

# Office-Based Ambulatory Anesthesia: Factors That Influence Patient Satisfaction or Dissatisfaction With Deep Sedation/ General Anesthesia

Timothy T. Coyle, DDS, MD,\* John F. Helfrick, DDS, MS,† Martin L. Gonzalez, MS,‡  
Randi V. Andresen, BS,§ and David H. Perrott, DDS, MD, MBA||

**Purpose:** The purpose of this report was to analyze data collected in an outcomes study in an attempt to identify factors that may be significant predictors of either patient satisfaction or dissatisfaction with deep sedation/general anesthesia (DS/GA) administered in an office-based setting.

**Materials and Methods:** To address the research purpose, we used a prospective cohort study design and sample of patients undergoing procedures in the office-based ambulatory setting of oral and maxillofacial surgeons practicing in the United States who received local anesthesia (LA), conscious sedation (CS), or DS/GA. The predictor variables were categorized as demographic, anesthetic technique, adverse events, and patient-oriented outcomes (satisfaction/dissatisfaction). Appropriate descriptive and exact *P* values were completed as indicated. Statistical significance was set at *P* < .05. Multivariate analyses were performed to support the interpretation of univariate findings.

**Results:** The sample was composed of 34,191 patients, of whom 71.9% patients received DS/GA. There were 20,455 patient satisfaction forms completed, of which 14,912 forms were from patients undergoing DS/GA. Of patients who received DS/GA, 95.8% were extremely or moderately satisfied, 3.1% were neutral, and 1.1% moderately or extremely dissatisfied. Increased age and memory of postoperative instructions were identified as factors, which predicted satisfaction. The addition of nitrous oxide to some regimens also appeared to increase satisfaction. Young age, anxiety, pain, vomiting, and being awake during the procedure were predictors of dissatisfaction.

**Conclusions:** The findings of this study indicate that patients are overwhelmingly satisfied with DS/GA provided in an office-based ambulatory setting. Items identified as significant predictors of dissatisfaction (anxiety, pain, vomiting, being awake) generally confirm preexistent suppositions. Surprisingly, patient age (<10 years old) and memory of postoperative instructions appear to have relevance to dissatisfaction as well. Lack of specific regimens and controls prevents confirmation that nitrous oxide improves patient satisfaction rates. Although statistically significant, the variations, which resulted in a higher or lower satisfaction rate, are of questionable clinical significance in many cases.

© 2005 American Association of Oral and Maxillofacial Surgeons  
*J Oral Maxillofac Surg* 63:163-172, 2005

\*Formerly, Chief Resident, Department of Oral and Maxillofacial Surgery, University of Texas Health Science Center at Houston, Houston, TX.

†Professor Emeritus, University of Texas Health Science Center at Houston, Houston, TX.

‡Research Associate, American Association of Oral and Maxillofacial Surgeons, Rosemont, IL.

§Associate Executive Director, American Association of Oral and Maxillofacial Surgeons, Rosemont, IL.

||Principal Investigator and Chair of American Association of Oral and Maxillofacial Surgeons Outcomes Committee; Senior Vice Pres-

ident/Medical Director, Salinas Valley Memorial Healthcare System, Salinas, CA.

This project was funded by an Oral and Maxillofacial Surgery Foundation Grant and by the American Association of Oral and Maxillofacial Surgeons.

Address correspondence and reprint requests to Dr Helfrick: University of Texas Health Science Center at Houston, 1343 Creekford Circle, Sugarland, TX 77478; e-mail: JFHelfrick@aol.com

© 2005 American Association of Oral and Maxillofacial Surgeons

0278-2391/05/6302-0002\$30.00/0

doi:10.1016/j.joms.2004.10.003

Patient satisfaction with health care is a determinant, yet sometimes overlooked, component in the assessment of successful health care delivery. It is often overshadowed by morbidity and mortality rates, modality success or failure rates, and provider satisfaction. However, there have been sufficient studies to establish that the majority of patients desire and are satisfied with outpatient ambulatory surgery, inclusive of many procedures performed by the oral and maxillofacial surgeon.<sup>1-6</sup> Osborne and Rudkin<sup>1</sup> found the highest percentage of satisfaction after day surgery in a major teaching hospital with 98.9% of 6,000 patients stating satisfaction during a follow-up telephone conversation. Le May et al<sup>3</sup> reviewed 14 studies on patient satisfaction and found rates of satisfaction with anesthesia care ranging from 67% to 98%. However, few of the studies in that series evaluated *predictors* for satisfaction or dissatisfaction with anesthesia.

In assessment of patients' attitudes preoperatively and postoperatively, Ross<sup>5</sup> found that 96% of preoperative and 91% of postoperative patients were satisfied with the idea of day-case general anesthesia (GA) for removal of third molars. Most of these studies have shown relatively high patient satisfaction rates but have lacked the large numbers to support these findings.

