What Factors Influence Community Oral and Maxillofacial Surgeons' Choice to Use Capnography in the Office-Based Ambulatory Anesthesia Setting?

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Purpose: The American Association of Oral and Maxillofacial Surgeons Board of Trustees mandated monitoring using capnography during moderate sedation (MS) and deep sedation or general anesthesia (DS/GA) delivered in the office setting effective January 1, 2014. The purpose of this study was to estimate the frequency of capnography use and to identify variables associated with a clinician's choice to use capnography before the mandate.

Materials and Methods: To address the research purpose, the authors designed a prospective cohort study and enrolled 2 samples: *1)* American private practicing oral and maxillofacial surgeons (OMSs) and *2)* all eligible patients for whom these OMSs delivered MS or DS/GA. The predictor variables were categorized as surgeon or patient demographics, anesthesia risk factors, procedure-related variables, and anesthetic medications. The outcome variable was capnography use during MS or DS/GA. Descriptive, bivariate, and forward stepwise multiple logistic regression statistics were computed to evaluate the association between the predictor variables and capnography use, with statistical significance set at a *P* value less than or equal to .05.

Results: The surgeon sample was composed of 95 OMSs and 13.7% reported using capnography. The patient sample included 3,495 patients with a mean age of 30.6 years (standard deviation, 17.8 yr), 43.5% were men, and 5.6% were monitored using capnography. Based on bivariate analyses, 17 variables were associated with capnography use. Forward stepwise regression modeling identified 9 variables statistically associated with capnography use. These variables were patient's age, Mallampati airway score, alcohol consumption, board certification, sevoflurane use, number of monitoring methods, electrocardiogram use, precordial stethoscope use, and number of personnel in operating suite.

Conclusions: Although this study might be of historical interest at this time, the results offer insight into OMSs' practice patterns before the mandatory requirement to use capnography. As more OMSs comply with the capnography mandate, their practice patterns involving variables found to statistically correlate with capnography use might become more similar to those of early adopters of this technology.

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The anesthesia-operator model for delivering sedation and general anesthesia in the office-based ambulatory outpatient setting is a hallmark of oral and maxillofacial surgery. Office-based anesthesia is safe and has a high level of patient satisfaction.[1] However, closed-claims data from the Oral and Maxillofacial Surgeons National Insurance Company indicate that the most frequent reason for transfer

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of a sedated patient to an emergency room is respiratory distress.[2]

Capnography is a noninvasive and real-time monitor of ventilatory status and has been shown to be effective in the early detection of hypoventilation, respiratory depression, and adverse respiratory events, enabling remedial measures to be taken to reverse or correct the critical condition.[3] Capnography monitoring has been in routine use in hospital operating rooms since 1988.[4] Despite this important contribution to patient safety, use of capnography monitoring is not universal in clinical areas outside the operating theater and varies from practice to practice.[5]

The American Society of Anesthesiologists (ASA), the Association of Anaesthetists of Great Britain and Ireland, and the American Heart Association revised and updated their recommendations on the use of capnography outside the operating room for moderate or deep sedation.[6] Subsequently, the American Association of Oral and Maxillofacial Surgeons (AAOMS) Board of Trustees revised the critical practice guidelines for oral and maxillofacial surgery and established a similar requirement for office-based ambulatory anesthesia effective January 1, 2014.[7]

The current literature provides in-depth information regarding the advantages of capnography and its clinical applications. The practice patterns among American oral and maxillofacial surgeons (OMSs) regarding capnography use for patient monitoring have not been studied. The purpose of this study was to describe the practice patterns of American private OMSs regarding their use of capnography before the AAOMS mandate. The authors hypothesized that multiple factors could influence a clinician's choice to use capnography to monitor anesthetized patients in office-based ambulatory anesthesia setting. The specific aims of this study were to:

1. Estimate the frequency of capnography use in a sample composed of community OMSs before the AAOMS mandate requiring capnography use
2. Identify variables associated with a clinician's choice to use capnography

Materials and Methods

STUDY DESIGN AND SAMPLE

Under a directive from the AAOMS Board of Trustees, the AAOMS Special Committee for Outcomes Assessments was tasked with designing a benchmarking study for office-based ambulatory anesthesia and third molar operations.[8] To meet this directive, the AAOMS Special Committee for Outcomes Assessments designed and implemented a practice-based research collaborative (P-BRC). The P-BRC members prospectively collected data from their patients regarding the practice and outcomes associated with office-based anesthesia and third molar surgery. To address the research purpose of the present study, the authors designed and implemented a prospective cohort study using data derived from the P-BRC database.

This study has a surgeon sample and a patient sample. The surgeon sample was composed of OMSs randomly selected from the population of AAOMS members from June 2011 through May 2012, stratified by census regions (Midwest, Northeast, South, and West). To avoid seasonality that might bias the results, each OMS was randomly assigned to enter data for 1 month during the 12-month study period (June 1, 2011 to May 31, 2012). Participants were required to enter data for all eligible patients during the assigned month.

To be eligible for study enrollment, clinician participants had to *1)* be an AAOMS member and agree to participate in a P-BRC sponsored by the AAOMS and submit required data to the AAOMS national data repository for all patients for whom they performed an operative procedure in an outpatient setting, *2)* be in private practice based in the United States, and *3)* deliver anesthesia in an office-based ambulatory setting. Exclusion criteria for the OMS sample were *1)* full- or part-time academic OMSs, *2)* OMSs practicing in Puerto Rico, Guam, and the Virgin Islands, *3)* full-time military or public health service OMSs, and *4)* surgeons who submitted an insufficient number of cases (<10) to the database.

The patient sample consisted of all eligible patients who underwent oral and maxillofacial operative procedures during the 1-month period when the surgeon was assigned to record data (June 2011 through May 2012). Eligible subjects for this study included all patients who received moderate sedation (MS) or deep sedation or general anesthesia (DS/GA) in the office setting. Patients were excluded from study enrollment if they had incomplete records or received local anesthesia or minimal sedation.

This study was approved by the University of Washington institutional review board (number 47,728; Seattle, WA).

STUDY VARIABLES

The predictor variables were composed of a heterogeneous set of variables that were grouped into the 5 different categories: surgeon demographics, patient demographics, anesthesia risk factors, procedure-related, and anesthetic medications.

Surgeon demographic variables included age, gender, degree status (single or dually qualified), board-certification status (board certified, yes or no), and census region (Midwest, Northeast, South, or West).