

Adherence of Greek gastroenterologists to established quality indicators in gastrointestinal endoscopy

Georgios Axiaris^a, Alexandros Ioannou^b, Konstantina Dimopoulou^c, Stavros P. Papadakos^d, Panagiotis Baxevanis^b, Margarita Papatheodoridi^d, Xenofon Tsamakidis^e, Georgios Tziatzios^f, Ioannis S. Papanikolaou^g, Konstantinos Triantafyllou^g, Spyridon Michopoulos^b, Kalliopi Panagiotopoulou^h, Konstantina D. Paraskeva^f

Theageneio Anticancer Hospital of Thessaloniki, Thessaloniki, Greece; Alexandra General Hospital, Athens, Greece; Red Cross Hospital, Athens Greece; “Laiko” General Hospital of Athens, Medical School of National & Kapodistrian University of Athens, Athens, Greece; St. Savvas Cancer Hospital, Athens, Greece; “Konstantopoulou-Patision” General Hospital of Nea Ionia, Athens, Greece; Attikon University Hospital, National and Kapodistrian University of Athens, Medical School, Athens, Greece; Associate Teaching Staff, Neapolis University Pafos, Cyprus

Abstract

Background Quality assessment is a priority in gastroenterology. Data on adherence to endoscopy quality standards in Greece remain limited. This study examined Greek gastroenterologists' compliance with endoscopic quality indicators.

Methods This survey collected data on the quality of upper and lower gastrointestinal endoscopy in Greece. Hellenic Society of Gastroenterology members were invited to complete an electronic survey that included validated endoscopic quality indicators.

Results In total, 164 gastroenterologists participated, of whom 107 (65%) were male. Gastroscopy duration was not recorded by 116 (71%), whereas 102 (62%) used photodocumentation. Use of Prague and Los Angeles classifications was high (156/95% and 159/97%). Complications were recorded by 103 (63.58%) after gastroscopy and 90 (55.56%) after colonoscopy. In colonoscopy, 140 (90.85%) used the Boston Bowel Preparation Scale and 158 (96.34%) achieved cecal intubation. An adenoma detection rate >25% was achieved by 117 (71.78%), and 103 (62.8%) used the Paris classification. Overall compliance with upper and lower endoscopy quality indicators was 87 (53%) and 75 (46%), respectively. Multivariate analysis showed that experience (odds ratio [OR] 2.25, 95% confidence interval [CI] 1-5.06; P=0.049), video recording (OR 2.55, 95%CI 1.23-5.28; P=0.012), and high-resolution endoscope use (OR 2.92, 95%CI 1.39-6.09; P=0.004) were associated with better compliance during upper endoscopy. For lower endoscopy significant predictors included video recording (OR 2.20, 95%CI 1.11-4.33; P=0.023), age (OR 4.33, 95%CI 1.67-11.24; P=0.003) and high-resolution endoscope use (OR 2.67, 95%CI 1.34-5.3; P=0.005).

Conclusion In this survey, discrepancies were observed in Greek endoscopists' compliance with endoscopic quality indicators, underscoring the need for further improvement.

Keywords Quality indicators, gastroscopy, colonoscopy, endoscopy

Ann Gastroenterol 2026; 39 (5): 571-580

Conflict of Interest: None

Correspondence to: Georgios Axiaris, Gastroenterology-Oncology Department, Theageneio Anticancer Hospital of Thessaloniki, Alexandrou Symeonidi 2, Thessaloniki 54639, Greece, e-mail: axiarisgeorge@gmail.com

Received 7 February 2026; accepted 1 June 2026; published online 26 June 2026

DOI: <https://doi.org/10.20524/aog.2026.1090>

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms

© 2026 Hellenic Society of Gastroenterology

Introduction

Quality assurance has become a cornerstone of modern healthcare, ensuring that clinical practices follow evidence-based standards and achieve optimal patient outcomes [1]. In gastrointestinal (GI) endoscopy, where diagnostic accuracy and procedural efficiency and safety are directly linked to the prevention and treatment of benign and malignant lesions, quality is a practical goal that can be measured and improved [2,3]. Over the past decade, technological advances, an increasing number of endoscopic procedures, and the growing interest in patient-centered care have

www.annalsgastro.gr

highlighted the need to monitor and enhance endoscopic performance.

