracheal Intubation, and Exhaled CO₂

Now, back to the future with exhaled CO₂ monitoring. A previous revision to the Standards for Basic Anesthetic Monitoring, in order to ensure the adequacy of ventilation during general anesthesia, mandated that “continual monitoring for the presence of expired carbon dioxide shall be performed unless invalidated by the nature of the patient, procedure or equipment.” Moreover, it required that exhaled CO₂ must be detected upon insertion of an endotracheal tube or laryngeal mask airway, quantitative analysis for exhaled CO₂ shall be performed, and end-tidal CO₂ alarms shall be activated and audible. These requirements were readily accepted by anesthesiologists, and in fact others who insert endotracheal tubes also have accepted the necessity of confirming correct positioning by detecting exhaled CO₂.

Monitoring Exhaled CO₂ with Moderate and Deep Sedation

Meanwhile, in a parallel universe, there were several years of impassioned discussion about moderate and deep sedation at the ASA and in various
component societies. ASA leaders developed a growing appreciation that the CSA’s approach to privileging non-anesthesiologists was perhaps more realistic or useful than the initial ASA statement, which declared that deep sedation and general anesthesia are essentially equivalent and thus should only be administered to patients by anesthesia-trained practitioners. This discussion now also began to include extending the use of exhaled CO$_2$ monitoring to settings beyond general anesthesia. With a focus on enhancing patient safety, CSPP concluded that monitoring exhaled CO$_2$—both as a kind of “apnea monitor” and as a trending device to help identify progressive hypoventilation$^8$—would help anesthesiologists better care for patients having both deep and moderate sedation. Although deeply sedated patients are more likely to have issues of airway obstruction and hypoventilation than moderately sedated patients, the stages of sedation (defined by four parameters—responsiveness, airway adequacy, spontaneous ventilation, and cardiovascular function)$^9$ are a continuum, blending into one another. Surely patients intended to be moderately sedated may become more deeply sedated and thereby have potential issues of inadequacy of ventilation. In fact, experienced clinicians have long known that supplemental oxygen therapy may disguise the presence of marked hypercapnia—and even suppress ventilatory drive—in patients manifesting normal oximetry readings.

Consequently, the Standards for Basic Anesthetic Monitoring were revised with a consensus in the committee, acceptance at the BOD, and little discussion or fanfare at the HOD. Beginning in July 2011 (allowing time to appreciate the change and secure the required monitoring equipment),

*During regional anesthesia (with no sedation) or local anesthesia (with no sedation), the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs. 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.*

Hence, regional anesthesia with moderate or deep sedation is subsumed within this mandate. Moreover, the preamble to the Standards clearly states that they apply to all anesthetic care, including general anesthesia, regional anesthesia, and monitored anesthesia care (i.e., moderate or deep sedation), with limited exceptions (e.g., obstetric care).
Revised CMS Interpretive Guidelines

In the meantime, while the ASA is focused on patient safety and updates Standards intended to improve care by anesthesiologists, the Centers for Medicare and Medicaid Services (CMS) is busy completely rewriting its Interpretative Guidelines (IGs) relating to Hospital Conditions of Participation (CoP) governing anesthesia services, aiming to standardize care for all patients within hospitals that have contracts with Medicare. CMS promulgated regulations in December 2009 and May 2010 that decreed that all anesthesia-related services along the continuum of anesthesia care available in a hospital be organized under a single anesthesia service, which must be directed by a qualified physician and consistently implemented in every hospital department and setting that provides any type of anesthesia services. Moreover, CMS-defined “anesthesia” (general anesthesia—deep sedation is treated like general anesthesia by CMS—regional anesthesia, and monitored anesthesia care) now can only be given by anesthesiologists, non-physician anesthesia practitioners, other physicians, dentists, oral surgeons and podiatrists who are qualified to administer anesthesia under state law. CMS specifies that other anesthesia services that are not “anesthesia” (topical and local anesthesia, minimal sedation, moderate sedation/analgesia, also known as “conscious sedation,” and obstetrical “analgesia” short of surgery) are not subject to these restrictions as regards who may administer them. To respond to this major change by CMS, the ASA has written a Statement on Granting Privileges for Deep Sedation to Non-Anesthesiologist Sedation Practitioners.10

Putting together the revised ASA Standards and the revised CMS IGs, what was written by CSPP for anesthesiologists now appears to apply more broadly. There appears to be a de novo requirement by CMS that all anesthetic care must be rendered to the same standard within one hospital, no matter in what location or by what practitioner. This should mean that monitoring for exhaled CO₂ must be done for all moderate and deep sedation not only by anesthesiologists wherever they render services (Cath Lab, ER, PACU, ICU, GI Lab, etc.), but also by all other non-anesthesiologist sedation practitioners. However, this is complicated and confused by CMS’s looking at this with the perspective of its own unique parsing of what is and what is not “anesthesia.” As far as CMS is concerned, moderate sedation is not “anesthesia,” but to the ASA, during moderate sedation, exhaled carbon dioxide must be monitored. There is no indication that CMS expects anyone to follow the ASA Standards, but if anesthesiologists are to be held to this standard, should not those with less expertise in administering sedation do the same? At a minimum, anesthesiologists must work with their facilities to have available in all anesthetizing locations the equipment for adhering to these newly modified ASA Standards,
and this includes sedating locations (moderate or deep sedation, so-called by others “conscious” or “procedural” sedation) where they may be called upon to render any level of anesthetic care. The effective date of July 2011 is intended to allow reasonable and adequate time for this to be effected and to avoid any accreditation inspection issues.

