

Endoscopic Sedation in the United States: Results From a Nationwide Survey

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OBJECTIVES: The introduction of new sedative agents as well as a desire for improved patient satisfaction and greater efficiency has changed the practice of endoscopic sedation. This survey was designed to provide national and regional data on endoscopic sedation and monitoring practices within the United States.

METHODS: A 22-item survey regarding current practices of endoscopy and sedation was mailed to 5,000 American College of Gastroenterology physician members nationwide.

RESULTS: A total of 1,353 questionnaires (27.1%) were returned. Respondents performed an average of 12.3 esophagogastroduodenoscopies (EGDs) and 22.3 colonoscopies per wk. Endoscopic procedures were performed within a hospital setting (55.2) more often than at an ambulatory center (35.8%) or private office (8.8%). The vast majority of EGDs and colonoscopies (>98%) were performed with endoscopic sedation. Almost three quarters (74.3%) of the respondents used a narcotic and benzodiazepine for sedation, while propofol was preferred by 25.7%. Sedation practices varied considerably within different geographic regions of the United States. Respondents routinely monitored vital signs and pulse oximetry (99.2% and 98.6%, respectively), and supplemental oxygen was administered to all patients during EGD by 72.7% of endoscopists. Endoscopist satisfaction with sedation was greater among those using propofol than conventional sedation (10 vs 8, $p < 0.0001$).

CONCLUSIONS: During the past 15 yr, the volume of procedures performed by endoscopists in the United States has increased two- to fourfold. Propofol is currently being used for sedation in approximately one quarter of all endoscopies in the United States. The findings from this survey may help in the formulation of updated policies and practice guidelines pertaining to endoscopic sedation.

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INTRODUCTION

Patient sedation, a central determinant of the efficacy, safety, and cost of endoscopy, is evolving throughout the world due to increased demand for endoscopic services, economic pressures, and the introduction of new sedation agents (1-3). In Europe, several audits and surveys during the past decade have generated data regarding these changes, indicating that there is increased use of endoscopic sedation (4-6). The most recent real-world analysis of sedation and monitoring practices in the United States was completed in 1989, when the American Society for Gastrointestinal Endoscopy (ASGE) surveyed 509 members (7). Since that time, several important trends in endoscopic sedation have been observed including an increase in the use of propofol and automated monitoring devices (8-10). In order to fully understand the impact of these and other changes on endoscopic outcomes, it is essential that we have accurate data regarding current sedation

practices. In this study, we report the results of a nationwide postal survey of 5,000 U.S. gastroenterologists regarding sedation and monitoring practices.

METHODS

A 3-page, 22-item survey (Appendix 1) was developed by the authors and refined by a marketing consultant. The survey addressed respondent demographics (5 questions), routine endoscopic practices (3 questions), intra-procedure staffing (3 questions), sedation (4 questions), and opinions regarding the advantages and disadvantages of existing sedation agents (7 questions).

American College of Gastroenterology (ACG) members ($N = 7,589$ at the time of the mailing) were subgrouped into six geographic regions of the United States (Table 1). A survey and a cover letter explaining the study were mailed in July

Table 1. Survey Postings and Return Rates by Region

Region of United States*	ACG Members N (%)	Surveys Posted N (%)	Percent of Surveys Returned (%)	Percent of Total Surveys Returned (%)
West	1,088 (14)	700 (14)	28.3	14.8
Southwest	698 (9)	450 (9)	23.1	7.8
Mid-Atlantic	1,926 (25)	1,250 (25)	27.1	25.3
Northeast	420 (6)	300 (6)	29.0	6.5
South	1,960 (26)	1,300 (26)	27.4	26.6
Midwest	1,497 (20)	1,000 (20)	25.6	19.1
Total	7,589 (100)	5,000 (100)	26.8 [†]	100

*Mid-Atlantic: NY, NJ, PA, MD, DE; Northeast: CT, RI, MA, VT, NH, ME; South: WV, VA, NC, SC, KY, AR, TN, LA, MS, AL, GA, FL; Midwest: ND, SD, MN, WI, OH, IA, IL, NE, MO, KS, MI, IN; West: WA, MT, OR, WY, ID, CA, CO, HI, AK, UT, NV; Southwest: AZ, TX, NM, OK.