International societies, such as the European Society of Gastrointestinal Endoscopy (ESGE) and the American Society for Gastrointestinal Endoscopy (ASGE), have developed thorough frameworks of quality indicators for both upper and lower GI endoscopy [4-8]. These indicators provide clear measures that reflect the various stages of the endoscopic process, from preprocedural aspects such as appropriate indications, bowel preparation, informed consent, and sedation management, to intraprocedural performance, including photodocumentation, lesion detection, resection and adherence to biopsy protocols, and postprocedural parameters, such as detailed documentation, communication of findings, adverse event recording and follow-up recommendations. Strict compliance with these standards is associated with a reduction in post-endoscopy cancer rates and patient outcome improvement [4,7]. Despite their well-established clinical value, adherence to endoscopic quality indicators varies among centers and endoscopists, because of differences in training, facilities, equipment and data recording systems. Although efforts to develop national quality registries in Europe are increasing, comprehensive evidence, particularly in Greece, remains scarce [9-11]. Greek endoscopy units function in diverse healthcare settings—public hospitals, private clinics and academic institutions—often without standardized recording systems or structured performance documentation. Such heterogeneity may complicate the accurate evaluation of endoscopy quality. Assessing Greek endoscopists' awareness and adherence to validated quality indicators is essential for identifying gaps in practice, guiding targeted education and informing the development of a national quality framework aligned with European standards. This study evaluates the knowledge, attitudes and compliance of Greek gastroenterologists with established quality metrics in upper and lower GI endoscopy, aiming to highlight current performance, pinpoint areas for improvement, and support ongoing efforts to strengthen endoscopic quality and patient safety.

*Gastroenterology-Oncology Department, Theageneio Anticancer Hospital of Thessaloniki, Thessaloniki, Greece (Georgios Axiaris);

^bGastroenterology Department, Alexandra General Hospital, Athens, Greece (Alexandros Ioannou, Panagiotis Baxevas, Spyridon Michopoulos); ^cDepartment of Gastroenterology, Red Cross Hospital, Athens Greece (Konstantina Dimopoulou); ^d1st Academic

Department of Gastroenterology, "Laiko" General Hospital of Athens^{***}, Medical School of National & Kapodistrian University of Athens, Athens, Greece (Stavros P. Papadakos, Margarita Papatheodoridi);

^eGastroenterology Department, St. Savvas Cancer Hospital, Athens, Greece (Xenofon Tsamakidis); ^fDepartment of Gastroenterology,

"Konstantopoulou-Patision" General Hospital of Nea Ionia, Athens, Greece (Georgios Tziatzios, Konstantina D. Paraskeva);

^g2nd Gastroenterology Department, Attikon University Hospital, National and Kapodistrian University of Athens, Medical School, Athens, Greece (Ioannis S. Papanikolaou, Konstantinos Triantafyllou);

^hAssociate Teaching Staff, Neapolis University Pafos, Cyprus (Kalliopi Panagiotopoulou)

Materials and methods

Study purpose

This study assessed Greek gastroenterologists' knowledge of, and adherence to established quality standards for upper and lower GI endoscopy, aiming to highlight the importance of systematically measuring and monitoring quality indicators. Using ESGE- and ASGE-based benchmarks, it also examined factors influencing the adoption and implementation of quality metrics in routine gastroscopy and colonoscopy practice.

Study design

This survey, initiated by the Young Members' Committee of the Hellenic Society of Gastroenterology (HSG) and approved by its board of directors, was conducted from October 2024 to January 2025. The study collected data on quality indicators for upper and lower GI endoscopy in Greece. The primary endpoint was the compliance of HSG member gastroenterologists with established quality indicators, assessed through responses to a purpose-designed electronic questionnaire. Secondary objectives included identifying factors affecting compliance. All registered HSG members, including certified gastroenterologists and trainees (probationary members), were eligible to participate. Participation was voluntary, anonymous, and without financial incentives. Informed consent was obtained via a dedicated option within the questionnaire, and participants were informed about the use of collected data.

Questionnaire distribution and collection

The survey employed a structured questionnaire created using Google Forms and distributed via email, with each address allowed a single submission. Online distribution enabled a broad nationwide reach across the Greek gastroenterology community, while preserving anonymity. Electronic surveys have been shown to provide a response quality comparable to that of traditional mailed questionnaires, with a substantially lower administrative burden [12-15]. The questionnaire was disseminated in 2 rounds—an initial invitation followed by a reminder 3 months later—between October 2024 and January 2025. All invitations were sent by the HSG secretariat and included a clear description of the survey's purpose.

Data collection tool - questionnaire

The questionnaire's final structure was determined through consensus by the HSG Young Members' Committee, following systematic discussions to evaluate its scientific accuracy, completeness, clarity, and applicability to clinical practice.

