Gastrointestinal Endoscopy Sedation and Monitoring Practices in Spain: A Nationwide Survey in the Year 2014

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Background and study aims: The introduction of new sedative agents and a desire for improved patient care have encouraged the use of sedation for gastrointestinal (GI) endoscopy over the last decade. This survey aims to provide, within Spain, national and regional data on gastroenterologists' endoscopic sedation and monitoring practices, and on their attitudes concerning these practices.
Methods: A 19-item survey covering the current practices of sedation and monitoring in GI endoscopy was electronically mailed to all members of the three nationwide scientific societies.
Results: Of 2476 e-mailed questionnaires, a total of 569 (23%) were returned, proportionally representing the structure of the Spanish health care system. Monitoring and resuscitation resources were universally available, as well as post-endoscopy recovery rooms. Endoscopy teams usually included a registered nurse (98.5%), an auxiliary nurse (80.5%), and other physicians (25.7%), generally anesthesiologists. More than half of esophagogastroduodenoscopies (EGDs) are performed with the patient under sedation; in 25% of centers, more than 95% colonoscopies are performed with the patient sedated, but a wide variation was observed. Pre-endoscopic risk is assessed in the vast majority of procedures. Propofol is the most commonly used sedative, either alone (in 70% of EGDs and 80% of colonoscopies) or in combination with other drugs. Private funding of a clinic was the only predictor of a significant increase in the use of sedation; 57.7% of the respondents stated having difficulties in implementing sedation, with the limited availability of anesthesiologists and resuscitation training for the auxiliary staff the most common complaints.
Conclusions: The use of sedation during GI endoscopy in Spain varies widely but is on the increase and is more common in private practice. Propofol is the preferred sedative in all procedures.

Introduction

The diagnostic and therapeutic potential of gastrointestinal (GI) endoscopic procedures has notably increased in recent decades, to the point that these techniques are now considered routine examinations for the assessment of many digestive processes. In parallel, the use of procedural sedation during endoscopy has also increased in Western countries over the last decade, so much so that sedation is now considered somehow inseparable from most endoscopic procedures. Sedation is offered to patients with the double aim of improving their perception of the quality of care as a result of the suppression of pain, and preventing patient movements that can jeopardize the efficacy and safety of the endoscopic procedure [1].

Although sedation was initially limited to more complex endoscopic procedures, such as endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasonography (EUS), and was administered only by anesthesiologists, it is now increasingly being used in the most commonly performed endoscopic procedures, such as gastroscopy and colonoscopy, and is also administered by specifically trained endoscopists. The availability of safe sedative agents with a fast onset of action and short-lived effects has facilitated their wider use in clinical practice, with the support of position documents and procedural guidelines released by scientific societies [2–7].

The regulations of different countries vary in regard to who is allowed to administer sedative and anesthetic drugs; their administration is restricted to anesthesiologists and intensive care unit (ICU) doctors in some cases. The law in Spain allows such drugs to be administered by any doctor who knows how to use them. In the particular case of Europe, several national societies for GI endoscopy have developed nationwide surveys to assess the extent of the use of sedation in endoscopy in their respective environments [8–11].

In the case of Spain, Baudet et al. in 2009 conducted the first national survey on sedation practices by distributing a questionnaire to 165 GI endoscopy units; the results revealed a high degree of variation in the pattern of utilization [12]. However, this survey focused on GI endoscopy units and was completed by the person in charge of each unit, so individual attitudes and the perception of the gastroenterology community were not assessed. Additionally, the impact of education and teaching carried out by scientific societies during recent years was not included in this study.

The aim of this survey-based study was to determine the extent to which procedural sedation and monitoring are being used in Spanish endoscopy units, the factors responsible for variations in their use, the patterns of endoscopy room staffing, and the perception of Spanish gastroenterologists regarding this topic, including their attitudes about training and environmental limitations for the expanded use of sedation in endoscopy.

Methods

Study setting

This study was conducted with a survey that was mailed electronically to every gastroenterologist affiliated with any of the three major scientific societies representative of gastroenterology and GI endoscopy in Spain: the Spanish Society of Digestive Diseases (*Sociedad Española de Patología Digestiva*, or SEPD); the Spanish Society of Digestive Endoscopy (*Sociedad Española de Endoscopia Digestiva*, or SEED); and the Spanish Association of Gastroenterology (*Asociación Española de Gastroenterología*, or AEG). The survey was submitted to the affiliated professionals, regardless of whether they performed endoscopy or sedation within their clinical practice.