[†]Thirteen surveys were excluded because they did not indicate geographic region.

2004 to 5,000 randomly selected ACG members, preserving proportional geographic representation. Each survey was assigned a unique code to maintain anonymity. To improve the response rate, survey respondents were entered into a raffle to win one of five Apple iPods and were sent a follow-up reminder postcard in September 2004.

Responses were entered into a software database (Microsoft Excel; Microsoft Corp., Redmond, WA, USA). Statistical analyses were performed using SAS Version 8.2 (SAS Institute, Cary, NC, USA). Survey results are reported for all respondents, and when appropriate by geographic region. The national data are not presented as weighted averages since the results were similar across geographic regions. The Student's *t*-test was implemented to test for differences between means, the nonparametric Wilcoxon rank sum test was implemented for the comparison of ratings, and the χ^2 test was used to test for differences between proportions.

RESULTS

Demographics

A total of 1,353 ACG members completed and returned the survey, representing an overall response rate of 27.1%. The response rate was between 23.1% and 29.0% for every region of the United States; the geographic distribution of survey respondents was nearly identical to that of the ACG membership within the United States (Table 1). A total of 333 surveys did not contain the answer to at least one question.

The demographic characteristics of survey respondents are summarized in Table 2. Men comprised the majority of all respondents (89.3%), and almost two thirds (60.3%) were less than 50 yr of age and practicing for less than 20 yr (66.6%). Seventy-eight percent of the respondents were in private practice and 21.2% practiced at an academic medical center. Among those in private practice, 19.1% were in solo practice, 44.1% were in a single-specialty group practice, and 15.6% were in a multispecialty group practice. Most respondents practiced in either a large (53.1%) or a medium-sized (38.7%) metropolitan area.

Endoscopic Practices

In four of the six geographic regions of the United States, a majority of the survey respondents indicated that they per-

formed colonoscopy primarily in a hospital environment (Table 3). Nationally, survey respondents selected a hospital (55.2%) more often than either an ambulatory surgical center (ASC) (35.8%) or an office (8.8%) as the primary site to perform endoscopic procedures. However, there were marked differences between various geographic regions in the proportion of endoscopies being performed at each of these three locations. As an example, office endoscopy accounted for 19.8% of procedures in the mid-Atlantic region but only 0.4% in the Northeast. Similarly, the use of ASCs and hospitals as the primary site of service ranged from 26.4% to 46.8% and from 49.8% to 70.1%, respectively. All respondents indicated that their dominant site of service (hospital/ASC/office) was the same for both EGD and colonoscopy (data for EGD not shown).

Survey respondents performed an average of 12.3 (range, 9.2–15.6) esophagogastroduodenoscopies (EGDs) per wk, with the highest number (15.6) in the Southwest and the lowest (9.2) in the Northeast (Table 3). Respondents performed

Table 2. Demographic Characteristics of Survey Respondents

Characteristic	Percent (%)
Gender (N _r = 1,340)	
Male	89.3
Age (N _r = 1,341)	
30–49	60.3
50–64	33.1
≥65	6.6
Years in practice (N _r = 1,332)	
0–9	33.5
10–19	33.1
20–29	23.9
≥30	9.5
Practice setting (N _r = 1,337)	
Academic	21.2
Private practice	78.8
Solo	19.1
Single-specialty	44.1
Multispecialty	15.6
Practice population size (N _r = 1,326)	
Small (<50,000)	8.2
Medium (50–500,000)	38.7
Large (>500,000)	53.1

N_r = Number of responses to an individual question (1,353 total surveys returned).