Until now, patient satisfaction and predictors thereof from a prospective study of sufficient population size to support statistical significance have not been conducted for the office-based ambulatory setting. Other authors have examined predictors of satisfaction with anesthesia on a smaller scale. Macario et al<sup>7</sup> had patients rank 10 potential general anesthetic-associated outcomes using both priority ranking and relative value scales, determining that vomiting was the least desirable outcome. This was followed closely by memory of gagging on the endotracheal tube and pain. Nausea, recall of surgery in progress without pain, residual weakness, shivering, sore throat, somnolence, and normal feelings (no negative feeling) followed in that order. Urbach and Eldelist<sup>8</sup> reported a 46% incidence of dizziness both early and late postoperatively, as well as a high incidence of nausea/vomiting and sore throat after patients underwent oral surgical day surgeries under GA with nasotracheal intubation. Despite this, 91% of those patients would still opt for the same anesthetic again, implying patient satisfaction.

The American Association of Oral and Maxillofacial Surgeons (AAOMS) in partnership with Outcomes Sciences, Inc (Boston, MA) has established a specialty-specific data repository as part of the Outcomes Assessment Project. Previous publications have discussed the need for outcomes research within the specialty, the development of the Outcomes Assess-

ment Project, and analysis of the results of  $\alpha$  and  $\beta$  testing.<sup>9,10</sup> The Office Anesthesia Study is only one module for which this repository is designed to collect large amounts of data on practice trends, techniques, and risk-adjusted outcomes. For purposes of this study, data from this module were used for analysis of multiple variables and their correlations. The objectives and goals to be achieved from this data collection were derived by using the 1995 AAOMS Parameters of Care document as a guideline.<sup>10,11</sup> The purpose of this study was to use objective and subjective variables, which contribute to patient satisfaction or patient dissatisfaction for deep sedation (DS)/GA. Goals of this analysis included documentation of previous assumptions (such as the probability that memory of pain leads to decreased satisfaction) and identification of areas where a clinical change could affect the patient-oriented outcome.

## Materials and Methods

### DATA COLLECTION

Data were submitted for inclusion in the office-based ambulatory anesthesia data repository via an online data entry system and monitored collection and management.<sup>12</sup> Patient and surgeon data were tracked with unique identification numbers to ensure anonymity and to preclude the need for patient consent. Participating sites submitted data for the population of patients who underwent oral and maxillofacial surgical procedures in the office-based setting involving local anesthesia (LA), conscious sedation (CS), or DS/GA. Eligible office-based ambulatory settings included community-, dental school-, or hospital-based practices. There were no exclusion criteria for patients.

Data were collected once for each participant surgeon with respect to practice demographics and training.<sup>12</sup> Patient data were collected twice, first on the day of surgery and then again after surgery, usually at the first postoperative visit. The day of surgery form contained data elements regarding the patient's clinical condition, procedure performed, level of anesthesia obtained, person or people administering the anesthetic and/or monitoring the patient, monitoring methods used, anesthesia technique, and anesthesia-related adverse outcomes. Patient-oriented outcome data contained a brief statement describing the purpose of the study and indicating that participation was voluntary and that lack of participation would not affect the patient's care. This form was completed either immediately after surgery, during a follow-up visit, or via telephone (Fig 1). If the patient was a minor or could not complete the form without parental input, the parent or guardian was asked to complete the form.

Surgeon ID:  
 Patient ID:  
 Date Form Completed: \_\_\_/\_\_\_/\_\_\_

**Your surgeon has enrolled in a national project to measure treatment outcomes and effectiveness of the anesthesia provided to you. Your cooperation in completing this confidential survey will help your doctor and others to continually improve procedure techniques. This survey is completely voluntary. Answering or not answering will not affect your care. If you choose to participate, your answers will be treated with the utmost confidentiality. Your answers will be entered anonymously into a database and combined to create averages. Please answer all questions as best as you can and let your doctor know if there is anything you do not understand or feel that you cannot answer. Thank you.**

1) Which of the following do you remember about your anesthetic experience? (check all that apply)

- Pain during procedure (after anesthetic was given)  
 Discharge instructions  
 None of the above

If you received general anesthesia, were put to sleep or received other medications to relax you during the procedure, which of the following do you remember about your anesthetic experience?

- Being awake and **ABLE** to communicate during procedure  
 Being awake but **UNABLE** to communicate during procedure  
 I do not remember anything about the procedure

2) How satisfied were you with your anesthetic experience (choose one):

- Extremely satisfied  
 Moderately satisfied  
 Neutral  
 Moderately dissatisfied  
 Extremely dissatisfied

3) Would you recommend the same kind of anesthetic to a loved one?

- No  Yes  Not sure

4) How anxious would you be about having the same kind of anesthesia in the future? (choose one)

- Not anxious  
 Somewhat anxious  
 Moderately anxious  
 Extremely anxious  
 Panic stricken

**FIGURE 1.** AAOMS Office Anesthesia Study: Patient Satisfaction Form.

Coyle et al. *Office-Based Ambulatory Anesthesia. J Oral Maxillofac Surg* 2005.