Study design

A survey of 19 items grouped into six categories was designed to explore the following topics: (1) the demographic and pro-

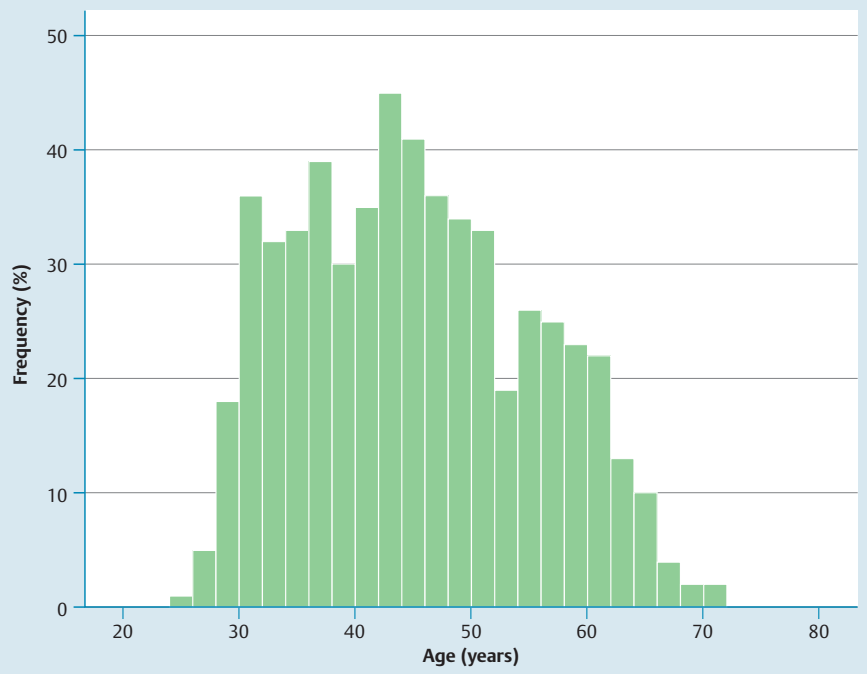

Fig. 1 Distribution of the ages of the 569 Spanish gastroenterologists who responded to our nationwide survey of gastrointestinal endoscopy sedation and monitoring practices in Spain in 2014.

fessional characteristics of the gastroenterologists surveyed and their place of work; (2) the human and material resources for sedation available in the workplace; (3) active participation in sedation procedures; (4) the proportion of endoscopic procedures carried out with the patient under sedation and adjustment to perceived needs; (5) perceived limitations in the environment for the practice of sedation; and (6) attitudes toward sedation and the impact of specific training.

To avoid duplication, the survey was sent individually by e-mail with a link to a SurveyMonkey questionnaire, which could be completed in about 6 minutes. Up to three attempts were made to collect completed surveys, after which gastroenterologists who had failed to return the questionnaire were considered nonresponders. The results provided were automatically recorded in the system.

Statistical analysis

All quantitative results were expressed as median (interquartile range), and qualitative results were expressed as counts and percentages. Comparisons between groups for qualitative results were performed with chi-squared tests; for quantitative variables, nonparametric tests (Kruskal–Wallis) were used. A significance level of 5% ($P<.05$) was selected. All calculations were performed with the statistical package IBM SPSS Statistics (IBM, Armonk, New York, USA).

Results

Demographic characteristics of the sample

A total of 569 responses to the survey (23 % of those sent), completed by 382 men (67.1 %) and 187 women (32.9 %), were received. The average age of the respondents was 44.7 years (standard deviation [SD] 10.1 years; range 25–71), with a polymodal distribution of ages that reflected the different generations of gastroenterologists who made up the sample (**Fig. 1**).

The geographic origins of the responders reflected the population weight of each region in Spain: the autonomous regions that contributed more results were Andalusia, followed by Madrid, Catalonia, and Valencia, accounting for more than half of the overall sample (**Table 1**). Only 14 of the 569 respondents (2.5 %) did not perform endoscopic examinations.