Table 3. Geographic Variability in Sites of Endoscopic Service, Procedural Volume, and Sedation Agents

	All Regions	Mid-Atlantic	North-East	South	Mid-West	West	South-West
Primary site of endoscopy (%)*							
Office	8.8	19.8	0.4	7.3	2.2	7.2	4.0
Ambulatory	35.8	26.4	28.3	42.7	30.7	46.8	42.6
Hospital	55.2	53.8	70.1	49.8	67.1	45.6	53.4
Other	0.2	0.0	1.2	0.2	0.0	0.4	0.0
Average number of procedures/week†							
EGD	12.3 (11.9–12.8)	11.6 (10.6–2.5)	9.2 (8.0–10.4)	13.0 (12.2–13.7)	13.3 (12.3–14.4)	10.8 (9.9–11.6)	15.6 (12.8–18.4)
Colon	22.3 (21.5–23.1)	20.6 (19.1–22.3)	21.5 (19.1–24.0)	24.5 (22.7–26.2)	23.2 (21.7–24.8)	19.9 (18.4–21.3)	23.2 (19.7–26.8)
Preferred sedation agent(s) (%)*							
Meperidine	56.0	48.1	56.3	59.6	59.8	41.9	66.3
Fentanyl	52.7	41.3	65.5	45.2	50.4	71.2	57.7
Midazolam	86.6	77.9	93.1	83.4	84.8	88.9	90.4
Diazepam	6.3	5.9	3.4	7.0	6.6	6.6	4.8
Propofol	25.7	42.8	6.9	30.6	15.2	12.6	11.5

*Data expressed represent responses for colonoscopy. The responses for EGD were comparable.

†Data expressed as mean (95% confidence interval).

an average of 22.3 colonoscopies per wk. Fourteen percent of the respondents performed more than 30 colonoscopies per wk (Fig. 1). The ratio of colonoscopy to EGD in the United States was approximately 2:1.

Patient Monitoring

Survey respondents monitored vital signs (pulse, blood pressure, and respiratory rate) and oxygen saturation almost unanimously (99.2% and 98.6%, respectively), although the use of capnography was infrequent (3.1%) (Table 4). Nearly three quarters of the respondents (70.2% and 72.7%) routinely administered oxygen during every endoscopy (colonoscopy and EGD, respectively). A registered nurse was part of the endoscopy and sedation team at most (89.5%) endoscopy locations.

Routine Sedation Practices

Respondents administered intravenous sedation in 98.2% of EGDs and 98.8% of colonoscopies. Nearly 79% (78.5%) of respondents indicated that the endoscopist was primarily re-

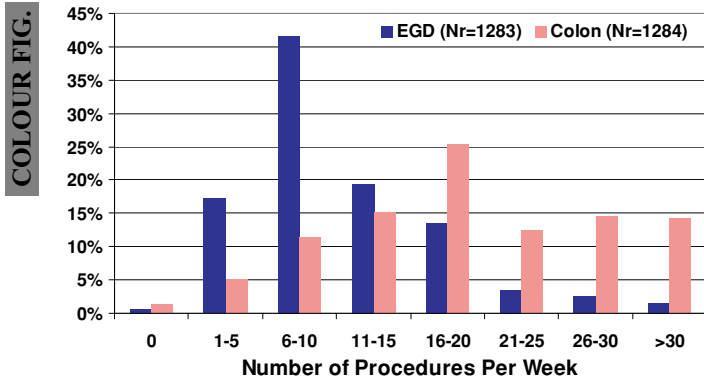
sponsible for determining the frequency, timing, and dosage of sedative agents, while an anesthesiologist or a certified registered nurse anesthetist (CRNA) was responsible in 27.8% (more than a single response was permitted) (Table 4). The use of an anesthesiologist to administer sedation was standard practice for 6–7% of endoscopists in the Midwest, Southwest, and Northeast regions, compared to 17.4% and 36.6% of those within the South and Mid-Atlantic regions, respectively (Fig. 2).