The questionnaire was divided into 4 sections:

1. Introduction and consent: This section outlined the study's purpose and included a consent statement for participation and data processing.
2. Demographic and professional characteristics: Seven questions covered participants' sex, age, workplace region, work setting, years of gastroenterology practice or training stage (for trainees), and attendance at endoscopy quality-related seminars or courses over the past 5 years.
3. Upper GI endoscopy quality indicators: Ten questions addressed topics such as gastroscopy duration, photo/video documentation, use of standardized terminology, biopsy protocols for Barrett's esophagus (Seattle protocol), atrophy, or intestinal metaplasia, complication recording, maintenance of a Barrett's esophagus patient registry, and patient experience documentation.
4. Lower GI endoscopy quality indicators: Thirteen questions focused on metrics including bowel preparation quality—e.g., Boston Bowel Preparation Scale (BBPS)—cecal intubation rates, withdrawal time, adenoma detection rates (ADR), polyp description using the Paris classification, polypectomy techniques for polyps <5 mm and <10 mm, adverse event recording, post-polypectomy surveillance protocols, use of digital recording systems, high-definition endoscopy usage, and patient experience documentation.

Definition of variables

To evaluate the primary endpoint, binary variables were created to assess successful compliance with endoscopy quality indicators. This methodology has been used in prior studies, such as that of Zagari *et al* [11].

Statistical analysis

Descriptive statistics included absolute and relative frequencies for categorical variables. Comparisons between groups used Pearson's χ^2 and Fisher's exact tests, as appropriate. The multinomial goodness-of-fit test was used to compare sex and workplace region between the survey sample and the HSG population. Associations between quality endoscopy performance (upper/lower) and demographic/professional characteristics were analyzed using univariate and multivariate logistic regression. P-values ≤ 0.05 were considered statistically significant, with values between 0.05 and 0.10 reported as indicative. Analyses were performed using Stata 15.0.

Results

Of the 668 HSG members [16] 164 responded (response rate 24.6%). Of the 164 respondents, 107 (65.2%) were male,

and 88 (53.7%) were aged 40–60 years. Overall, 132 (80.49%) had completed their gastroenterology specialization, whereas 32 (19.51%) were still trainees. The majority (92, 56.79%) worked in Attica, 27 (16.67%) in Central Macedonia, and 43 (26.54%) in other regions of Greece. Public healthcare settings employed 102 (62.58%) responders and the private sector 61 (37.42%). Of the responders, 122 (74.85%) had attended a quality-related course within the past 5 years, 138 (84.15%) used digital recording systems during endoscopy, 82 (50%) did not record endoscopy on video, and 79 (48.17%) routinely performed endoscopy with high-definition scopes supporting digital chromoendoscopy (Table 1).

According to HSG records, 543 (81.3%) are males and 125 (18.7%) females, whereas the study sample comprised 107 (65.2%) males and 57 (34.8%) females. The sample therefore under-represents males ($P < 0.001$). Geographically, 321 (48.1%) HSG members work in Attica, 122 (18.3%) in Central Macedonia and 225 (33.7%) in the rest of Greece, compared with 92 (56.1%), 27 (16.5%) and 43 (26.2%) in the sample, respectively. This distribution is not significantly different ($P = 0.072$). Despite the sex imbalance, the geographic distribution of gastroenterologists in our sample remains representative of the overall population distribution.

Upper GI endoscopy quality indicators

The majority of the respondents (116/70.73%) did not document gastroscopy duration. Photodocumentation of major anatomical landmarks (≥ 10 images plus additional images for pathological findings) was reported in $\geq 90\%$ of procedures by 102 (62.2%) participants. The Prague classification was utilized by 156 (95.1%) respondents for Barrett's esophagus, the Los Angeles classification by 159 (97%) for erosive esophagitis, while the Seattle protocol was followed by 140 (85.89%) for non-dysplastic Barrett's surveillance. A Barrett's registry was not in place according to 83 (50.92%) participants, whereas 54 (33.13%) registered $\geq 85\%$ of the patients. Regarding gastric atrophy/intestinal metaplasia, 158 (96.3%) performed systematic biopsies per ESGE recommendations. Post-therapeutic upper GI-endoscopy complications were documented in $\geq 95\%$ of cases by 103 (63.58%), in $< 95\%$ by 28 (17.28%), and were not documented at all by 31 (19.14%) responders (Table 2). Patient experience after upper endoscopy was not recorded by most responders (126/76.8%), while 29 (17.7%) documented it without validated tools, and only 9 (5.5%) used certified questionnaires. A total of 160 (97.6%) completed all 8 upper endoscopy quality-indicator items. Responders answering 7 items were classified as compliant if ≥ 6 responses met the guidelines measure. Overall, 87 endoscopists (53.1%) met the composite quality indicator for upper GI endoscopy. Multivariate analysis showed that endoscopist years in practice, use of video recording, and use of high-resolution endoscopes were statistically significant predictors of compliance with upper GI endoscopy quality indicators (Table 3, Fig. 1). Gastroenterologists with 5–15 years