Table 1 Distribution by region of Spanish gastroenterologists who responded to our Internet-based survey of sedation and monitoring practices during endoscopy.

Autonomous region	n	%
Andalusía	102	18.2
Aragón	15	2.7
Asturias	14	2.5
Canarias	22	3.9
Cantabria	8	1.4
Castilla – La Mancha	29	5.2
Castilla y León	25	4.5
Cataluña	69	12.3
Ceuta	1	0.2
Extremadura	13	2.3
Galicia	36	6.4
Islas Baleares	11	2.0
La Rioja	3	0.5
Madrid	94	16.8
Melilla	2	0.4
Murcia	19	3.4
Navarra	16	2.9
País Vasco	32	5.7
Valencia	49	8.8

Table 2 Characteristics of responding gastroenterologists and their respective clinics, gastroenterology departments, and endoscopy units.

Characteristics of clinics and responders	n (%)
Number of hospital beds	
< 200	132 (23.6)
200 – 500	189 (33.8)
501 – 1000	177 (31.7)
> 1000	61 (10.9)
Level of complexity of clinic	
Third level	244 (48.3)
Second level	167 (33.1)
First level	48 (9.5)
Private clinic	46 (9.1)
University hospital	
No	211 (37.4)
Yes	353 (62.6)
Funding origin	
Public resources	444 (78.3)
Private funds	77 (13.6)
Mixed	46 (8.1)
Gastroenterology training with residency system	
Yes	492 (87.9)
No	68 (12.1)
Professional category of respondent	
Head/responsible for department or unit	130 (23.6)
Intermediate professional position	21 (3.8)
Senior assistant physician (experience > 5 years)	296 (53.8)
Junior assistant physician (experience < 5 years)	103 (18.7)
Years of experience as a gastroenterologist	
< 5	103 (18.6)
5 – 10	81 (14.6)
10 – 15	121 (21.8)
15 – 20	81 (14.6)
> 20	169 (30.5)
Number of endoscopy rooms in clinic/department	
1	73 (14)
2	143 (27.4)
3	117 (22.4)
4	108 (20.7)
5	81 (15.5)
Gastroenterology staff (number of doctors)	
Minimum	1
Q1	5
Q2	9
Q3	15
Maximum	37

Q, quartile.

Endoscopy unit and hospital characteristics

The structural and teaching characteristics of the participating centers were consistent with the expectations for our health system, with a predominance of medium-size centers, centers of intermediate complexity, university centers, and centers with public funding and with accredited specialized training (**Table 2**). The flagship professional profile was that of a senior specialist with more than 10 years of professional experience after the completion of specialist training (**Table 2**).

Most respondents worked in clinics or hospitals with 2 to 4 endoscopy rooms, although some centers had a single room (14%) or 5 or more endoscopy rooms (15.5%). The endoscopy staff were very diverse, and half of the centers had 9 or more doctors on staff (**Table 2**). The survey respondents performed a median of 4 esophagogastroduodenoscopies (EGDs) and 6 colonoscopies weekly, but wide variation was noted.

With regard to the staff available in each endoscopy room, the presence of a nurse was almost universal, and a nursing assistant was present in 80.5% of cases. An additional physician was present in a quarter of cases (25.7%), and this physician was an anesthesiologist in more than half of the cases (**Table 3**).

Table 3 Health care staff assigned to endoscopy rooms in centers participating in the survey.

Staff in endoscopy rooms	n (%)
Registered nurse	511 (98.5)
Auxiliary nurse	421 (80.5)
Other physicians, specialty	134 (25.7)
Anesthesiologist	86 (64.2)
Gastroenterologist	22 (16.4)
Resident in gastroenterology	14 (10.4)
Other/no response	12 (9)

Of the physicians who responded to the survey, 59.6% had anesthesiologists in attendance at any moment in the endoscopy units. These were usually assigned to a specific room or technique (59.4%). There was wide variation in the number of days the anesthesiologist was available, with the whole week covered in just 30.4% of cases. The availability of anesthesiologists in endoscopy rooms showed an independent and significant relationship with private funding of the clinic and its size (expressed as number of beds) in a multivariate logistic regression model. The university character of the hospital or its complexity had no relationship with the allocation of anesthesia resources for GI endoscopy.

