Factors Affecting Patient Satisfaction With Their Anesthesiologist: An Analysis of 51,676 Surveys From a Large Multihospital Practice

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BACKGROUND: An increasing focus of health care quality is the assessment of patient-reported outcomes, including satisfaction. Because anesthesia care occurs in the context of perioperative surgical care, direct associations between anesthetic management and patient experience may be difficult to identify. We analyzed anesthesia-specific patient satisfaction survey data from a large private practice group to identify patient, procedure, and anesthetic-specific predictors of patient satisfaction with their anesthesiologist, measured via responses to a validated patient satisfaction survey instrument. We hypothesized that some factors governing satisfaction with an anesthesia provider are beyond their ability to control.

METHODS: We retrospectively reviewed responses to the Anesthesia Patient Satisfaction Questionnaire (APSQ), administered online to patients cared for by US Anesthesia Partners, a multistate anesthesia group practice. The APSQ focuses on patient satisfaction with their anesthesiologist and patient-reported outcomes and is administered after discharge. Responses from May to November 2016 were aggregated, and relationships between responses and patient, procedural, and clinician-related factors were assessed using multivariable logistic regression.

RESULTS: Out of 629,220 adult patients cared for during the study period, 51,676 responded to the survey request for a 9.3% overall response rate for patients. Nonresponders were slightly older and more likely to be male than responders. After multivariable regression, no patient or procedural factor was associated with patient rating of their anesthesiologist. However, ≥55 years of age, inpatient (versus outpatient) setting, and nighttime surgery (between 6 PM and 6 AM) were associated with lower scores on other satisfaction questions.

CONCLUSIONS: Our data suggest that some factors governing satisfaction with an anesthesia provider are beyond their ability to control. Further work is needed to identify elements of patient satisfaction with their anesthesiologist and to optimize these aspects of perioperative care. (Anesth Analg 2019;129:951–9)

KEY POINTS

- **Question:** What factors predict patient satisfaction with their anesthesiologist and the anesthesia experience?
- **Findings:** In a large database of patient satisfaction survey data, factors in addition to anesthesiologist behavior such as age, outpatient versus inpatient setting, time of surgery, and type of anesthesia independently affected patient satisfaction with their anesthesiologist.
- **Meaning:** Incentive programs based on patient satisfaction with their anesthesiologist should adjust for factors outside their direct control.

A growing focus in health care quality is assessment of the patient experience, and measures of such experience are now included in public reporting programs such as Physician Compare.[1] Patient experience surveys now comprise 30% of the Medicare Hospital Value-Based Purchasing Program,[2] highlighting the importance of patient satisfaction to government payers. Evaluations of the patient experience involve both surveys of patient satisfaction and assessments of specific interactions with the health care system.[3,4]

Of the survey tools for assessing the patient experience, the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) is the most widely used.[5] This validated, 32-question tool is required by the US Affordable Care Act of 2010, has a 27% response rate among the sample of patients surveyed, and results have been publicly reported since 2008.[5] However, the HCAHPS tool does not focus specifically on the perioperative period and provides little feedback on the role of the anesthesiologist in the patient experience.[5] The American Society of Anesthesiologists (ASA) likewise notes that no widely validated tool exists for assessing patient satisfaction with anesthesia care.[6]

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Because anesthesia care occurs in the context of perioperative surgical care, associations between anesthetic management and patient satisfaction may be difficult to separate from surgical, hospital, and other factors affecting the perioperative experience. Factors associated with improved perioperative patient satisfaction have included quality of recovery, having caregivers smile, controlling postoperative pain, and informing patients about the billing process, whereas surgery late in the day has been associated with patient dissatisfaction.[7–10]

Studies of satisfaction with overall anesthesia care in non-US settings suggest inconsistent effects of patient age, sex, and ASA physical status (PS).[11–13] The effect of anesthesia type on patient satisfaction is also uncertain. While a 2017 Belgian study found that ambulatory patients who received regional anesthesia (RA) were more satisfied compared to those who received general anesthesia (GA), a 2017 multicenter Saudi Arabian study found the opposite effect.[13,14]

An important aspect of interpreting patient satisfaction surveys is clarifying the contribution of the anesthesiologist. To address this issue, we retrospectively reviewed a convenience sample of anesthesiologist-specific patient satisfaction survey data from a large multicenter private practice group. We sought to identify patient, procedure, and anesthetic-specific factors that were associated with patient satisfaction with their anesthesiologist and hypothesized that, after adjustment, some factors governing satisfaction with the anesthesia provider would be beyond their direct control.

METHODS

Setting and Participants

Because all data were deidentified, this study was reviewed by the University of Chicago Institutional Review Board and judged exempt from written consent. We retrospectively reviewed patient satisfaction quality data from US Anesthesia Partners, a large national anesthesia company. Anesthesia teams relevant to the database included anesthesiologists and Certified Registered Nurse Anesthetists (CRNAs), and, in some cases Certified Anesthesiologist Assistants (CAAs), anesthesia residents, or student nurse anesthetists. Patients who had surgery or a procedure requiring anesthesia at one of the participating sites were surveyed regarding their experience after discharge if they had not opted out preoperatively. Patients <18 years old were excluded.