For purposes of this study, *local anesthesia* was defined as the elimination of sensation, especially pain, in one part of the body through the topical application or regional injection of a drug. No other adjunctive agents were used to relieve anxiety. *Conscious sedation* was defined as a minimally depressed level of consciousness that retains the patient's ability to independently and continuously maintain an airway and to respond appropriately to physical stimulation or verbal command and that is produced by a pharmacologic or nonpharmacologic method or a combination thereof. *Deep sedation/general anesthesia* was defined as an induced state of depressed

consciousness or unconsciousness accompanied by partial loss of protective reflexes, including the inability to continually maintain an airway independently or to respond purposefully to physical stimulation or verbal command, and is produced by a pharmacologic or nonpharmacologic method or combination thereof.<sup>10,13</sup>

A more detailed description of the methods and materials, including study design/sample, study variables, data collection, and database management and analysis, can be found in the first of a series of papers regarding the AAOMS Anesthesia Outcomes Project by Perrott et al.<sup>13</sup>

## STATISTICAL ANALYSIS

Fisher's exact test was used to compute statistical significance when comparing the percentage of patients who were satisfied with the percentage who were not satisfied across selected patient characteristics. The significance level used in this study was  $P < .05$ . In support of the univariate conclusions, multivariate logistic regression analyses were performed using satisfaction as the dependent variable (1 = satisfied, 0 = not satisfied). The independent variables included age in deciles except that those 80 or older were aggregated, preoperative anxiety (1 = not anxious, 0 = somewhat anxious to panic stricken), complications (1 = any complication, 0 = no complications), pain (1 = remembered, 0 = not remembered), instructions (1 = remembered, 0 = not remembered), future anesthetic anxiety (1 = not anxious, 0 = somewhat anxious to panic stricken), and consciousness (2 = nothing remembered, 1 = awake and able to communicate, 0 = awake but unable to communicate). Vomiting in recovery is a subcategory of complications and therefore was omitted. Recommended to a loved one was omitted because it is viewed as the consequence of satisfaction not a precursor. American Society of Anesthesiology (ASA) Class<sup>14</sup> was omitted because the age variable contained what was unique about the association of health with satisfaction.

With this analysis, it was possible to test the significance of each variable listed in Table 1 while controlling for other variables listed in the table. The purpose of the multivariate regression analysis was to confirm the findings of the univariate analysis. Each explanatory variable was entered first in the logistic regression analysis, and then all potential confounders were analyzed as a block.

## Results

Seventy-nine volunteer oral and maxillofacial surgeons in 59 sites representing all 6 AAOMS districts submitted data from January 2001 through December 2001. A total of 34,578 patients were enrolled in this study. Approximately 0.5% (187) cases were excluded from analyses because the anesthetic technique was not reported. The sample size available for analyses was 34,391.

From this group of patients, 20,455 patient satisfaction forms were completed at the first follow-up visit or after recovery on the day of surgery representing 59% of all anesthetic procedures.

The data collected are the result of convenience samples, for which the representative nature is strengthened by a large sample size collected from numerous practitioners representing all AAOMS districts. The fact that practitioners were instructed to

complete forms on all anesthetic procedures is also important.<sup>12</sup> In most instances, day-of-surgery information for patients with satisfaction forms compared with patients without satisfaction forms showed a statistically significant difference ( $P \leq .05$ ), even though the difference is relatively small. For example, the mean age of patients with satisfaction forms is 31.77, whereas the mean age of patients without a satisfaction form is 32.22 ( $t = 2.15$ ;  $df = 33,982$ ;  $P = .03$ ). However, there is no statistically significant difference on the outcome variable of any complications from anesthesia: those with and without satisfaction forms had a 1.3% complication rate ( $\chi^2 = 0.17$ ;  $df = 1$ ;  $P = .67$ ).<sup>12</sup>

The data from the patient satisfaction forms representing all 3 levels of anesthesia are shown in Table 2. However, the focus of this study is for those patients who received DS/GA.

Patients who were moderately or extremely satisfied with their anesthesia represented 94.9% within the category of DS/GA; neutral, 3.1%; and moderately dissatisfied or extremely dissatisfied, 1.1%. In extracting those 142 forms in which the anesthetic type was not identified, these numbers change to 95.8% who were extremely or moderately satisfied, 3.1% who were neutral, and 1.1% who were moderately or extremely dissatisfied.

The data collected revealed that only 1.9% remembered pain, 27.2% remembered discharge instructions, 90.5% remember nothing of the operative procedure itself, 3.7% remember being awake and unable to communicate, less than 1% would not recommend this type of anesthesia to a loved one for a similar procedure, and 95.8% would recommend this to a loved one. Postoperatively, 61.4% of patients reported that they would not be anxious about a future experience of this type, whereas based on the day-of-surgery forms, only 15.5% of patients were categorized as not anxious.

In analysis of the data for variables predictive of satisfaction or lack thereof, we included those patients with neutral feelings in the category of dissatisfaction. This was done on the premise that patients giving a neutral answer to this question may have been trying to express dissatisfaction in a polite manner. Forms missing data for this question were not included, leaving a total of 14,770 patients included in the following analysis: 14,150 patients (95.8%) were satisfied (extremely or moderately) and 620 patients (4.2%) were dissatisfied (extremely, moderately, or neutral).