Material and monitoring equipment in endoscopy rooms

The ability to administer oxygen and the availability of a pulse oximeter and cardiopulmonary resuscitation trolley were practically universal in endoscopy rooms; electrocardiographic monitors and automated blood pressure monitors were very common. A quarter of endoscopy rooms (27.4%) also had capnographs, and the same proportion (24.8%) had carbon dioxide insufflation for endoscopy.

Recovery rooms were available in most of the units (94.8%), most of which (78.9%) were located within the endoscopy unit itself. In two-thirds of cases, the recovery room was exclusively dedicated to GI endoscopy; the rest were shared with other services or techniques. Two-thirds of the responses stated that personnel were specifically assigned to recovery rooms (**Table 4**).

Sedation in endoscopy in clinical practice

According to our survey, sedation was relatively common for EGD, and more than half of the procedures are performed in

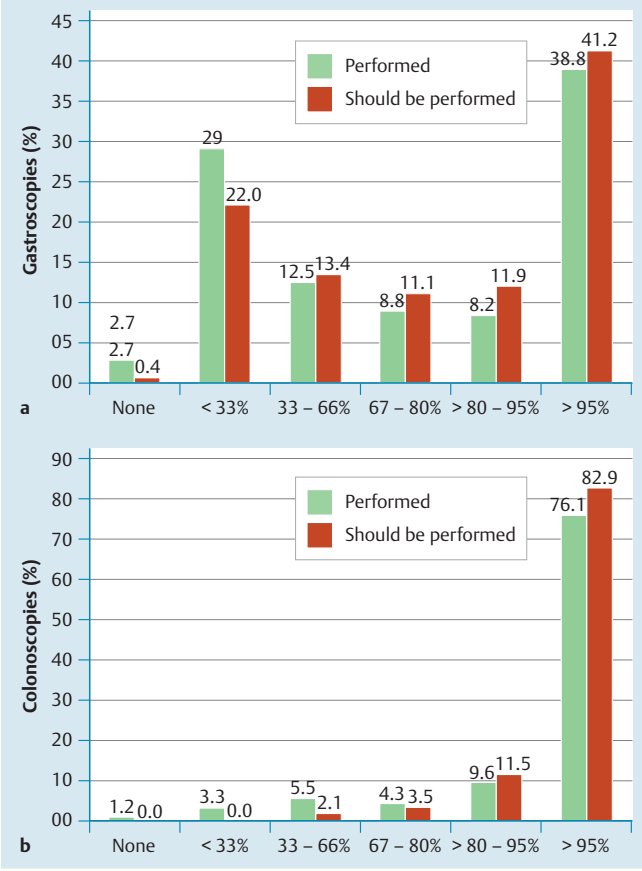

Fig. 2 Proportion of esophagogastroduodenoscopies (**a**) and colonoscopies (**b**) performed with the patients under sedation (regardless of the professional conducting such sedation) in the replying centers (green bars), and the proportion that should have been performed with the patients under sedation in the opinion of the gastroenterologist (red bars).

Table 4 Monitoring and recovery resources in the endoscopy units that responded to the survey.

Resource	n (%)
Pulse oximeter	516 (99.6)
Ability to administer (deliver) oxygen	518 (99.4)
Electrocardiographic monitor	419 (81.5)
Blood pressure monitor	444 (86.7)
Capnograph	128 (27.4)
Carbon dioxide insufflation	121 (24.8)
Cardiopulmonary resuscitation trolley	508 (97.9)
Recovery rooms	494 (94.8)
Within the endoscopy unit	362 (78.9)
Outside the endoscopy unit	97 (21.1)
Exclusively for gastrointestinal endoscopy	326 (66.8)
Shared with other specialties	162 (33.2)
Staff specifically assigned to recovery rooms	
Yes	328 (68.6)
No	150 (31.4)

this way. Regarding colonoscopy, sedation was provided in more than 95% of examinations in most centers. However, the frequency of sedation for both procedures was below what would be considered desirable by the gastroenterologists answering the survey (▶ **Fig. 2**).