The primary outcome was the relationship between patient, procedural, and anesthetic factors and answers to survey questions pertaining to patient satisfaction. We examined the relationship between patient satisfaction and factors potentially controllable by the anesthesiologist such as anesthesia type and those not controllable by the anesthesiologist such as patient age and sex, surgery start time, and inpatient (versus outpatient) setting.

The satisfaction survey instrument was the 27-point Anesthesiologist Patient Satisfaction Questionnaire (APSQ). The APSQ was created to be consistent with ASA Patient Satisfaction Recommendations[6] and was administered via the web-based SurveyVitals company (Springtown, TX). The survey focused on patient satisfaction with their anesthesiologist and contained 5-point Likert items, yes/no items, and open-ended questions (Supplemental Digital Content, Appendix 1, http://links.lww.com/AA/C839). Questions 2–8 and 10 centered on the patient interaction with their anesthesiologist. The survey also contained questions focused on self-reported anesthesia outcomes such as pain, nausea/vomiting, and unpleasant memories. The APSQ has been validated as internally consistent with a Cronbach α of .86.[15]

Data Collection

After discharge from the hospital, patients with valid contact information were sent an email or text message according to their preoperatively declared preference that directed them to a website hosting the APSQ survey. Survey responses were then aggregated into a larger data set containing deidentified patient demographic information and ASA PS. Demographic data were collected from billing records and included patient age, sex, zip code of residence, type of procedure (per Current Procedural Terminology [CPT] code), type of anesthesia, procedural location, date, and time of surgery. To assign anesthesia type, a General > Regional > Sedation hierarchy of types was applied. Thus, a patient receiving GA and a nerve block would be classified as GA, and a patient receiving RA and sedation would be classified as having received RA. Most surveys were filled out between 7 and 14 days after the procedure. Surveys collected between May and November 2016 were included in our analysis because the survey instrument had not been fully functional during the first 4 months of the year, and survey return rates were thus lower and less consistent.

Statistical Analysis

Statistical analyses were performed in Stata 14 (StataCorp, College Station, TX). Adults with a known anesthesia type who answered at least 1 survey question were included in the study. Patient age was dichotomized at the median into 2 categories (18–54 years old and ≥55 years old). Procedural location was classified by the survey tool as outpatient, inpatient, or a physician's office. Because of the low number of office procedures, office and outpatient procedural locations were grouped together. Because nearly all patients were from the Southern United States (defined using 2012 US Census terminology), survey data from other regions of the country were excluded from the study.[16] Patients who answered "no" to the question "did you remember enough about your recent procedure" were also excluded.

ASA classes were analyzed separately except for ASA PS IV and V categories, which were combined due to low patient numbers in the ASA PS V group. The primary anesthesia type for each anesthetic was classified as "general" (including total intravenous anesthesia), "sedation" (monitored anesthesia care), and "regional" (including epidural, spinal, or nerve block). Anesthetic combinations (GA and RA) were resolved using the hierarchy described above. Information about the type of procedure was extracted from the primary CPT surgical code associated with the procedure and grouped by CPT code for analysis. Income data for each patient were estimated using the median household

income for the patient's zip code, which was obtained from 2015 Internal Revenue Service (IRS) Individual Income Tax Statistics.[17]

Likert scale answers were dichotomized as described previously to allow multivariable regression analysis.[18] "Strongly agree" and "Agree" responses were collapsed together, and "Strongly disagree," "Disagree," and "Neutral" responses were collapsed together. Responses to the question "Please rate your anesthesiologist" were dichotomized so that scores of 4 and 5 were interpreted as "Satisfied" and 1–3 were interpreted as "Not satisfied."

To adjust for time of day, we divided cases into 3 groups by procedure start time: 6 AM to 12 PM, 12 PM to 6 PM, and 6 PM to 6 AM. This approach has been used previously to analyze start times for procedural interventions.[19]

To compute confidence intervals (CIs) on response rates, the Clopper–Pearson exact test was used. The Spearman rank order correlation test was used to assess correlation between answers to patient satisfaction questions. To address our primary outcome, we performed univariate logistic regressions for each satisfaction question to compare responses by primary anesthesia type, patient demographic characteristics, ASA PS, and procedure type. Significant independent predictors were entered into multivariable regression models, and anesthesia type, patient age, sex, place of service, ASA PS, procedure type, estimated household income, and scheduled procedure start time were included in the final models. Collinearity between potential predictors was assessed by assessing the variance inflation factor (VIF) for each independent predictor and removing those with VIF values >5. We did not include direct measures of procedure complexity or postoperative surgical complications as independent predictors because these data were not available.

To assess the impact of self-reported outcomes on anesthesiologist rating, we performed a multivariable logistic regression for outcome questions with response rates over 50% as independent predictors and the question "Please rate your anesthesiologist" as the dependent variable. All models were adjusted for multiple comparisons using the sequential Holm–Bonferroni correction, and $P < .001$ was considered significant.[20] Goodness of fit was tested using the Hosmer–Lemeshow test.

