

Monitoring for the Oral and Maxillofacial Surgeon



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KEYWORDS

- Anesthesia monitoring • Capnography • Pulse oximetry • Electrocardiography
- Oscillometric blood pressure recording • Pretracheal auscultation

KEY POINTS

- Office-based sedation is a stochastic process; variability of patient responses leads to unpredictability in achieving and maintaining an appropriate level of sedation.
- Unintentional or unanticipated oversedation will lead to diminution of airway tone and ventilatory urge, both of which can lead to early hypoxemia if not rapidly identified.
- Level of consciousness, oxygenation, ventilation, and circulation (and temperature when appropriate) must be continuously monitored during the administration of anesthesia.
- Robust monitoring guides anesthetic drug titration and facilitates early identification and remediation of adversity.
- Inherent limitations in the information provided by various monitors reminds the clinician to continually use her or his senses of sight and sound to complement information provided by monitoring devices.

INTRODUCTION

The purpose of this article is to highlight commonly used monitoring modalities during the delivery of various levels of office-based, open airway anesthesia. Modes of action, interpretation, significance, and limitation of information obtained is reviewed. It is important to appreciate that this technology continually evolves, and that changes in “standards” or “guidelines” will naturally follow, albeit at nonuniform paces. The requirement of “evidence” to support changes in these documents has been questioned,^{1,2} in view of the inability to design randomized, prospective, single-variable trials that potentially and unethically expose patients to noxious treatment or lack of treatment. In such instances, carefully

contemplated “reason” must prevail, especially when there is a possibility of improving patient safety.

Centrally acting sedative, analgesic, hypnotic, and locally acting anesthetic drugs are administered in the oral and maxillofacial surgery office to diminish or eliminate discomfort, anxiety, memory, and awareness, and blunt the neuroendocrine stress response associated with surgical procedures. The rapid or slow onset of anticipated and unanticipated, positive and negative alterations in patient “status,” involving depth of sedation/anesthesia, autonomic and cardiopulmonary systems, occur as a direct consequence of the challenges of surgery/sedation or a result of an adverse side effect or overdose of medications. These problems include oversedation,

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undersedation, exacerbation of underlying disease, aspiration, compromise or loss of upper airway tone and patency, diminished or eliminated ventilatory drive, predisposition to laryngospasm, increases or decreases in blood pressure and heart rate, and perturbation of heart rhythm, among others. As these problems are anticipated, “continual watchfulness” is mandated to facilitate early identification and remediation. Early identification will facilitate more rapid intervention, blunting the “time urgency,” which may negatively affect performance. This is called *vigilance*, which is the motto of the American Society of Anesthesiologists.³

STANDARDS AND GUIDELINES

Although various agencies and organizations have difficulty in agreeing to a uniform “set of rules/regulations/guidelines” for the indications and necessity of various monitoring devices during the various levels of sedation, there is uniformity in recommendations that the patient’s level of sedation (consciousness), oxygenation, ventilation, circulation, and temperature (during the use of potential triggers of malignant hyperthermia) be continually evaluated during the delivery of anesthetic agents.⁴ It is not the intent of this article to trigger conformity, but rather to stimulate a perceived need for intense monitoring during

anesthesia as a primary means to improve patient safety, in spite of the lack of supportive evidence-based data.¹

THE PURSUIT OF PATIENT SAFETY

The physiologic variables accompanying the various depths of sedation have been defined⁵ (Table 1). Several concepts can be gleaned from this chart. All of these various levels are drug-induced and reversible. The use of the words “usually,” “may,” and “frequently” imply that the divisions between these various levels can be arbitrary and patient responses to drug administration are continuously variable, which can facilitate rapid, and possibly unexpected movement between levels of sedation. Levels of sedation also vary with surgical stimulation, variability of drug onset, and accumulation/redistribution from fat or muscle stores to central nervous system receptors. It is precisely for this reason that practitioners should be able to rescue their patients from 1 level deeper than intended. This rescue includes support and maintenance of airway patency, ventilation, and cardiovascular parameters necessary for perfusion of vital organs. It stands to reason that monitoring should therefore be appropriate for at least 1 level deeper than the intended level of sedation.

Table 1

Continuum of depth of sedation: definition of general anesthesia and levels of sedation and analgesia

	Minimum Sedation (Anxiolysis)	Moderate Sedation/ Analgesia (Conscious Sedation)	Deep Sedation/ Analgesia	General Anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful ^a response to verbal or tactile stimulation	Purposeful ^a response after repeated or painful stimulation	Unarousable
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired

As sedation is a continuum, individual patient responses are variable and may not exactly follow these categorizations.

^a Reflex withdrawal from a painful stimulus is not considered a purposeful response.

From American Society of Anesthesiologists. Continuum of depth of sedation: definition of general anesthesia and levels of sedation/analgesia. 1999. Last amended October 15, 2014. Available at: <http://www.asahq.org/~media/sites/asahq/files/public/resources/standards-guidelines/continuum-of-depth-of-sedation-definition-of-general-anesthesia-and-levels-of-sedation-analgesia.pdf>. Accessed May 24, 2016. Reprinted with permission of the American Society of Anesthesiologists, 1061 American Lane, Schaumburg IL.

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