Table 1 summarizes variables that were determined to be statistically significant (exact test  $P < .05$ ) as predictors of satisfaction or dissatisfaction. It was interesting to find that patients older than the age of 40 had the highest satisfaction rate (97.4%). Although

**Table 1. STATISTICALLY SIGNIFICANT VARIABLES OF PATIENT SATISFACTION OR DISSATISFACTION UNDERGOING DEEP SEDATION/GENERAL ANESTHESIA**

Study Variable	Dissatisfied (and Neutral)	Satisfied	Statistically Significant: Univariate Analysis? ( $\alpha = .05$ )	Fisher's Exact Test <i>P</i> Value	Statistically Significant: Multivariate Logistic Regression Analysis? ( $\alpha = .05$ )	<i>P</i> Value
Sample size (%)	620 (4.2%)	14,150 (95.8%)				
Age (yr)						
0-9	39 (10.4%)	336 (89.6%)	Yes	<.001	Yes	<.000
10-100	574 (4.0%)	13,650 (96.9%)				
0-29	492 (4.8%)	9,706 (95.2%)	Yes	<.001	Yes	<.000
30-100	121 (2.7%)	4,280 (97.3%)				
0-39	536 (4.6%)	11,090 (95.4%)	Yes	<.001	Yes	<.001
40-100	77 (2.6%)	2,896 (97.4%)				
ASA Class						
I	505 (4.5%)	10,820 (95.5%)	Yes	.005	No	<.797
II to V	115 (3.3%)	3,327 (96.7%)				
I or II	614 (4.2%)	13,834 (95.8%)	Yes	.033	No	<.338
III to V	6 (1.9%)	313 (98.1%)				
Preoperative anxiety						
Somewhat anxious to panic stricken	549 (4.5%)	11,712 (95.5%)	Yes	<.001	Yes	<.001
Not anxious	62 (2.7%)	2,237 (97.3%)				
Any complication						
Yes	21 (8.8%)	217 (91.2%)	Yes	.001	Yes	<.021
No	599 (4.1%)	13,933 (95.9%)				
Vomiting in recovery						
No	9 (15.0%)	51 (85.0%)	Yes	.001	—	—
Yes	611 (4.2%)	14,099 (95.8%)				
Pain remembered						
Yes	58 (20.9%)	219 (79.1%)	Yes	<.001	Yes	<.000
No	562 (3.9%)	13,931 (96.1%)	Yes	<.001	Yes	<.000
Instructions remembered						
Yes	125 (3.1%)	3,911 (96.9%)	Yes	<.001	Yes	<.000
No	495 (4.6%)	10,239 (95.4%)				
Awake, able to communicate	43 (6.8%)	587 (93.2%)	Yes	.017	Yes	<.064
Awake, unable to communicate	59 (10.9%)	482 (89.1%)				
Remembered nothing of operation	504 (3.7%)	12,944 (96.3%)	Yes	<.001	Yes	<.000
Awake	102 (8.7%)	1,069 (91.3%)				
Recommend to loved one	395 (2.8%)	13,829 (97.2%)	Yes	<.001	—	—
No/not sure would recommend	219 (44.4%)	274 (55.6%)				
Not anxious about future anesthetic	244 (2.7%)	8,873 (97.3%)	Yes	<.001	Yes	<.000
Somewhat anxious to panic stricken	375 (6.7%)	5,235 (93.3%)				

NOTE. The first item in each pairing is compared against all other patients for this variable alone. Each line represents 100% of the patients treated with deep sedation or general anesthesia for which satisfaction forms were returned. The number of patients is followed by the equivalent percentage in parenthesis. Only statistically significant variables ( $P < .05$ ) are included. Multivariate regression analysis was performed to confirm the findings of the univariate analysis.

Coyle et al. Office-Based Ambulatory Anesthesia. *J Oral Maxillofac Surg* 2005.

patients younger than 10 years old had a satisfaction rate of 89.6%, it should be noted that for this age group, a parent or guardian might be the one completing the satisfaction form for the patient. When patients were classified using the ASA system, it was found that the higher the ASA Class, the higher was the level of satisfaction. However, ASA classification was found not to uniquely affect satisfaction in the multivariate logistic regression that includes age. This suggests that declining health with age explains as

much about less patient satisfaction as does ASA Class itself. In analyzing anxiety levels, patients who were not anxious preoperatively had a satisfaction rate of 97.2%, which was equivalent to the 97.3% satisfaction rate in patients who, postoperatively, would not be anxious about a future procedure of this nature.

The presence of any anesthetic adverse outcome increased the dissatisfaction rate to 8.8%. Predictor variables that statistically affected dissatisfaction were vomiting in recovery ( $n = 60$ ; dissatisfaction, 15%)