Statistical Power

Because our study involved a larger N than most prior published studies on patient satisfaction, we expected to have sufficient power to identify relationships between factors similar to those in previous studies.[10–14] To minimize the reporting of small, clinically nonrelevant relationships, we set an adjusted P value of .001 as statistically significant.

RESULTS

Survey Characteristics

During the 7-month study period, 672,117 patients received anesthesia care from US Anesthesia Partners and were thus eligible to receive a survey. Of the surveys returned, 39,124 patients under 18 years old (5.8%) were excluded because the survey format differed for patients <18 years old. Of the adult patients who returned the survey, 3773 were excluded due to missing data on anesthesia type. Of the remaining surveys, 51,974 patients answered at least 1 question. After excluding patients not from the Southern United States, 51,676 patients were included in analyses for an overall sample rate of 9.3%. Of the 51,676 encounters, 2187 (4.2%) occurred on the weekend. A flow diagram of patient inclusions and exclusions is provided in Figure 1.

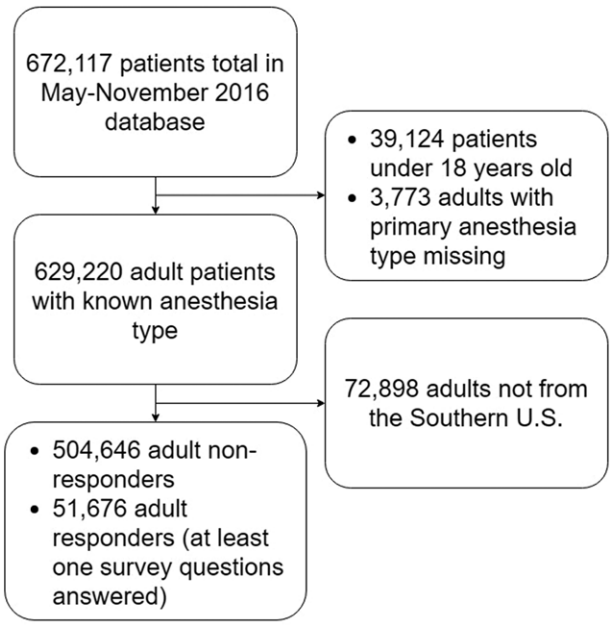

Figure 1. Patient flow diagram including exclusions and inclusions.

Responders differed slightly from nonresponders both demographically and with respect to aspects of their perioperative care (Table 1). Specifically, responders were more likely to be younger, female, have a lower ASA PS, have had outpatient surgery, not have had GA, and have had surgery during the day (6 AM to 6 PM).

In the surveys returned, response rates also differed by question. Of the 8 Likert questions focused on patient satisfaction, 2 ("Your anesthesiologist ensured your comfort during the surgical experience" and "Please rate your anesthesiologist") had lower response rates (Table 2; $P < .001$). Response rates for questions on anesthesia outcomes were consistently lower than those for satisfaction and also differed by question (Table 2). Specifically, only 2 questions had a response rate >50%: "Did you experience nausea and vomiting after surgery?" and "Was your anesthesiologist available to answer questions after surgery?" Overall, among responders, 81.2% of patients answered at least 6 of the 8 satisfaction questions (questions 2–8, 10) and considerably fewer (37.2%) answered at least 6 of 8 outcome questions (questions 1, 12–18). Respondents (93.2%) stated they remembered enough about their anesthesia experience to answer questions.

The mean patient age (±standard deviation [SD]) was 52.8 ± 16.3 years, and 33,724 (65.3%) patients were female (Table 1). Race and ethnicity information was not available in the data set. Approximately one-third (34.2%, N = 17,693) were inpatients. The median ASA PS was II with an interquartile range of 1–3. The distribution of procedures is provided

Table 1. Demographic Characteristics of Patients Who Did Versus Did Not Respond to the APSQ Survey Between May and November 2016

	Responders (N = 51,676)	Nonresponders (N = 504,646)
Age (mean, SD)	52.8 (16.3)	55.1 (17.8)
Sex		
Male	17,947 (34.73%)	200,880 (39.81%)
Female	33,724 (65.26%)	303,701 (60.18%)
Place of service		
Inpatient	17,693 (34.24%)	189,727 (37.60%)
Outpatient or office	33,981 (65.76%)	314,873 (62.39%)
ASA physical status		
I	5182 (10.03%)	38,832 (7.69%)
II	28,013 (54.21%)	210,510 (41.71%)
III	14,129 (27.34%)	158,149 (31.34%)
IV or V	4074 (7.88%)	79,866 (15.83%)
Procedure type by organ system		
Musculoskeletal, integumentary, heme, and lymphatic	14,170 (27.42%)	122,078 (24.19%)
Respiratory, cardiovascular, mediastinum, and diaphragm	3118 (6.03%)	45,565 (9.03%)
Digestive	14,690 (28.43%)	148,189 (29.36%)
Urinary and male GU	3015 (5.83%)	28,949 (5.74%)
Maternity and delivery, female GU, reproductive	9697 (18.76%)	69,093 (13.69%)
Endocrine, nervous, eye and adnexa, auditory system	5710 (11.05%)	72,978 (14.46%)
Others/missing	1276 (2.47%)	17,786 (3.52%)
Start of procedure		
6 AM to 12 PM	33,599 (65.02%)	315,638 (62.55%)
12 PM to 6 PM	15,541 (30.07%)	162,179 (32.14%)
6 PM to 6 AM	2536 (4.91%)	26,829 (5.32%)
Median income ($)		
<50,000	36,197 (70.05%)	364,401 (72.21%)
≥50,000	14,645 (28.34%)	132,192 (26.19%)
Anesthesia type		
General	38,738 (74.96%)	396,961 (78.66%)
Sedation	6473 (12.53%)	57,878 (11.47%)
Regional	6465 (12.51%)	49,807 (9.87%)