Non-Anesthesia Practitioners and Exhaled CO₂ Monitoring

This whole issue potentially becomes more problematic for non-anesthesia practitioners, who may object and claim that these are not their standards and that moderate sedation is not “anesthesia,” according to CMS. Fortunately, some specialty societies already appear to be moving to embrace and to adopt these new standards. Indeed, consider this scenario: if some anesthesiologist is the physician director of anesthesia services for a particular hospital and mandates these standards of monitoring, then it becomes a privileging matter for the hospital medical staff. Many anesthesiologists as individual practitioners might personally believe that policies for moderate and deep sedation could be different, but that is not what the ASA Standards say, at least as far as monitoring for exhaled CO₂ is concerned. If, perhaps for local political reasons, or perhaps because they do not accept the ASA logic, an individual medical staff via its Medical Executive Committee (MEC) decides not to institute the mandate, then that MEC will have set its own minimum standard, which could be exceeded by anesthesiologists. Dr. Jeff Apfelbaum predicts, based upon his knowledge and experience,¹¹ that if such a hospital were to be surveyed by CMS, then it is very likely that compliance with their own medical staff policies would likely be sufficient because CMS’s focus is on compliance with CMS regulations. If, however, the MEC does not set a minimum standard, considering what an anesthesiologist director of anesthesia services might mandate and what the revised IGs require, then this might not pass muster with CMS surveyors.¹²

Each of the deemed accrediting organizations survey at a minimum for compliance with CMS regulations, but they may also have standards beyond this “minimum.” The Joint Commission, by far the most common surveyor for CMS, declares this mission:

To continuously improve health care for the public, in collaboration with other stakeholders, by evaluating health care organizations and inspiring them to excel in providing safe and effective care of the highest quality and value.

How a hospital with two different levels of care for moderate sedation would fare with any of the deemed surveyors is not predictable at this time.
Monitoring Exhaled Carbon Dioxide (cont’d)

It is likely that monitoring for exhaled CO₂ will become the standard in all health care institutions. Whether the “driver” for this change will be departments of anesthesiology or rather managers of patient safety and risk management remains to be seen. However it plays out, it is important that CSA members digest the implications of the revised ASA Standards, and thereby be poised to serve as a resource in their own institutions for improving patient care and ensuring compliance with regulatory mandates.

The author wishes to thank Dr. Jeffrey Apfelbaum, Chair of the ASA Committee on Standards and Practice Parameters, Professor and Chairman of the Department of Anesthesia and Critical Care at the University of Chicago Hospitals and Pritzker School of Medicine, Past President of the ASA, and currently President of the Society of Academic Anesthesiology Associations and the Association of Academic Anesthesiology Chairs, for sharing his considerable knowledge and expertise, and for serving as a resource and a mentor for me as I wrote this article.

1 “Standards for Basic Anesthetic Monitoring” http://www.asahq.org/For-Healthcare-Professionals/~media/For%20Members/documents/Standards%20Guidelines%20Stmts/Basic%20Anesthetic%20Monitoring%202011.ashx


3 “Policy Statement on Practice Parameters” http://www.asahq.org/For-Healthcare-Professionals/~media/For%20Members/documents/Standards%20Guidelines%20Stmts/Practice%20Parameters.ashx

4 The Preamble to the Standards document clearly delineates the circumstances in which the Standards do and do not apply, as does the “Policy Statement on Practice Parameters” (cited just above) for other practice parameters.

5 A description of the Classes and Levels of evidence is found in all recent ASA Practice parameters, e.g., in the newly revised “Practice Advisory for the Prevention of Peripheral Neuropathies” http://www.asahq.org/For-Members/Clinical-Information/~media/For%20Members/Practice%20Management/PracticeParameters/PerioperativePeripheral-Neuropathies.ashx

6 Roster of the Committee on Standards and Practice Parameters http://www.asahq.org/sitecore/content/Home/For-Members/About-ASA/ASA-Committees.aspx#stan

7 “A task force of 8-10 anesthesiologists leads each practice parameter project. Its members are chosen carefully to provide a balance between private practice and academia as well as representation from each major geographic area of the United States. Each task force, in turn, identified approximately 75-100 consultants who serve as an additional source of opinion, practical knowledge, and expertise. The consultant group’s diversity helps to ensure a broad perspective and good ‘reality testing.’” Ahrens, JF, Chair. Interim Report of the Committee on Practice Parameters, March 2003.

8 Dr. Jeffrey Apfelbaum, Committee Chair, personal communication.
Continuum of Depth of Sedation https://www.asahq.org/For-Members/Clinical-Information/~media/For%20Members/documents/Standards%20Guidelines%20Stmts/Continuum%20of%20Depth%20of%20Sedation.ashx


Dr. Jeffrey Apfelbaum, Committee Chair, personal communication.

For hospitals, there are now three CMS-approved accreditation organizations—The Joint Commission (TJC), the American Osteopathic Association Healthcare Facilities Accreditation Program (AOA/HFAP), and DNV (Det Norske Veritas) Healthcare (DNV). As of July 2010, TJC’s “deemed” status is no longer written into the law, and it must apply to CMS for deeming authority, just like any other organization.