A prior assessment of anesthetic risk was done in the vast majority of patients undergoing endoscopic procedures under sedation: in 94.7% of EGDs/colonoscopies and in 97.5% of ERCPs, EUS procedures, and therapeutic procedures, there was a previous assessment of the patient, although the timing of the evaluation of the risk and the type of evaluation significantly differed (▶ **Table 5**). The risk assessment methods most commonly used by endoscopists in our country to decide which patients could undergo a procedure under sedation, the depth and type of such sedation, and the drugs to be used were the clinical history and the American Society of Anesthesiologists grading system (▶ **Table 5**).

As for the most commonly used sedative agent for each type of procedure, propofol was by far the most frequently administered hypnotic drug, either as monotherapy or in combination with other drugs. Propofol was used as the sole sedative agent in 70% of EGDs and in 80% of colonoscopies conducted with the patient under sedation; it was also used in therapeutic procedures. The remaining patients were sedated with a benzodiazepine alone or in combination with an opiate. Sedation exclusively with propofol also predominated for ERCP and EUS. In contrast, emergency endoscopy was the only situation in which benzodiazepines were used as often (50%) as propofol (50%) (▶ **Table 6**).

No significant differences were observed in the use of sedation according to gender, age, or residency-based training. Length of practice and professional category also were not related to differences in the use of sedation in colonoscopy and EGD, nor was the availability of equipment for monitoring and/or sedation recovery.

The availability of support from nurses or from other gastroenterologists/residents in the endoscopy room was not associated with an increased frequency of sedation during EGD and colonoscopies. Having an anesthesiologist in the endoscopy unit was associated with a higher frequency of sedation in EGD, but not in colonoscopy.

The size of the hospital (number of beds) and whether the hospital was affiliated with a university were not associated with the frequency of sedation in EGD or colonoscopy.

With regard to hospital complexity, for hospitals in the first, second, or third level, no differences were found in the frequency of the use of sedation for EGD, which ranged between 27.9% and 39.7% (P = not significant [n.s.]); in all cases, the use of sedation in EGD was significantly more frequent in private clinics (77.3%; $P < 0.001$).

For colonoscopy, no differences in the use of sedation were observed among hospitals of different levels or with respect to private clinics, with a frequency of 68.1% to 93.2% (P = n.s.). However, private funding of a clinic was found to be the sole determinant of an increased frequency of universal sedation in endoscopy compared with public funding (77.5% vs. 31.3%; $P < 0.001$).

Table 5 Pre-endoscopy risk assessment methods and rating scales used by Spanish gastroenterologists who answered survey.

Anesthetic risk assessment	Diagnostic EGD/colonoscopy, n (%)	Therapeutic endoscopy (ERCP/EUS/other procedure), n (%)
In general, risk not assessed	30 (5.3)	14 (2.5)
Inquiries made by doctor/nurse just before examination, without use of written document	206 (36.2)	91 (16)
Risk assessment (from gastroenterology clinic) available before endoscopy	112 (19.7)	87 (15.3)
Document/form filled in with history data/scores to assess risk	188 (33)	133 (23.4)
Risk assessed in pre-anesthetic visit or consultation	74 (13)	186 (32.7)
Risk assessment systems before and/or during procedure		
None	16 (2.8)	10 (1.8)
Background risk clinical records	320 (56.2)	196 (34.4)
ASA class system	272 (47.8)	235 (41.3)
Mallampati score	106 (18.6)	105 (18.5)
Score to control level/depth of sedation (OAAS, Ramsay score)	47 (8.3)	51 (9)
Score to assess post-sedation recovery (Aldrete score)	96 (16.9)	82 (14.4)

EGD, esophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound; ASA, American Society of Anesthesiologists; OAAS, observer's assessment of alertness/sedation.

Table 6 Frequency of sedative use in the different types of endoscopic procedures.[1]

	EGD, %	Colonoscopy, %	ERCP, %	EUS, %	Therapeutic endoscopy, %	Emergency endoscopy, %
BZP	30 (0–90)	10 (0–90)	0 (0–0)	0 (0–0)	10 (0–90)	50 (10–90)
BZP + meperidine	0 (0–20)	20 (0–90)	0 (0–10)	0 (0–90)	10 (0–90)	0 (0–30)
Propofol alone	70 (10–100)	80 (0–100)	50 (0–100)	100 (70–100)	80 (0–100)	50 (10–100)
BZP + propofol	0 (0–10)	0 (0–10)	0 (0–10)	10 (0–80)	0 (0–20)	0 (0–20)

EGD, esophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasonography; BZP, benzodiazepine.
[1] Results are expressed as median (interquartile range: Q1–Q3).