Table 1 Demographic and professional characteristics of 164 members of the Hellenic Society of Gastroenterology participating in the survey for quality in endoscopy

Variable	Value n (%)
Sex	
Male	107 (65.24)
Female	57 (34.76)
Age (years)	
<40	62 (37.8)
40-50	48 (29.27)
50-60	40 (24.39)
>60	14 (8.54)
Geographical region	
Attica	92 (56.79)
Central Macedonia	27 (16.67)
Rest of Greece	43 (26.54)
Missing value	2
Workplace	
National health system hospital	81 (49.69)
Academic hospital	21 (12.88)
Private sector	61 (37.42)
Missing value	1
Participation in quality related seminars relevant to endoscopy (past 5 years)	
No	41 (25.15)
Yes	122 (74.85)
Missing value	1
Board certified	
No	32 (19.51)
Yes	132 (80.49)
Years of practice	
Residency	32 (19.51)
<5	44 (26.83)
5-10	27 (16.46)
11-15	18 (10.98)
16-20	10 (6.10)
>20	33 (20.12)
Image digital recording system	
No	26 (15.85)
Yes	138 (84.15)
Use of video recording	
No	82 (50)
Yes, in selected cases	71 (43.29)
Yes, always	11 (6.71)
High-definition endoscope use	
No	85 (51.83)
Yes	79 (48.17)

of experience had double the odds of compliance with upper GI endoscopy quality indicators compared to other experience groups (odds ratio [OR] 2.25, 95% confidence interval [CI] 1-5.06). Video usage increased compliance likelihood by 2.5 times (OR 2.55, 95%CI 1.23-5.28), and high-definition endoscope usage by nearly 3 times (OR 2.92, 95%CI 1.39-6.09), after adjustment for other factors.

Table 2 Responses of 164 gastroenterologists regarding upper gastrointestinal endoscopy quality indicators

Question	Value n (%)
Upper gastrointestinal endoscopies with documented procedure duration	
<90%	32 (19.51)
≥90%	16 (9.76)
Not recorded	116 (70.73)
Upper gastrointestinal endoscopies with photographic documentation of anatomical landmarks including at least 10 images	
<90%	54 (32.93)
≥90%	102 (62.2)
No photodocumentation	8 (4.87)
Classification for the description of Barrett's esophagus	
Description of maximum Barrett length	2 (1.22)
Short and long Barrett discrimination	6 (3.66)
Use of Prague classification	156 (95.12)
Classification for erosive esophagitis	
None	4 (2.44)
Savary-Miller classification	1 (0.61)
Los Angeles classification	159 (96.95)
Biopsy protocol in patients with non-dysplastic Barrett's esophagus	
1-2 random biopsies from the Barrett's esophagus	3 (1.84)
3-4 random biopsies from the Barrett's esophagus	19 (11.66)
4 biopsies every 2 cm along the Barrett's esophagus (Seattle protocol)	140 (85.89)
No biopsies	1
Missing value	1
Procedures with complication documentation post upper gastrointestinal endoscopy	
<95%	28 (17.28)
≥95%	103 (63.58)
Not recorded	31 (19.14)
Missing value	2
Biopsy protocol for gastric atrophy and in intestinal metaplasia in the stomach	
1 biopsy from the antrum and 1 from the corpus	1 (0.61)
≥2 biopsies from the antrum	1 (0.61)
≥2 biopsies from the antrum and ≥2 biopsies from the corpus*	158 (96.34)
No systematic use of a protocol	4 (2.44)
Percentage of patients with Barrett's esophagus included in a registry for dysplasia surveillance	
<85%	26 (15.95)
≥85%	54 (33.13)
No use of a registry for Barrett's esophagus dysplasia surveillance	83 (50.92)
Missing value	1

*according to European Society of Gastrointestinal Endoscopy's recommendations

Lower GI endoscopy quality indicators

Most respondents (149/90.9%) used the BBPS to measure bowel preparation. Cecal intubation rates exceeded 90%

Table 3 Multivariate logistic regression for the composite compliance endpoint for quality in the upper gastrointestinal endoscopy for 164 gastroenterologists who participated in the survey