Values expressed as mean (SD) or N (% of total) as appropriate. Percentages may not add up to 100% due to missing data (see text).

Abbreviations: APSQ, Anesthesia Patient Satisfaction Questionnaire; ASA, American Society of Anesthesiologists; GU, genitourinary; SD, standard deviation.

in Table 1. The most common procedural categories were "Digestive" and "Musculoskeletal, Integumentary, Heme, and Lymphatic," and the least common was "Urinary and male GU." The median yearly income of survey participants by zip code of residence had an interquartile range between $25,000 and $74,999. Among patients who responded to the survey, 38,738 (75.0%) received GA, 6473 (12.5%) received sedation, and 6465 (12.5%) received RA.

In unadjusted analyses, patients in the sedation, GA, and RA groups differed in their demographic characteristics ($P <$ .001) (Supplemental Digital Content, Appendix 2, http://links.lww.com/AA/C839). Patients who received RA were younger than patients who received GA or sedation (33.4 ± 11.2 vs 54.9 ± 15.0 and 59.3 ± 14.1 years, respectively). The most common procedural categories for each anesthesia type were musculoskeletal for GA, digestive for sedation, and maternity for RA.

Patient Factors Affecting Satisfaction With Their Anesthesiologist

Dichotomized responses to APSQ survey questions are provided in Table 2. Overall, 47.4% of patients responded to the question "Please rate your anesthesiologist," and 92.5% of patients who responded rated their anesthesiologist at 4 or 5 on the 1–5 Likert scale (Table 2). Mean responses to 7 of the 8 satisfaction questions were over 4.5 with an SD ranging from 0.66 to 0.85 (Figure 2). Over 90% of patients who responded also agreed that their questions about anesthesia were answered, that their options were explained to them by the anesthesiologist, and that their anesthesiologist ensured their comfort (Table 2). The question with the lowest Likert response was "Were you able to spend time with your anesthesiologist before surgery?" (2.33, SD = 1.79, 66.8% disagree). Answers to satisfaction questions were only moderately correlated with Spearman rank correlation coefficients ranging from −0.481 to 0.707 (Supplemental Digital Content, Appendix 3, http://links.lww.com/AA/C839).

After multivariable logistic regression adjusting for anesthesia type, patient age, sex, place of service, ASA PS, procedure type, and estimated household income, no patient or procedural factor was associated with the overall patient rating of their anesthesiologist (question 10). However, several factors were independently associated with specific satisfaction questions (Table 3). Patients ≥55 years old were less likely than patients <55 years old to agree that their questions had been answered, that their options for anesthesia were explained before surgery, or that their anesthesiologist helped ease their anxiety, ensured their comfort, or respected their privacy (Table 3). Patients ≥55 years old were also less likely to agree that they were prepared to make informed decisions or spend time with their anesthesiologist before surgery.

Patients undergoing surgery in an outpatient setting generally rated their experience with their anesthesiologist more highly than those undergoing inpatient surgery (Table 3). Outpatients were more likely to agree that their questions had been answered, that their options had been explained, and that their anesthesiologist eased their anxiety. Outpatients were also more likely to agree that they were well prepared to make informed decisions and had been able to spend time with their anesthesiologist before surgery.

Patients who underwent surgery between 6 PM and 6 AM were less likely to agree that their anesthesiologist had eased their anxiety and that they had been able to spend time with their anesthesiologist before surgery than those with a morning procedure start time (Table 3). Similarly, patients who underwent surgery in the evening (start time 12 PM to 6 PM) were less likely to report that they had been able to spend time with their anesthesiologist before surgery compared to those with a morning procedure start time. In contrast, patients with ASA PS IV or V were more likely to agree that their options were explained before surgery and much more likely to agree that their anesthesiologist was available to answer questions. Procedure type also affected patient satisfaction (Table 3). When compared to the musculoskeletal/integumentary category, patients in the respiratory/cardiovascular category were less likely to agree that their anesthesiologist eased their anxiety.