Table 4. Endoscopic Sedation Practices (%)

	EGD	Colonoscopy
Routine use of intravenous sedation (N _r = 1,325; 1,312)	98.2	98.8
Routine use of supplemental oxygen (N _r = 1,313; 1,302)	70.2	72.7
Routine use of pharmacologic antagonist (N _r = 1,318)	0.8	0.8
Routine patient monitoring (N _r = 1,322)		
Vital signs		99.2
SaO ₂		98.6
End-tidal CO ₂		3.1
Who makes dosing decisions about sedation? (N _r = 1,328)		
Endoscopist		78.5
Endoscopy assistant		9.9
Anesthesiologist		17.8
CRNA		10.0
Who administers propofol when it is used? (N _r = 338)		
RN/Endoscopist		7.7
CRNA		17.8
Anesthesiologist		38.5
Anesthesiologist and CRNA		31.7
No response		4.4

N_r = Number of responses to an individual question.

*More than one response was permitted.

**Figure 1.** Average number of endoscopic procedures performed per week by survey respondents (N = 1,353).

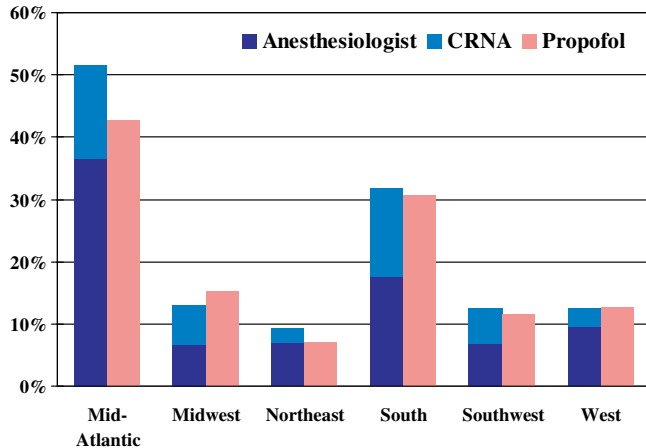


Figure 2. Prevalence rates for use of propofol and anesthesiologist/CRNA for endoscopic sedation analyzed by geographic region of the United States.

Preferred Sedation Agents

Survey respondents were asked to indicate the drug(s) and dose range(s) that they most frequently administered for conscious sedation (more than a single response to this question was permitted) (Table 3). Three fourths (74.3%) of respondents reported using conventional sedation (benzodiazepine + narcotic), while 25.7% (338 respondents) utilized propofol-based sedation. Of these 338 respondents, 235 (70%) used both conventional and propofol-based sedation, although the survey did not indicate whether these agents were given individually or in combination.

The survey respondents strongly favored midazolam over the benzodiazepine diazepam (86.6% vs 6.3%), the use of an opioid was almost evenly split between fentanyl and meperidine (56.0% vs 52.7%), and some endoscopists indicated that they had no preference for either narcotic. Most endoscopists used a combination of an opioid and a benzodiazepine, although a small number of survey respondents administered only a single agent, either a benzodiazepine (8, 0.6%) or an opioid (9, 0.7%). The preference of an individual endoscopist for a particular drug combination was consistent during colonoscopy and EGD (data for EGD not shown). The dosages of meperidine and fentanyl most commonly used during colonoscopy were 50–75 mg (52.0%) and 75–100 mcg (55.8%), respectively, and the dose of midazolam most commonly used was ≥ 3 mg (52.0%). Less than 1% of respondents used more than 100 mg of meperidine, and fewer than 10% exceeded 100 mcg of fentanyl. Only 11 respondents (0.8%) routinely administered a pharmacologic antagonist following the completion of each procedure.

Propofol Administration

The use of propofol varied from 42.8% in the mid-Atlantic region to 6.9% in the Northeast. Nationwide, the prevalence of propofol use was 25.2% among respondents 30–49 yr old, 28.2% for ages 50–64 yr, and 10.1% for those 65 yr and older ($p = 0.007$). In most instances (87.9%), propofol adminis-

tration was directed by an anesthesiologist (38.5%), a CRNA (17.8%), or a combination of the two (31.7%) (Table 4). Gastroenterologist and/or nurse administered propofol was reported by only 7.7% of those utilizing propofol sedation. As expected, prevalence rates for the presence of an anesthesia specialist and propofol usage closely paralleled one another throughout every geographic region of the United States (Fig. 2).