Attitude of Spanish gastroenterologists regarding sedation in endoscopic practice

Most gastroenterologists perceived no difficulties or limitations encountered in using sedation during endoscopy in their workplace, including occasional (19.1%) and frequent (38.6%) difficulties. The main difficulties were related to the availability of anesthesiologists, followed by the training of auxiliary staff in sedation and cardiopulmonary resuscitation (CPR) support. Other causes of difficulty are listed in ▶ **Table 7**. The remaining 42.3% of gastroenterologists did not perceive difficulties or limitations in conducting endoscopic examinations with the patient sedated.

Two-thirds (66%) of the respondents believed that changes to promote or facilitate the administration of sedation by endoscopists in the workplace are needed, and 62.6% were in favor of a greater availability of anesthesiologists for certain techniques. ▶ **Table 8** lists the changes that the gastroenterologists believed should be introduced to encourage the practice of sedation by endoscopists.

Of the gastroenterologists who responded to the survey, 32% considered specific training of endoscopists in sedation practice crucial to implementing this provision; 39% responded that training in sedation would have a slight effect favoring the practice of sedation by endoscopists, whereas 28.4% of the respondents thought that such training would not change their clinical practice.

The availability of specific regulations on the provision of sedation by endoscopists was considered crucial to the implementation of this technique in their own workplace by 36.1% of the respondents and would have a slightly positive impact in 40.3% of cases. Such legislation would have no impact on clinical practice in 23.6% of cases. A significantly higher proportion of the gastroenterologists younger than 50 years (69.2%) than of those older than 50 years (57.3%) expressed a willingness to increase the practice of sedation ($P = 0.01$). No relationship was found between the willingness of gastroenterologists to increase the practice of sedation in endoscopy and the experience or dedication of the gastroenterologists who responded to the survey.

Regulation and training of endoscopists in the use of sedation

Of the respondents, 42.2% reported that rules, procedures, or criteria for sedation in endoscopy had been provided by their hospital or regional health authorities. Conversely, specific regulations were absent in 55% of cases; 2.6% of gastroenterologists were unaware of the availability of these standards.

Records of the practice of sedation in endoscopy and its possible adverse effects were kept in the majority of clinics in our country (74% agreement), mainly in the endoscopy room just after the procedure (in 38.3% of sedation cases performed by the endoscopist and in 30.8% of sedation cases performed by the anesthesiologist) or during the post-sedation recovery period (26% of sedation cases performed by the endoscopist and 24.1% of sedation cases performed by the anesthesiologist).

Of the gastroenterologists who responded to the survey, 94% considered training courses in administering sedation during endoscopy necessary, and 90.9% were willing to attend such courses. In contrast, only half of the respondents (54.5%) had ever attended an activity of this type, and only 42.1% of the participants had chan-

Table 7 Spanish gastroenterologists' perception of difficulties and limitations encountered in performing endoscopic procedures with the patient under sedation.

Origin of perceived difficulty	Median (IQR), %
Availability of anesthesiologists	5 (1 – 8)
Training of auxiliary staff in sedation and CPR support	4 (0 – 6)
Pressures from the anesthesiology department	3 (0 – 7)
Availability of monitoring and recovery resources	2 (0 – 6)
Legislation or regulations regarding sedation	2 (0 – 5)
Gastroenterologists' training in endoscopist-administered sedation and CPR support	2 (0 – 5)
Regulations or standards of the gastroenterology department	0 (0 – 3)
Others	0 (0 –)

IQR, interquartile range; CPR, cardiopulmonary resuscitation.

Table 8 Spanish gastroenterologists' beliefs regarding changes required to enhance endoscopic sedation practices.