Table 2. Patient Responses to the APSQ Survey (N = 51,676)

	Strongly Disagree, Disagree, or Neutral	Strongly Agree or Agree	Total	Response Rate (% of 51,676 Surveys Included in Analysis [95% CI])
Your questions about anesthesia, the process, risks, and possible after effects were answered	3560 (7.5%)	43,648 (92.5%)	47,208	91.3% (91.1%–91.6%)
Your options for anesthesia were explained before your surgery	4507 (9.6%)	42,589 (90.4%)	47,096	91.1% (90.9%–91.4%)
Your anesthesiologist helped ease any anxiety you were feeling	3084 (6.7%)	42,884 (93.3%)	45,968	89.0% (88.7%–89.2%)
Your anesthesiologist ensured your comfort during the surgical experience	2204 (8.0%)	25,508 (92.0%)	27,712	53.6% (53.2%–54.1%)
Your anesthesiologist did his or her best to respect your privacy	3908 (8.2%)	43,625 (91.8%)	47,533	92.0% (91.8%–92.2%)
You were well prepared to make informed decisions	2487 (5.8%)	40,474 (94.2%)	42,961	83.1% (82.8%–83.5%)
Were you able to spend time with your anesthesiologist before surgery?	29,707 (66.8%)	14,779 (33.2%)	44,486	86.1% (85.8%–86.4%)
Using a number from 5 to 1, where 5 is the best anesthesiologist possible and 1 is the worst, please rate your anesthesiologist	1830 (7.5%)	22,673 (92.5%)	24,503	47.4% (47.0%–47.9%)
	No	Yes	Total	Response Rate
Do you remember enough about your recent surgery or procedure to answer questions about your experience?	3517 (6.8%)	48,080 (93.2%)	51,597	99.8% (99.8%–99.9%)
Did you experience nausea or vomiting after your surgery?	18,189 (44.3%)	22,866 (55.7%)	41,055	79.4% (79.1%–79.8%)
Was your anesthesiologist available to answer questions after surgery?	12,900 (43.1%)	17,016 (56.9%)	29,916	57.9% (57.5%–58.3%)
Were you slow to awaken after your surgery?	5636 (26.2%)	15,913 (73.8%)	21,549	41.7% (41.3%–42.1%)
Did you experience more pain than expected after your surgery?	2962 (15.1%)	16,679 (84.9%)	19,641	38.0% (37.6%–38.4%)
Did you experience bothersome numbness after your surgery?	1917 (10.0%)	17,311 (90.0%)	19,228	37.2% (36.8%–37.6%)
Did you experience unpleasant memories after your surgery?	636 (3.3%)	18,533 (96.7%)	19,169	37.1% (36.7%–37.5%)
Were the anesthesia drugs used during surgery effective?	1125 (5.9%)	18,000 (94.1%)	19,125	37.0% (36.6%–37.4%)

Values expressed as N (% of all responses to a given question with 95% CI). Total % responding a given question may not be 100% as not all patients answered every question.
Abbreviations: APSQ, Anesthesia Patient Satisfaction Questionnaire; CI, confidence interval.