When endoscopists using conventional sedation were asked whether they would consider using propofol, 68% indicated they would, provided they and their endoscopy staff were properly trained. Those who would not use propofol cited the following reasons: medicolegal issues (43.9%), concern about the risk of cardiopulmonary complications (43.4%), satisfaction with conventional sedation (42.7%), need for additional staff (27.7%), added expense of medication/monitoring equipment (21.2%), and regulatory restrictions (13%). These reasons varied according to the age of the respondent. For example, 57.1% of endoscopists older than 65 yr stated they were satisfied with conventional sedation, compared with 45.9% of endoscopists 50–64 yr of age and 37.5% of endoscopists 30–49 yr of age.

Recovery Time

Endoscopists using conventional sedation estimated that the mean recovery times for EGD and colonoscopy were 36.0 (SD 17.0) and 41.4 (SD 18.5) min, respectively, compared with 28.3 (SD 14.8) and 31.4 (SD 15.3) min among users of propofol. These differences in recovery times between conventional and propofol sedation for both EGD and colonoscopy were statistically significant ($p < 0.0001$).

Endoscopist Satisfaction with Sedation Agents

Respondents were requested to rate their global satisfaction with the sedation agents currently used at their site, using a 10-point scale (10 = best). For this analysis only, the 18% of respondents who indicated that they utilized both conventional and propofol-based sedation were excluded, leaving 1,076 evaluable responses. The results (median, 25th/75th quartiles) were as follows: benzodiazepine + narcotic = 8 (8/9) (N = 974); propofol sedation = 10 (10/10) (N = 102) ($p < 0.0001$) (Wilcoxon rank sum test). Respondents using conventional sedation with a satisfaction level below 8 (N = 237; 24.3%) listed the following reason(s) for dissatisfaction: patient discomfort (38.9%), delayed patient recovery (16.2%), slow onset of action (23.5%), risk of cardiopulmonary complication (10.3%), and the patient's inability to resume normal activities within 2 h of completing the procedure (9.4%).

Endoscopists' Choice of Sedation Agent for Their Own Endoscopy

We asked survey respondents to indicate what type of sedation they would choose for their own endoscopy (Table 5). For colonoscopy and EGD, respectively, 47.8% and 41.3% of survey respondents selected propofol, 39.4% and 36.8%

Table 5. Endoscopists' Choice of Sedation Agent(s) for Their Own Endoscopy*

	EGD (%) (N _r = 1,317)	Colonoscopy (%) (N _r = 1,303)
Propofol	41.3	47.8
Benzodiazepine + opioid	36.8	39.4
No sedation	14.7	11.9
Benzodiazepine alone	8.0	1.7
Opioid alone	0.9	0.8

N_r = Number of responses to an individual question.

*More than one answer was permitted.

chose a benzodiazepine/opioid combination, and 11.9% and 14.7% preferred to receive no sedation. Those who selected propofol gave the following reasons: better sedation and analgesia (87.0%), reduced recovery time (86.7%), faster return to work/usual activity (78.2%), and improved quality of endoscopic examination (52.1%) (more than a single response was permitted). The preferred sedation agent varied according to the age of the respondent. For colonoscopy, propofol was preferred by 51.3% of endoscopists aged 30–49 yr, 44.3% of those aged 50–64 yr, and 32.1% aged 65 yr and older ($p = 0.001$). Similarly, 44.1% of endoscopists aged 30–49 yr preferred propofol sedation for EGD, compared to 38.9% of respondents aged 50–64 yr and 25.0% of those aged 65 yr and older ($p = 0.002$).

DISCUSSION

The results of our survey of 5,000 physician members of the ACG provide national and regional data on endoscopic sedation within the United States. These results can be compared to the findings of a previous survey performed in the United States (7), in order to show trends in the practice of sedation and endoscopy during the past 15 yr.