Type of change	n (%)
Training of auxiliary staff in sedation and CPR	162 (28.5)
Wider availability of monitoring and recovery resources	144 (25.3)
Gastroenterologists' training in sedation and CPR	142 (25)
Improving the availability of anesthesiologists	138 (24.3)
New regulations or laws on sedation not controlled by an anesthesiologist	121 (21.3)
Reduction of pressures from the anesthesiology department	106 (18.6)
Change in the regulations or standards of the gastroenterology department	57 (10)
Others (< 1 %)	
Improve availability of support staff	5
Increase or improve space for administering sedation	4
Reduce workload/patient load in endoscopy rooms	3
Receive greater support from managers/administration	3

CPR, cardiopulmonary resuscitation.

ged their practice of sedation as a consequence of having received specific training. However, the impact of the change was large; the gastroenterologists who had not previously administered sedation then started to sedate a median of 80% of their patients (interquartile range [IQR] 60% – 95%), and those who had already practiced sedation by themselves increased this practice by a median of 50% (IQR 30% – 80%).

Finally, regarding CPR training, 24% of the respondents had never received training in these techniques. Only 10.8% completed yearly courses, and 38.4% and 26% of the respondents, respectively, attended courses every 3 to 5 years.

Discussion

This study, based on the results of surveys sent to members of the three major Spanish scientific societies of gastroenterology and endoscopy, allowed us to compare sedation practices in GI endoscopy in Spain with those in other Western countries (mainly Germany, Switzerland, and the United States) and also with previous data available for Spain [8, 12 – 14]. We were able to document a significant increase in the use of sedation in GI endoscopy in Spain in comparison with the previous data, although with wide variation noted for the different endoscopic procedures and among different hospitals and clinics. This wide variation in the use of sedation in GI endoscopy is traditionally a well-documented fact, not only in our country [12, 15 – 17] but also in a European and an international context [18].

At the same time, our study shows that propofol is currently the most widely used sedative drug for all endoscopic procedures. It is used mainly as a sedative and has replaced the benzodiazepines (administered alone or in combination with opioids), which were the sedatives predominantly used in Spain 5 years ago [12]. The use of propofol as the sole sedative in our study contrasts with the prevailing trend of combining it with midazolam, recently documented in other European environments [11]. In fact, the widespread use of propofol for GI endoscopy has been documented in several European countries [11, 19], replacing benzodiazepine-based sedation, with a majority of endoscopists administering it without the assistance of an anesthesiologist [13]. Institutional and scientific guidelines, both national [20 – 22] and international [3, 4], and especially the characteristics of propofol itself, which combines a rapid onset of action (30 – 45 seconds) with a short-term effect (4 – 8 minutes), thus allowing a shorter recovery time and greater patient and examiner satisfaction [1] without increasing the risks of adverse events [23], have undoubtedly contributed to the position that this drug is the ideal sedative agent for outpatient and relatively short endoscopic procedures [24].

Sedation and analgesia have been recognized as important elements of endoscopic procedures capable of improving the quality of examinations and contributing to the willingness of patients to undergo an endoscopic examination or repeated examinations [25]. Our results show different attitudes toward sedation for EGDs and colonoscopies on the part of gastroenterologists. Although the use of sedation for colonoscopy is widespread (76.1% of responding centers sedate patients in more than 95% of these examinations, and more than 80% of respondents favor "universal" sedation), the results are very different in the case of EGDs, in which the proportions of sedated patients vary widely among centers and only 41% of respondents favor universal sedation. The dramatic increase in the use of sedation for endoscopy, especially colonoscopy, has been documented in other Western countries [8, 26], in contrast with the opinion of Spanish gastroenterologists, who still consider its use to be below desirable levels, according to our survey.

From our survey data, we can infer that generally speaking, the more sedation is provided (for both EGDs and colonoscopies), the more it is considered desirable for most patients. This statement is particularly true for EGD; those gastroenterologists not skilled in sedation usually consider it less necessary, and vice versa. This trend may indicate that the more endoscopists know how to use sedation, the more they will use it because they believe it is necessary.

Some aspects of our research require additional comments. Previous European [8 – 11] and American [14] studies based on surveys associated a more frequent use of sedation in endoscopy with a higher level of hospital complexity, an association that was not found in our survey. We

also found no associations between an increased use of sedation and a wide range of other parameters, including age, experience or training of the endoscopist, and size of the clinic. Interestingly, the more frequent presence of anesthesiologists in endoscopy rooms in hospitals with the highest numbers of beds was not associated with an increased use of sedation in GI endoscopy in comparison with smaller clinics. In fact, the only feature that showed an association with a higher frequency of sedation in GI endoscopy was private funding of the hospital or clinic, as was previously found in our country by Baudet et al. [12]. We should mention that providing sedation during endoscopy in publicly funded centers does not imply additional remuneration for health care professionals, although the situation may be different in privately funded clinics in our environment.