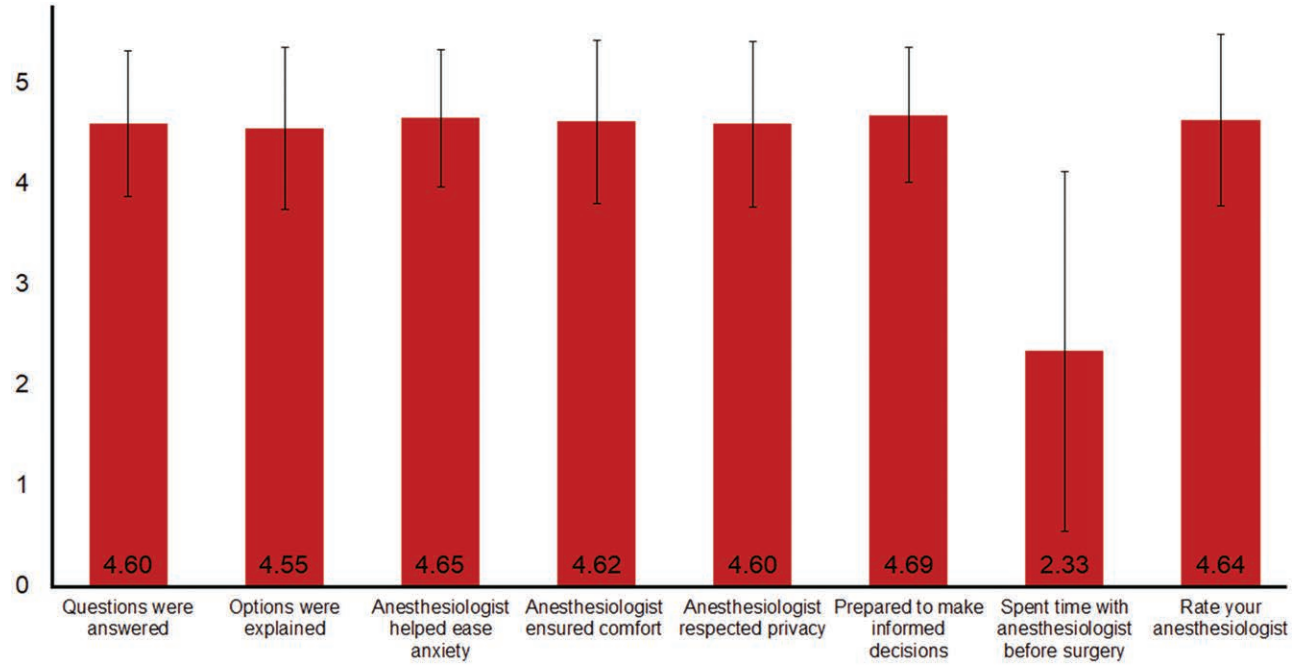

Figure 2. Responses to Likert (1–5) questions by question type for Anesthesiologist Patient Satisfaction Questionnaire items related to patient satisfaction. Values presented as mean ± standard deviation.

Table 3. Multivariable Logistic Regression Results for Patient Satisfaction Questions Contained in the APSQ Survey

	Your Questions About Anesthesia, the Process, Risks, and Possible After Effects Were Answered	Your Options for Anesthesia Were Explained Before Your Surgery	Your Anesthesiologist Helped Ease Any Anxiety You Were Feeling	Your Anesthesiologist Ensured Your Comfort During the Surgical Experience	Your Anesthesiologist Did His or Her Best to Respect Your Privacy	You Were Well Prepared to Make Informed Decisions	Were You Able to Spend Time With Your Anesthesiologist Before Surgery?	Using a Number From 5 to 1, Where 5 Is the Best Anesthesiologist Possible and 1 Is the Worst, Please Rate Your Anesthesiologist
Anesthesia type								
General	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Sedation	1.09 (0.97–1.22)	1.13 (1.02–1.25)	1.09 (0.97–1.24)	**1.48 (1.28–1.72)**	1.23 (1.10–1.38)	1.26 (1.09–1.46)	**0.58 (0.54–0.63)**	1.24 (1.06–1.44)
Regional	1.40 (1.18–1.66)	**1.76 (1.50–2.06)**	1.16 (0.97–1.37)	1.19 (0.97–1.45)	**1.54 (1.30–1.83)**	1.27 (1.04–1.55)	1.19 (1.09–1.30)	0.91 (0.73–1.13)
Age								
18–54	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Over >55	**0.55 (0.50–0.60)**	**0.63 (0.58–0.68)**	**0.65 (0.59–0.71)**	**0.76 (0.69–0.85)**	**0.78 (0.72–0.84)**	**0.74 (0.67–0.82)**	**0.72 (0.68–0.75)**	0.91 (0.81–1.02)
Sex								
Male	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Female	0.96 (0.88–1.04)	0.97 (0.90–1.04)	1.05 (0.97–1.15)	1.01 (0.92–1.12)	1.00 (0.92–1.08)	0.97 (0.88–1.07)	1.06 (1.01–1.11)	0.95 (0.85–1.07)
Place of service								
Inpatient	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Outpatient or office	**1.33 (1.23–1.45)**	**1.22 (1.13–1.31)**	**1.27 (1.16–1.39)**	1.20 (1.08–1.34)	1.16 (1.07–1.26)	**1.23 (1.11–1.36)**	**1.40 (1.33–1.48)**	1.08 (0.96–1.21)
ASA physical status								
I	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
II	0.90 (0.78–1.04)	1.10 (0.98–1.24)	0.92 (0.79–1.06)	0.92 (0.77–1.09)	1.08 (0.96–1.22)	1.06 (0.90–1.24)	0.95 (0.88–1.02)	0.86 (0.71–1.04)
III	0.80 (0.69–0.93)	1.05 (0.93–1.19)	0.75 (0.64–0.88)	0.83 (0.69–1.00)	0.99 (0.87–1.13)	0.90 (0.76–1.07)	**0.67 (0.61–0.72)**	0.79 (0.64–0.97)
IV or V	1.39 (1.13–1.69)	**1.73 (1.46–2.06)**	1.21 (0.98–1.49)	0.72 (0.55–0.95)	0.96 (0.81–1.13)	1.18 (0.94–1.48)	**4.27 (3.85–4.74)**	0.70 (0.51–0.95)
Procedure type by organ system								
Musculoskeletal, integumentary, heme, lymphatic	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Respiratory, cardiovascular, mediastinum, diaphragm	0.78 (0.67–0.91)	0.77 (0.67–0.88)	**0.70 (0.59–0.82)**	0.73 (0.60–0.89)	0.80 (0.69–0.93)	0.75 (0.62–0.90)	**0.63 (0.56–0.70)**	0.85 (0.68–1.05)
Digestive	0.87 (0.79–0.96)	0.87 (0.80–0.95)	0.91 (0.82–1.02)	0.86 (0.76–0.97)	**0.82 (0.75–0.90)**	0.92 (0.82–1.03)	0.98 (0.93–1.04)	0.88 (0.77–1.01)
Urinary and male GU	0.95 (0.81–1.11)	0.96 (0.83–1.11)	1.00 (0.84–1.19)	1.06 (0.86–1.32)	0.86 (0.74–1.00)	1.04 (0.86–1.27)	1.02 (0.92–1.12)	1.23 (0.96–1.57)
Maternity and delivery, female GU, reproductive	0.95 (0.82–1.10)	0.95 (0.83–1.07)	0.81 (0.70–0.95)	0.79 (0.66–0.94)	1.10 (0.95–1.26)	1.03 (0.87–1.23)	0.90 (0.84–0.98)	0.93 (0.77–1.13)
Endocrine, nervous, eye and adnexa, auditory system	0.87 (0.76–0.99)	0.88 (0.78–0.99)	0.90 (0.79–1.04)	0.74 (0.63–0.87)	0.86 (0.76–0.97)	0.98 (0.83–1.14)	1.01 (0.93–1.09)	0.78 (0.65–0.93)
Others/missing	0.67 (0.54–0.83)	0.75 (0.61–0.93)	0.78 (0.61–0.99)	0.88 (0.65–1.19)	0.91 (0.72–1.15)	0.79 (0.60–1.04)	0.98 (0.85–1.13)	0.74 (0.55–1.00)
Median income ($)								
<50,000	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
≥50,000	1.00 (0.92–1.08)	0.91 (0.85–0.97)	0.95 (0.87–1.03)	0.96 (0.87–1.06)	0.98 (0.91–1.05)	0.90 (0.77–0.93)	**1.13 (1.08–1.19)**	0.93 (0.83–1.03)
Start of procedure								
6 AM to 12 PM	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
12 PM to 6 PM	0.88 (0.81–0.95)	0.93 (0.86–0.99)	0.88 (0.81–0.96)	0.91 (0.83–1.01)	1.01 (0.93–1.09)	0.84 (0.77–0.93)	**0.90 (0.86–0.95)**	0.86 (0.77–0.95)
6 PM to 6 AM	0.72 (0.60–0.86)	0.76 (0.64–0.90)	**0.69 (0.58–0.83)**	0.71 (0.58–0.87)	1.04 (0.85–1.27)	0.71 (0.57–0.88)	**0.79 (0.71–0.88)**	0.73 (0.59–0.92)