Estimates of the annual number of colonoscopies performed in the United States range from 4 to 14.2 million per yr (11, 12). Our study provides individual data on procedure volume by endoscopist. Nationwide, endoscopists performed an average of 12.3 EGDs and 22.3 colonoscopies per wk, or 565 EGDs and 1025 colonoscopies a year (assuming 46 work wk per yr). There was minimal variation in endoscopic output among endoscopists working in different regions of the country. These results are considerably higher than the estimates from the Clinical Outcomes Research Initiative database (David Lieberman, M.D., personal communication), which likely reflects differences in practice demographics. Our data confirm that individual endoscopists are performing more procedures today than 15 yr ago. Comparing our data to the 1989 ASGE survey (which also used a self-report methodology) (7), there has been a twofold increase in EGDs and a three- to fourfold increase in colonoscopies performed by survey respondents. This rapid growth in colonoscopy services has been attributed to increased de-

mand for colorectal cancer screening and the introduction of Medicare coverage for screening colonoscopy (13).

The sites of service for endoscopic procedures are influenced by several factors at the local level including the available resources within hospital endoscopy units, practice precedent within the community, the existence of ASCs, and the site of service differential in physician reimbursement. In this survey, we found that in spite of the financial incentives that encourage the use of less costly sites (ASCs and offices), endoscopists in all six regions of the country continue to perform procedures primarily within a hospital setting. The practice of office-based endoscopy remains quite limited and is largely restricted to the mid-Atlantic region of the United States.

The results of this survey demonstrate that intravenous sedation during endoscopy is a standard practice throughout the United States. Three quarters of endoscopists in the United States continue to use an opioid combined with a benzodiazepine for sedation. However, the preferred agent within each drug class has changed. Today, midazolam has replaced diazepam as the benzodiazepine of choice, and fentanyl is now used with nearly equal frequency as meperidine. These newer drugs provide comparable sedation and analgesia to the older agents but in addition provide a more rapid onset, faster recovery, and fewer side effects.

This survey quantifies the changes in sedation practice brought about by the introduction of propofol. We found that propofol is being used by about 25% of all endoscopists in the United States. This rate is higher than that recently reported in a small U.S. survey that identified propofol use by 17–19% of respondents (14). The number of endoscopists using propofol (in most instances with the assistance of an anesthesiologist) varies within the United States, from 42.8% in the Mid-Atlantic region to 6.9% in the Northeast. These geographic differences in the rate of propofol adoption can be explained in large part by local payor policies regarding coverage of anesthesia services during endoscopic procedures (3).

Our findings indicate that most endoscopists are satisfied with their current method of sedation. However, satisfaction scores were significantly higher among users of propofol than among those using conventional sedation. Endoscopists listed procedure-related discomfort and slow onset as the major reasons for dissatisfaction with conventional sedation. In addition, enhanced satisfaction among users of propofol may also be related to a reduction in workload or sedation-related expenses or perhaps to other changes in the endoscopy suite that are associated with the presence of an anesthesia provider. Endoscopists were more likely to select propofol over conventional sedation agents when asked what method of sedation they would choose for their personal endoscopic examination.

Concomitant with an increase in propofol use is the growing presence of anesthesiologists and CRNAs in the endoscopy suite. Our data indicate that an anesthesia provider is present during 27.8% of all endoscopic procedures performed

by survey respondents, compared with 3.1% in 1989 (7). At the present time, only 7.7% of U.S. gastroenterologists using propofol sedation are administering the drug themselves without an anesthesiologist or CRNA. As expected, the principal reasons why endoscopists remain reluctant to self-administer propofol are concerns about the risk of complications and medical–legal issues. In contrast, gastroenterologist-administered propofol is more prevalent in other countries such as Switzerland, where a recent report found that 34% of Swiss gastroenterologists are administering propofol (6). In our survey, 68% of U.S. endoscopists expressed an interest in incorporating propofol into their practice if they and their staff were properly trained in its use.