By comparing our results with those of the study published by Baudet et al. in 2009, we were able to perceive evolving changes in Spain in recent years regarding the use of sedation in GI endoscopy, although the two studies were based on different designs [12]. The number of commonly performed procedures (EGDs and colonoscopies) carried out with the patient under sedation has increased significantly. Thus, "universal" sedation has grown, both for EDG (from 14% to 38.8%) and for colonoscopy (from 30% to 76.1%). This has meant a shift in the use of endoscopy unit resources, with space now provided for post-endoscopic recovery in 94.8% of centers (in the previous study the relevant figure was 53%) and an increased availability of recovery rooms. In parallel, basic monitoring of patients is universal today, whereas a few years ago only 77% of endoscopy units that provided sedation had pulse oximetry monitoring available. However, differences in study design prevent us from comparing changes in the proportions of procedures in which sedation is directly controlled by an anesthesiologist, although it is clear that the number of examinations performed with the patient under sedation has increased far more than the anesthesia resources allocated to GI endoscopy.

The impact of specific training for endoscopists in the use of sedation, which has been promoted in recent years in our country, and the availability of specific regulations on this issue were also evaluated in our study. More than 90% of Spanish gastroenterologists support such training and are interested in receiving it. In general, the impact of specific training on the practice of sedation by endoscopists was high, although based on our results, some difficulties in the implementation of this practice were recognized. Thus, 28% of the respondents considered that specific training would not change their clinical practice; 42.1% of endoscopists who had been trained did not change the number of sedated procedures, and up to 23.6% of gastroenterologists felt that the availability of a specific regulation (ranging from national laws to unit protocols) on the administration of sedation by practitioners who are not anesthesiologists would not change their use of sedation in the workplace.

Therefore, barriers to the implementation of sedation in endoscopy do exist, and these were also explored in our study. The most common were related to the availability of anesthesiologists, the training of auxiliary staff in sedation and cardiopulmonary resuscitation, and pressures from the anesthesiology department. The changes needed to implement the administration of sedation by endoscopists identified by the survey respondents were varied; the one most commonly recognized was training of the staff members, both nurses (28.5%) and endoscopists (25%). This aspect should be considered by providers of training when they organize multidisciplinary courses, as already stated in the different guidelines [3,7,27].

Our study has the strength of being based on data obtained from a large sample of gastroenterologists, members of the largest and most extensive nationwide scientific societies. The data represent all regions of the country in proportion to their populations and also represent the different types and levels of hospitals. Furthermore, our response rate of 23% can be considered high enough to allow reliable results.

The limitations of our study come from its methodology, with results depending on the percentage of responses obtained and the representativeness of the sample. The fact of that most of the responses were received from gastroenterologists who already perform endoscopic examinations, and who probably are more interested in sedation or predominantly dedicated to GI endoscopy, should be taken into account. Indeed, this may have caused both the practice of sedation and the use of propofol as the predominant sedative drug to be overestimated in the results. In any case, the increasing use of sedation in GI endoscopy, and more relevantly in colonoscopy, is a well-documented trend in the medical environment of developed countries, as well as the expanding use of propofol as the sedative of choice for outpatient and short procedures, as has been well documented in our results.

In conclusion, the results of our survey of sedation and monitoring in GI endoscopy show a wide variation in their use throughout our country, but with a significant increase compared with the previous data available, such that levels now approach the standards of other Western countries. Propofol-based sedation, especially with propofol as the sole sedative, is clearly predominant, and propofol has replaced benzodiazepines and opiates in endoscopy. Private funding of health care is the only factor associated with an increased use of sedation, and Spanish gastroenterologists recognize several barriers and limitations that prevent the use of these techniques from spreading. In their opinion, an increased use of sedation for GI endoscopy would require a greater availability of anesthesia resources, and especially a greater effort to make specific training available for all the members of the endoscopy team.

Competing interests: None

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