Comparisons within categories are presented as OR (95% CI). ORs (95% CI) associated with Holm–Bonferroni adjusted *P* values <.001 are in bold.
Abbreviations: APSQ, Anesthesia Patient Satisfaction Questionnaire; CI, confidence interval; GU, genitourinary; OR, odds ratio.

Effect of Anesthesia Type on the Patient Experience With Their Anesthesiologist

After multivariable regression including age, sex, ASA PS, and procedure time and type, anesthesia type (GA, RA, or sedation) emerged as an independent predictor of responses to individual survey questions regarding patient satisfaction with their anesthesiologist (Table 3). In contrast to patients receiving GA, patients receiving RA were more likely to agree that their options were explained before surgery and that their anesthesiologist respected their privacy.

Patients receiving sedation were less likely than those receiving GA to agree that they were able to spend time with their anesthesiologist before surgery, but more likely to agree that their anesthesiologist ensured their comfort during surgery. After multivariable regression, patients' overall rating of their anesthesiologist did not differ by anesthesia type.

Anesthesia Outcomes

The second part of the survey contained questions focusing on specific self-reported anesthesia outcomes including unpleasant memories, nausea or vomiting, or having more pain than expected. As noted above, response rates were lower for this part of the survey so analysis of this section of the survey was limited. Two questions had a response rate over 50% ("Did you experience nausea and vomiting?" and "Was the anesthesiologist available afterward to answer questions?") (Table 2). Each was then included in a multivariable regression model with "rate your anesthesiologist" as the dependent variable and age and place of service as other independent predictors. After multivariable regression, self-reported nausea and vomiting was not associated with anesthesiologist rating (odds ratio [OR] = 0.94; 95% CI, 0.84–1.04), but patients whose anesthesiologist was available to answer questions after surgery were more likely to rate their anesthesiologist as either a 4 or a 5 on a 1–5 Likert scale (OR = 1.87; 95% CI, 1.69–2.06)

Sensitivity Analysis

To verify that our results did not depend on our choice of dichotomization threshold, we reperformed our analysis after dichotomizing Likert responses to 1–4 (Not satisfied) and 5 (Satisfied). The results were similar (Supplemental Digital Content, Appendix 4, http://links.lww.com/AA/C839).

DISCUSSION

In this retrospective review of survey data on patient satisfaction with their anesthesiologist, we found that age <55 years and outpatient surgery were associated with better patient satisfaction, while surgery start time at night was associated with worse patient satisfaction. We also observed that when compared to patients who underwent GA, those who received sedation or RA responded more positively to questions relating to satisfaction with their anesthesiologist.