**Table 2. PATIENT SATISFACTION FORM DATA GROUPED ACCORDING TO ANESTHETIC TECHNIQUE**

Study Variable	Overall	Local Anesthesia	Conscious Sedation	General Anesthesia or Deep Sedation	$\chi^2$ P Value
Sample size (%)	20,455 (100)	2,995 (14.6)	2,548 (12.5)	14,912 (72.9)	NA
Memory after anesthesia (Both pain and instructions possible)					<.001
Pain	695 (3.4)	282 (9.4)	133 (5.2)	280 (1.9)	<i>df</i> = 2 <.001
Discharge instructions	7,116 (34.8)	1,866 (62.3)	1,197 (47.0)	4,053 (27.2)	<i>df</i> = 2 <.001
Neither pain nor instructions	12,914 (63.1)	968 (32.3)	1,276 (50.1)	10,670 (71.6)	<i>df</i> = 2 <.001
Memory of operation					<i>df</i> = 4 <.001
Awake, able to communicate	1,899 (9.3)	601 (20.1)	666 (26.1)	632 (4.2)	
Awake, unable to communicate	718 (3.5)	20 (0.7)	153 (6.0)	545 (3.7)	
Remember nothing	14,855 (72.6)	77 (2.6)	1,278 (50.2)	13,500 (90.5)	
Missing data	2,983 (14.6)	2,297 (76.7)	451 (17.7)	235 (1.6)	
Satisfaction with anesthetic					<i>df</i> = 8 <.001
Extremely satisfied	16,785 (82.1)	2,266 (75.7)	1,991 (78.1)	12,528 (84.0)	
Moderately satisfied	2,504 (12.2)	467 (15.6)	415 (16.3)	1,622 (10.9)	
Neutral	689 (3.4)	136 (4.5)	88 (3.5)	465 (3.1)	
Moderately dissatisfied	148 (0.7)	27 (0.9)	19 (0.7)	102 (0.7)	
Extremely dissatisfied	68 (0.3)	9 (0.3)	6 (0.2)	53 (0.4)	
Missing data	261 (1.3)	90 (3.0)	29 (1.1)	142 (1.0)	
Recommend to a loved one					<i>df</i> = 4 <.001
No	154 (0.8)	52 (1.7)	18 (0.7)	84 (0.6)	
Not sure	678 (3.3)	156 (5.2)	111 (4.4)	411 (2.8)	
Yes	19,375 (94.7)	2,695 (90.0)	2,401 (94.2)	14,279 (95.8)	
Missing data	248 (1.2)	92 (3.1)	18 (0.7)	138 (0.9)	
Anxious about future experiences					<i>df</i> = 8 .007
Not anxious	12,521 (61.2)	1,736 (58.0)	1,634 (64.1)	9,151 (61.4)	
Somewhat anxious	4,320 (21.1)	646 (21.6)	498 (19.5)	3,176 (21.3)	
Moderately anxious	2,023 (9.9)	320 (10.7)	254 (10.0)	1,449 (9.7)	
Extremely anxious	1,251 (6.1)	175 (5.8)	135 (5.3)	941 (6.3)	
Panic stricken	98 (0.5)	21 (0.7)	10 (0.4)	67 (0.4)	
Missing data	242 (1.2)	97 (3.2)	17 (0.7)	128 (0.9)	

Coyle et al. Office-Based Ambulatory Anesthesia. J Oral Maxillofac Surg 2005.

and recall of having pain ( $n = 278$ ; dissatisfaction, 20.9%). Patients who recalled being awake during the procedure were more likely to be dissatisfied, while those who recalled being awake *and* unable to communicate had a 10.9% dissatisfaction rate across 541 patients. Remembering nothing of the operation lowered the dissatisfaction rate to 3.7%. Therefore, the most satisfied were patients who remembered nothing of the operation. Somewhat less satisfied were those patients who were awake at some time during the procedure and were able to communicate. Least satisfied were patients who were awake but could not communicate.

A much larger number of patients (4,036) remembered postoperative instructions, and 96.9% were satisfied. Of patients who would recommend this anesthetic to a loved one, 97.2% also reported satisfaction.

Items that were not statistically significant included gender, intraoral versus extraoral procedure, use of

premedication, and anesthetic adverse outcomes (vomiting during induction, laryngospasm or bronchospasm, respiratory problem, cardiac arrhythmia, syncope, seizure, neurologic impairment, prolonged emergence, peripheral vascular injury, and "other") other than vomiting during recovery.

As stated earlier, these complications as a collective group were significant. The item on the satisfaction form for "neither pain nor instructions remembered" was dropped from the analysis after crosschecks of the data revealed it to be invalid.

In response to the high dissatisfaction rate in children (10.4%), these rates were also calculated for this age group of 0 to 9 years across all types of anesthesia and each type individually. The overall rate of dissatisfaction was 9.2% of 487 patients. Only 20 patients in this age group received LA only, of which only one was not satisfied ( $P = 1.000$ ). Young patients having CS numbered 92, with 5.4% being dissatisfied ( $P = .604$ ). These  $P$  values compare each group against the