The estimates of recovery provided by survey respondents would suggest that recovery time following propofol sedation is reduced compared with recovery following an opioid/benzodiazepine combination. While estimates of recovery based upon recall are highly subjective and prone to recall bias, the mean recovery times in this survey are consistent with the results of other studies that have carefully analyzed recovery. For example, Sipe (15) and Roseveare (16) reported recovery times of 33 and 40 min, respectively, following sedation with an opioid/benzodiazepine combination, versus 36.0 min in our survey. These same authors recorded recovery times of 14 and 10 min, respectively, following propofol sedation, compared to 28.3 min in this survey.

In general, the administration of intravenous sedation by U.S. endoscopists conforms with published guidelines (17–19). Nearly all respondents monitor heart rate, blood pressure, and pulse oximetry during endoscopy, and approximately 70% of endoscopists routinely provide supplemental oxygen to all patients during procedures. By comparison, the use of pulse oximetry and supplemental oxygen, in 1989, was reported by 64.9% and 6.5% of respondents, respectively (7). While most sites (89.5%) utilize a registered nurse during endoscopy, the endoscopist was identified most often as the individual responsible for determining the frequency, timing, and dosage of sedation medication. Endoscopists in the United States do not routinely administer a reversal agent following endoscopy.

This survey has several limitations. For one, we are unable to validate the responses in this survey. By its nature, a retrospective survey is subject to recall bias that may cause a survey respondent to over- or underreport. A practice audit would overcome the weaknesses that are inherent in self-reporting, but an audit on the scale of this survey is not feasible. Second, we cannot be certain that our 1,353 responders, representing 27.1% of those surveyed, accurately reflect the practice and opinions of the ACG membership. Similarly, we cannot exclude the possibility that more than a single member of a group practice responded to the survey. However, the use of a stratified random sampling scheme and large sample size reduces potential sampling error and increases the probability that the samples are representative of the entire population (20). Furthermore, the geographic distribution

of survey respondents closely matches the demographics of ACG members within the United States.

In conclusion, the results of this survey identify current sedation and monitoring practices within the United States and enable us to quantify changes during the past 15 yr. Major trends include an increased output of procedures by individual endoscopists throughout all regions of the United States, greater reliance upon anesthesia providers for administration of sedation, increased adoption of automated monitoring devices, and a shift from diazepam and meperidine to midazolam and fentanyl. These findings as well as others in the report will help to clarify policy debate, allow for cost and resource projections, and stimulate the development of appropriate training programs.

APPENDIX 1: ENDOSCOPIC SEDATION SURVEY

Definitions: Opioid = meperidine (demerol); fentanyl benzodiazepine = diazepam (valium); midazolam (versed) propofol = diprivan

1. **Gender:** Male Female

2. **Age:** 30–49 50–64 65 and above

3. **Number of years in practice:**

0–9 10–19 20–29 30 or more

4. **Which one of the following best describes your practice setting?** (circle one)

Solo

Single-specialty group

Multispecialty group

Academic

5. **What is the approximate population of the area that your practice serves?**

Small town/rural (<50,000)

Mid-sized city (50,000–500,000)

Major metropolitan area (>500,000)

6. **Please indicate the total number of endoscopies (EGD/colonoscopies) that you perform each week and the proportion of procedures performed in each setting:**

EGD _____ per week Colonoscopy _____ per week

Office _____% Office _____%

Ambulatory Care Center _____% Ambulatory, Care Center _____%

Hospital _____% Hospital _____%

Other _____% Other _____%

Total 100% Total 100%

7. **What percentage of your endoscopies is performed with sedation?**

(a) EGD _____% (b) Colonoscopy _____%

8. **For those procedures where you use sedation, what is the average length of recovery time for the patient?** (time from completion of the procedure to time the patient is dressed and ready for discharge)

(a) EGD _____ minutes (b) Colonoscopy _____ minutes

9. **If the length of recovery time were able to be reduced, would this enable you to increase your procedure volume?**

(a) Yes (b) No (circle one)