Although other studies of patient satisfaction exist, no prior effort approaches the volume of data in this study. Our data differ slightly from previous studies of satisfaction with anesthesia. A 2013 French survey of 390 patients who underwent RA found less satisfaction in ASA PS I and II patients and greater satisfaction in patients over 55 years old.[12] Another 2008 Dutch study found a similar correlation between age and satisfaction that women were less satisfied than men and that patients with paid employment were less satisfied than those performing household duties or retired.[21] Similarly, a 2007 Italian study found that being over 70 years old was associated with higher patient satisfaction.[22] Although it is unclear why our data are inconsistent with these prior observations, one possibility is that cultural expectations toward anesthesia may differ among countries. Another possibility is that our data may have focused more on the anesthesia provider than prior studies of anesthesia satisfaction.

Our findings with respect to anesthesia type also differ from prior reports. A 2018 Saudi Arabian study found the highest satisfaction with GA and lowest with local anesthesia.[14] In contrast, we found that patients receiving sedation or RA were more likely than those receiving GA to respond positively to questions about their anesthesiologist. Our observation that patients who underwent sedation were more likely to agree that their anesthesiologist ensured their comfort is consistent with an anesthetic where verbal reassurance is important.

That patients receiving RA were no more satisfied with their anesthesiologist than those receiving GA seems paradoxical. However, concerns about complications of RA may have outweighed improved pain control, or patients may have had differing expectations depending on anesthesia type. Existing data suggest that managing expectations can affect patient satisfaction.[22]

Our finding that patient age and time of surgery associate with anesthesia provider satisfaction suggest that some factors affecting satisfaction with an anesthesia provider may lie outside his/her control. For example, in our study, younger patients or those undergoing daytime surgery were more likely to answer survey questions positively than older inpatients. One consequence of this finding is that surgeon, case, or protocol-based preferences may decrease anesthesia provider satisfaction ratings. Our data suggest, for example, that an anesthesiologist providing sedation for outpatient Dilation and Curettages (D&Cs) in young women would be more likely to achieve high satisfaction ratings based on demographic and procedural elements alone than an anesthesiologist who provides care to older men undergoing prostatectomies in the inpatient setting.

Our data also suggest that incentivizing anesthesiologists using patient satisfaction may only be partially effective. Experience in both medical and nonmedical domains suggests that incentive programs based on factors outside the control of program participants may induce gaming behavior rather than improve performance. In both medical and nonmedical domains,[23,24] incentive programs with unreachable goals have induced extensive gaming behavior.

Although we found factors driving anesthesia satisfaction that may not be fully controllable by anesthesiologists, we also note that patient satisfaction may itself be an important "product" to the patient.[25] Viewed in that light, anesthesiologists need not conclude that they are powerless to affect their own satisfaction ratings but rather that they may be able to improve their satisfaction scores by identifying high-risk patients. Our data suggest, for example, that taking time to answer questions after surgery may increase patient satisfaction with their anesthesiologist.

Our study has limitations. Because our data are deidentified, we could not verify the accuracy of survey answers or of demographic information. However, our data were collected by SurveyVitals, a company with experience surveying health care satisfaction since 2002. Because our data set also lacked sociodemographic information, we could not adjust for factors such as ethnic and educational status, patient preferences, engagement, or prior health status that may have affected our analysis.[26] In addition, our nonresponders were generally older, male, and less likely to undergo outpatient or daytime surgery. On the basis of demographic characteristics alone, we imagine that nonresponders would report less satisfaction with their anesthesiologist if they had participated. We also did not have access to provider information so could not directly adjust for specific providers or care team composition. However, although the individual anesthesiologist or care team clearly plays a critical role in satisfaction, we do not believe this limitation meaningfully changes the results of our study. With 51,676 individual patient surveys over a 7-month period, it is unlikely that any one anesthesia provider or care team could have generated enough surveys to alter the results. Missing months in our data collection period (May to November) and incomplete survey responses may also have biased our results. However, response rates for all satisfaction questions were >80%, and only 6.9% (3601/51,676) answered 2 or fewer questions. Excluding these surveys did not change our results. Finally, some confounding by indication is likely as anesthesia and surgery type may be related for many procedures and anesthesia care team composition may align with surgery type, zip code, or time of day. Nevertheless, our data set of 51,676 patients provides 1 descriptive snapshot of factors affecting patient satisfaction with their anesthesia provider and suggests that some of those factors lie outside the control of the anesthesiologist.

In summary, we describe patient and procedural factors affecting responses to a validated patient satisfaction survey. Several of our findings, including less favorable responses about the role of the anesthesiologist in patients ≥55 years old and those receiving GA, suggest that satisfaction survey responses may be affected in part by factors outside the anesthesiologist's control. Although likely in any patient–physician encounter, our observations have implications for incentive programs that include satisfaction. Because our retrospective data set can only be hypothesis generating, further work is needed to clarify patient and procedural factors affecting perioperative patient satisfaction with their anesthesiologist, identify factors that improve satisfaction, and develop survey methodologies that effectively measure the role of the anesthesiologist in perioperative satisfaction.

DISCLOSURES

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