**Table 3. DEEP SEDATION/GENERAL ANESTHESIA DRUG CLASS COMBINATIONS**

Study Variable	Dissatisfied (and Neutral)	Satisfied	Exact Test <i>P</i> Value
Sample size	620 (4.2%)	14,150 (95.8%)	
A. <i>Local + narcotic + benzodiazepine</i> + (not methohexital nor propofol nor ketamine) versus	35 (3.6%)	940 (96.4%)	.362
All other combinations	585 (4.2%)	13,210 (95.8%)	
B. <i>Local + narcotic + benzodiazepine</i> + ( <i>methohexital</i> or <i>propofol</i> or <i>ketamine</i> ) versus	471 (4.4%)	10,321 (95.6%)	.107
All other combinations	149 (3.7%)	3,829 (96.3%)	
C. <i>Local + narcotic + benzodiazepine</i> + <i>nitrous oxide</i> + (not methohexital nor propofol nor ketamine) versus	20 (3.7%)	514 (96.3%)	.652
All other combinations	600 (4.2%)	13,636 (95.8%)	
D. <i>Local + narcotic + benzodiazepine</i> + <i>nitrous oxide</i> + (methohexital or propofol or ketamine) versus	148 (3.7%)	3,864 (96.3%)	.066
All other combinations	472 (4.4%)	10,286 (95.6%)	
E. <i>Local + narcotic + benzodiazepine +</i> <i>nitrous oxide</i> versus	168 (3.7%)	4,378 (96.3%)	.046*
All other combinations	452 (4.4%)	9,772 (95.6%)	
F. <i>Local + narcotic + benzodiazepine +</i> (not methohexital nor propofol nor ketamine) + <i>decadron</i> versus	25 (3.8%)	627 (96.2%)	.775
All other combinations	595 (4.2%)	13,523 (95.8%)	
G. <i>Local + narcotic + benzodiazepine</i> + (methohexital or propofol or ketamine) + <i>decadron</i> versus	278 (3.9%)	6,818 (96.1%)	.109
All other combinations	342 (4.5%)	7,332 (95.5%)	
H. <i>Local + narcotic + benzodiazepine</i> + <i>decadron</i> versus	303 (3.9%)	7,445 (96.1%)	.071
All other combinations	317 (4.5%)	6,705 (95.5%)	

NOTE. The targeted drug class for each comparison is italicized and each generic regimen is compared against all other combinations. The overall satisfaction and dissatisfaction rate is denoted on the first line of the table. All patient subsets targeted for comparison received at least a local anesthetic, a narcotic, and a benzodiazepine.

Abbreviations: A, denotes the base rate; B, adds methohexital, propofol, and/or ketamine for comparison; C, patients from "A" who also received nitrous oxide; D, patients from "B" who received nitrous oxide; E, represents all patients from "C + D" who had nitrous oxide and is significant at  $P = .046$ ; F, represents patients from group "A" who also received decadron; G, represents patients from group "B" who also received decadron; H, all patients in "F + G."

\*Statistically significant.

Coyle et al. Office-Based Ambulatory Anesthesia. J Oral Maxillofac Surg 2005.

dissatisfaction rate for all other ages within that anesthetic category and were not significant.

Analysis of the available data based on medications or drugs identified on the day-of-surgery form resulted in more than 1,700 different drug regimens. This was broken down into all categories including local anesthetics. Fifty-six combinations each represented 0.5% or more of the total, with the most common regimen accounting for only 3.9%. To obtain more significant numbers for analysis, we have looked at what we believe to be the more common general patterns by classification of drugs. All groupings were compared against all other patients (Table 3).

Patients who received LA, any narcotic, and any benzodiazepine accounted for 11,767 of the 14,770 patients answering the level of satisfaction question

on the postoperative form. This group was used as the base for analysis of addition, or not, of methohexital, propofol, and/or ketamine in the aggregate. Nitrous oxide was then added to these 2 groups as a variable. The addition of nitrous oxide was minimally significant ( $P = .046$ ) only when all patients who received this plus a local anesthetic, a narcotic, and a benzodiazepine were included, regardless of methohexital, propofol, and ketamine use. Decadron use was evaluated in similar fashion and found to have no statistical significance across 7,748 patients.

Patients who completed the patient satisfaction form on the day of surgery versus at a postoperative visit both exhibited high rates of satisfaction. The exact test  $P$  value of .080 confirmed lack of statistical significance for this variable.

## Discussion

The patient satisfaction rate for DS/GA was very high, leaving little room for improvement. Certainly, attainment of 100% satisfaction would be ideal, but it is likely that a certain number of patients will always be dissatisfied, regardless of outcome, although we were unable to confirm this in the literature. Patients who admitted to being dissatisfied represented an extremely low rate of 1.1% for the sample. The small number of dissatisfied patients seemed to be a limiting factor in the utility of much of the analysis. The categories rating level of satisfaction with anesthesia included extreme or moderate satisfaction, neutral feelings, and moderate or extreme dissatisfaction. For purposes of this study, we elected to include those with neutral feelings in the “dissatisfaction” group. The theory was that this may represent a polite way for the patient to express dissatisfaction and in the process gave us a larger number with which to work. This also allowed us to separate those patients who were legitimately satisfied from those who may not have been, precluding overestimation of satisfaction.

When evaluating patient satisfaction, one must account for the question’s intent and that the subjects may not perceive the question or the answer in consistent fashion. For example, the best anesthetic for any given patient may depend on a subjective assessment of well-being at any given time. This assessment may vary significantly from one patient to the next, making prediction of satisfaction more difficult. As stated by Fung and Cohen,<sup>15</sup> “using patient satisfaction as an indicator to monitor the quality of clinical care has potential merit. For patients, satisfaction represents, at least in theory, an evaluation of the healthcare experience based on their own values, perceptions, and interactions with the healthcare environment.” Tong et al<sup>2</sup> concluded, after surveying 2,730 patients at 24 hours after day surgery, that dissatisfaction with anesthesia is a predictor of global dissatisfaction with ambulatory surgery and that increasing postoperative symptoms 24 hours after surgery is a predictor of dissatisfaction with anesthesia. This leads one to wonder whether we have evaluated patient satisfaction with anesthesia, their surgeon, or some combination more representative of the entire ambulatory surgical setting. There were so many potential variables in this study that it is difficult, if not impossible, to identify with certainty that any one variable was the sole cause of a patient’s satisfaction or dissatisfaction. In fact, unmeasured variables may play a role as well. It is important to remember that although patients were asked to rank their satisfaction with the anesthetic, they possibly were ranking their experience as a whole. This could mean conscious or subconscious inclusion of everything from parking,