10. Who determines the frequency/timing/dosage of sedation medication when you perform an endoscopy?

- Endoscopist
 Endoscopy assistant
 Anesthesiologist
 Certified Registered Nurse Anesthetist (CRNA)
 Other _____

11. Please indicate the drug(s) and dose range(s) that you use most often for endoscopic sedation: (you may select more than one response)

- meperidine (mg) 25–50 50–75 75–100 >100
(circle one dose range)
 fentanyl (mcg) 25–50 50–75 75–100 >100
(circle one dose range)
 diazepam (mg) <1 1–2 2–3 >3
(circle one dose range)
 midazolam (mg) <1 1–2 2–3 >3
(circle one dose range)
 propofol (mg) <50 50–100 100–150 >150
(circle one dose range)
 other _____

12. If you currently use propofol for colonoscopy, what percent of the time is it administered by an

- Endoscopist _____%
Registered Nurse _____%
Endoscopy assistant _____%
Anesthesiologist _____%
CRNA _____%
Other _____%

13. Rate your overall satisfaction with the sedation agents that you currently use for EGD/colonoscopy. Use a 10-point scale (10 is the highest rating).

_____ (0–10)

14. If you indicated that your overall satisfaction was below 10, rank the reason(s) in order of importance:

- (1= Most important reason for dissatisfaction)
 Patient discomfort during endoscopic examination
 Risk of cardiorespiratory complication
 Slow onset of action
 Delayed patient recovery
 Inability of patient to resume usual activities within 2 hours of endoscopy
 Other _____

15. If you and your staff were properly trained in the use of propofol, would you consider using this agent for routine endoscopic procedures?

- (a) Yes (b) No (circle one)

If no, why? I am satisfied with the current sedation agents

- Concern about risk of cardiopulmonary complication
 Medicolegal issues
 Added expense of medication/monitoring equipment
 Requirement for additional nurse or assistant during procedure
 Regulatory (FDA) restrictions
 Other _____

16. If there were a better formulation of propofol that addressed your primary concern(s) would you consider using this agent for routine endoscopic procedures?

- (a) Yes (b) No (circle one)

If no, why? I am satisfied with the current sedation agents

- Concern about risk of cardiopulmonary complication
 Medicolegal issues
 Added expense of medication/monitoring equipment
 Requirement for additional nurse or assistant during procedure
 Regulatory (FDA) restrictions
 Other _____

17. Do you routinely have a registered nurse present during endoscopic examinations?

- (a) Yes (b) No (circle one)

18. Do you routinely administer supplemental oxygen during

- (a) EGD Yes No (circle one)
(b) Colonoscopy Yes No (circle one)

19. What parameters of sedation do you routinely assess during EGD/colonoscopy?

- Vital signs (Pulse, BP, Respiratory rate)
 Oxygen saturation (SaO₂)
 Exhaled CO₂ (TCO₂)
 Bispectral index (BIS)
 Observer Assessment Alertness Scale (OAA/S)
 Other _____

20. Do you routinely administer a pharmacologic antagonist after completing an endoscopic examination?

- (a) Yes (b) No (circle one)

21. If you were having an endoscopy, indicate what you would select for endoscopic sedation:

EGD Colonoscopy

- Opioid alone Opioid alone
 Opioid and benzodiazepine Opioid and benzodiazepine
 Benzodiazepine alone Benzodiazepine alone
 Propofol Propofol
 No sedation/analgesia No sedation/analgesia

22. If you selected propofol, why?

(select as many responses as appropriate)

- Better sedation and analgesia
 Reduced recovery time
 Faster return to work/usual activity
 Improved quality of endoscopic examination
 Other _____

Thank you.

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Queries

- Q1** Author: Please link the authors Julie S. Wechsler, John N. Gaetano, and Ariel A. Benson with their corresponding affiliations.
- Q2** Author: EGDs has been spelled out as esophagogastroduodenoscopies. Please check whether it is correct.
- Q3** Author: CORI has been spelled out as "Clinical Outcomes Research Initiative." Please check whether it is correct.