interaction with staff, and physician rapport, to participation in decision making. Even if this were so, it would seem that in the face of such high levels of satisfaction, items such as these would only detract from satisfaction. For example, Greenwood<sup>4</sup> found a 58% dissatisfaction rate with parking in patients undergoing similar types of procedures. A distant second in that survey was patient privacy, whereas patients were most satisfied by the overall attitude of the clinician across all appointments. Items such as these must certainly play a role in patient satisfaction, regardless of how the survey questions are asked.<sup>16</sup>

Review of the data on patient satisfaction across all 3 types of anesthesia revealed minimal difference in patient dissatisfaction rates (1.2% LA; 1.1% DS/GA). At first glance one might question the benefit of performing a procedure under any more than LA. Although another paper in the Outcomes Project series identifies the low complication rate of DS/GA,<sup>12</sup> why take on the potential risks of parenteral and/or inhalation anesthesia? We contend that the minimal difference in acceptance between LA and DS/GA is probably because the patients in the latter group selected themselves out of having LA only. This occurs during the preoperative evaluation in combination with the planned surgical procedure and a clinical judgment by the practitioner. Many patients and procedures are simply not amenable to LA only or even CS. This leads into the fact that the surgeons’ perspective has not been evaluated by this study. We believe that most surgeons would prefer to perform the majority of procedures with a patient at a level of anesthesia at which the patient is comfortable and not apprehensive. Of course, this requires significant clinical judgment based on the risk/benefit ratio. In other words, it is easier, both mentally and physically, to perform surgery on a patient who is relaxed, completely comfortable, and not moving. This is opposed to surgery on a patient who is awake, anxious, or even panicky. Many surgeons simply would not perform some procedures commonly done with DS or GA under LA alone.

Because of the large sample size, variables showing statistical significance generally had a very small effect on the 95.8% satisfaction rate. The only variables dropping the satisfaction rate below the 90th percentile were age less than 10 years, vomiting during recovery, remembering pain during the procedure, and memory of being awake with inability to communicate during the procedure. Day-of-surgery variables for which the satisfaction rate was above 97% were age greater than 30, ASA Class of 3 or greater, and absence of preoperative anxiety.

Vomiting and memory of pain are predictors of dissatisfaction previously documented.<sup>7</sup> Few practitioners would argue this and most would not need a

publication to verify this finding. Prevention of pain and vomiting is advisable for all encounters. However, for patients less than 10 years of age, this is not as obvious. The dissatisfaction rate in this age group trended up through LA, CS, and DS/GA. Notably, many fewer patients in this age group were treated with LA or CS, most likely due to inability to manage the patient with other lesser levels of anesthesia. It seems likely that parents or guardians completed the satisfaction forms for these children (as per the study protocol). Could this finding represent the feelings of the very anxious parent, who has postoperatively seen their child appearing uncomfortable or crying, or possibly just appearing groggy and confused? From the practitioner's perspective, a perfect or nearly perfect anesthetic and surgery may appear to be something completely different for the understandably anxious parent. Possibly these findings are accurate, reflecting a lesser outcome in a patient population that for many may be more difficult to treat, or it may reflect a need for increased preoperative discussion with the patient and/or parent regarding postoperative expectations. Nevertheless, young age has been identified as a risk factor for patient dissatisfaction and a more in-depth study might reveal more insight into the etiology of the lower satisfaction rates. The memory of being awake during the procedure is also a risk for dissatisfaction, especially when combined with an inability to communicate. Other risk factors for dissatisfaction found to be statistically significant included anxiety and the presence of any complication. With regard to preoperative anxiety, it is interesting that those patients given premedication in an effort to alleviate anxiety showed no significant difference in the satisfaction rate.

Absence of preoperative anxiety is relatively easy to understand as a predictor of patient satisfaction; however, age over 30 and increased ASA status are less clear. Possibly patients with increased age have an increased maturity level with regard to expectations or more likely have experienced other surgical procedures with which to compare this anesthetic. The trend for less healthy patients to be more satisfied with their anesthetic is also unclear. However, as noted, ASA level did not have a statistically significant impact on patient satisfaction when controlling for all of the other variables listed in [Table 1](#).

Memory of postoperative instructions also predicts satisfaction but, understandably, less than half of the patients remembered their instructions. This is an excellent reason to give the patient explicit written postoperative instructions as well as oral instructions. The majority of patients did not remember anything of the operation itself, and this was significant as predictive of satisfaction. This correlates well with the goals of DS/GA. Unfortunately, many of these

same patients who did not remember postoperative instructions also completed the patient satisfaction form on the day of surgery. Despite lack of significant differences between patients who completed this form on the day of surgery versus at a postoperative visit, this still casts some level of suspicion on this data. Fortunately, the differences were not statistically significant, because dismissal of this data would have resulted in a large decrease in the number of surveys included in the analysis. This is a problem that is difficult to address when assessing patient satisfaction for this type of care. Last, when the practitioner can convince a patient of the attributes of a particular anesthetic as the preferred modality, being so correct that the patient would then recommend that modality to a loved one, the practitioner is more likely to have a satisfied patient. The same applies when this modality results in less postoperative anxiety.

Nitrous oxide use in conjunction with the more common regimens of DS/GA was statistically significant by a small margin as a predictor of patient satisfaction. However, the addition of decadron does not appear to be statistically significant despite a slight increase in satisfaction. Addition of nitrous oxide may improve the rate of patient satisfaction; however, lack of specific drug regimens and control groups in the face of an overwhelming number of medication combinations does not allow confirmation of this. At the very least, these findings do confirm that nitrous oxide and decadron do not have adverse effects on postoperative patient satisfaction.

This is one of the largest studies ever conducted in which patient satisfaction with office-based ambulatory anesthesia has been assessed. Patient satisfaction rates were excellent, not only with DS/GA but also with all modalities of anesthesia. This reflects a successful process with respect to anesthesia satisfaction as well as with the surgeon's ability to accurately assess patients and determine what modality of anesthesia is most appropriate for the patient given the surgical procedure. Future research in this area might also look at surgeon satisfaction with the modality of anesthesia. Identified predictors of satisfaction or dissatisfaction centering around pain, memory of the operation, complications such as vomiting in recovery, and level of anxiety only confirm what most surgeons already believe to be true. Young age as a predictor of dissatisfaction and older age as a predictor of satisfaction, as well as increased satisfaction correlated with memory of postoperative instructions, shed light onto variables previously less well known. Despite statistical significance, these variations of an extremely high satisfaction rate are of questionable clinical significance in most cases. The study design is insufficient to confirm the significance of nitrous oxide or dexamethasone as predictors of patient satisfaction. Although it seems to verify that there is not an adverse

effect on satisfaction, future research in this area may be warranted.

### *Acknowledgments*

We would like to thank the members of the AAOMS Outcomes Committee for all of their valuable input and dedication: Drs David Perrott (Chair), Peter Larsen, Thomas Dodson, Richard Scott, Myron Scott, John Helfrick (advisor), Richard Haug (advisor), and James Kelly (ex officio). We also want to thank all of the surgeons and study coordinators for their participation in the Office Anesthesia Study. A special acknowledgment is given to Dr John Henning for statistical analysis of the data and Judy Yuen for her leadership as the research associate at AAOMS.

### **References**

1. Osborne GA, Rudkin GE: Outcome after day-care surgery in a major teaching hospital. *Anesth Intensive Care* 21:822, 1993
2. Tong D, Chung F, Wong D: Predictive factors in global and anesthesia satisfaction in ambulatory surgical patients. *Anesthesiology* 87:856, 1997
3. Le May S, Hardy JF, Taillefer MC, et al: Patient satisfaction with anesthesia services. *Can J Anaesth* 48:153, 2001
4. Greenwood M: Patients' views of oral day surgery. *Br Dent J* 175:130, 1993
5. Ross MB: An assessment of patients' attitudes to day-case general anaesthesia for removal of mandibular third molars. *Br J Oral Maxillofac Surg* 36:27, 1998
6. Power KJ: Anesthesia for day case oral surgery. *Br J Oral Maxillofac Surg* 27:387, 1989
7. Macario A, Weigner M, Carney S, et al: Which clinical anesthesia outcomes are important to avoid? The perspective of patients. *Anesth Analg* 89:652, 1999
8. Urbach G, Eldelist G: An evaluation of the anaesthetic techniques used in an outpatient unit. *Can Anaesth Soc J* 24:401, 1977
9. Hu HM, Perrott DH, Rinaldi RC, et al: Outcomes research: A mandate for oral and maxillofacial surgery (part I). *J Oral Maxillofac Surg* 58:91, 2000
10. Hu HM, Perrott DH, Greene MG, et al: Development of an oral and maxillofacial surgery outcomes system for anesthesia and third molar removal: Results of alpha and beta testing. *J Oral Maxillofac Surg* 59:554, 2001
11. American Association of Oral and Maxillofacial Surgeons: Parameters of care for oral and maxillofacial surgery: A guide for practice, monitoring, and evaluation. *J Oral Maxillofac Surg* 53:21-24, 43, 1995 (suppl 5)
12. American Association of Oral and Maxillofacial Surgeons: Parameters and Pathways: Clinical Practice Guidelines for Oral and Maxillofacial Surgery (AAOMS ParPath 01) version 3.0. Anesthesia outpatient facilities. Rosemont, IL, AAOMS, 2001, pp ANE1-ANE23
13. Perrott DH, Yuen JP, Andresen RV, et al: Office-based ambulatory anesthesia: Outcomes of clinical practice of oral and maxillofacial surgeons. *J Oral Maxillofac Surg* 61:983, 2003
14. Manual for Anesthesia Department Organization and Management. Park Ridge, IL, American Society of Anesthesiology, 2001
15. Fung D, Cohen MM: Measuring patient satisfaction with anesthesia care: A review of current methodology. *Anesth Analg* 87:1089, 1998
16. Dionne RA, Yagiela JA, Moore PA, et al: Comparing efficacy and safety of four intravenous sedation regimens in dental outpatients. *J Am Dent Assoc* 132:740, 2001