Variable	OR (95%CI)	P-value
Workplace		
National health care system hospital	Reference	
Academic hospital	0.3 (0.09-1.02)	0.053*
Private sector hospital	2.21 (0.99-4.97)	0.053*
Years of practice		
<5 or >15 years	Reference	
5-15 years	2.25 (1-5.06)	0.049**
Use of video recording		
No	Reference	
Yes	2.55 (1.23-5.28)	0.012**
Use of high-definition endoscopes		
No	Reference	
Yes	2.92 (1.39-6.09)	0.004***

*≤0.1, **≤0.05, ***≤0.01

OR, odds ratio; CI, confidence interval

for 158 (96.3%) responses. Withdrawal time was routinely recorded by 61 (37.2%), while 151 (92.1%) reported a mean withdrawal time ≥6 min. An ADR ≥25% was reported by 117 (71.78%) responders. For polyps less than 10 mm, 111 (68.1%) used cold snare polypectomy in ≥90% of cases. Complications after lower endoscopy were documented in ≥95% of cases by 90 (55.56%) of participants. The Paris classification for polyp morphology was used routinely by 103 (62.8%), while 61 (37.2%) applied it selectively. Strict adherence to ESGE or ASGE post-polypectomy surveillance guidelines was reported by 51 (31.10%) participants, while the rest of them recommended shorter follow-up intervals, or used empirical approaches (Table 4). Patient experience was not recorded by 116 (70.7%), was documented without the utilization of validated tools by 38 (23.2%), while only 5.5% participants assessed it using certified questionnaires. A total of 160 responders (97.56%) answered all 9 lower endoscopy quality indicator questions. Those answering 8 questions were considered compliant if ≥6 (75% compliance) answers complied with guidelines. Overall, 75 (45.73%) participants met the composite quality indicator for lower GI endoscopy. Multivariate analysis showed that age (OR 4.32, 95%CI 1.67-11.24), video usage (OR 2.2, 95%CI 1.11-4.34) and high-definition endoscope usage (OR 2.67, 95%CI 1.34-5.3) were significantly associated with compliance with lower endoscopy quality indicators. Participants using video for colonoscopy had 2.2 times higher odds of compliance compared to those who did not. High-definition endoscope usage increased the compliance likelihood by 2.7 times (Table 5, Fig. 2).

Discussion

This national survey provides the first systematic assessment of Greek endoscopists' awareness of and

Table 4 Responses of 164 gastroenterologists regarding lower gastrointestinal endoscopy quality indicators.

Question	Value n (%)
Bowel cleanliness index use	
Boston Bowel Preparation Scale	149 (90.85)
None	15 (9.15)
Cecal intubation rate	
<90%	6 (3.66)
>90%	36 (21.95)
>95%	122 (74.39)
Withdrawal time recorded	
No	103 (62.8)
Yes	61 (37.2)
Mean withdrawal time	
≥6 min	82 (50)
≥10 min	69 (42.07)
<6 min	1 (0.61)
Not measured	12 (7.32)
Adenoma detection rate	
<25%	10 (6.13)
≥25%	117 (71.78)
Not measured	36 (22.09)
Missing value	1
Cold snare for polyps <10 mm	
in ≥90% of cases	111 (68.1)
in <90% of cases	49 (30.06)
Not removed at index colonoscopy	3 (1.84)
Missing value	1
Documentation of complications post-colonoscopy	
In <95% of cases	19 (11.73)
In ≥95% of cases	90 (55.56)
Not systematically recorded	53 (32.72)
Missing value	2
Use of the Paris classification	
Always	103 (62.8)
Usually	56 (34.15)
Only for pedunculated polyps	5 (3.05)
Post-polypectomy surveillance protocol	
Strict follow up according to ESGE guidelines	48 (29.27)
Follow up according to ASGE guidelines	3 (1.83)
Follow up sometimes according to ESGE guidelines	8 (4.88)
Based on guidelines, occasionally adopting	100 (60.98)
Shorter surveillance intervals	
Empirical surveillance	5 (3.05)

ESGE, European Society of Gastrointestinal Endoscopy; ASGE, American Society of Gastrointestinal Endoscopy

adherence to established quality indicators in upper and lower GI endoscopy. Overall adherence to quality guidance, using the composite endpoint, was moderate (53.1% and 45.7% for upper and lower GI endoscopies, respectively); these preliminary results are optimistic, but further validation of the observations is warranted to draw clinical meaningful conclusions. Moreover, in order to strengthen the validity of our results we calculated post-stratification weights based on sex and geographic region, using population totals from the HSG. The weighted composite compliance estimates were similar to the unweighted estimates (Supplementary

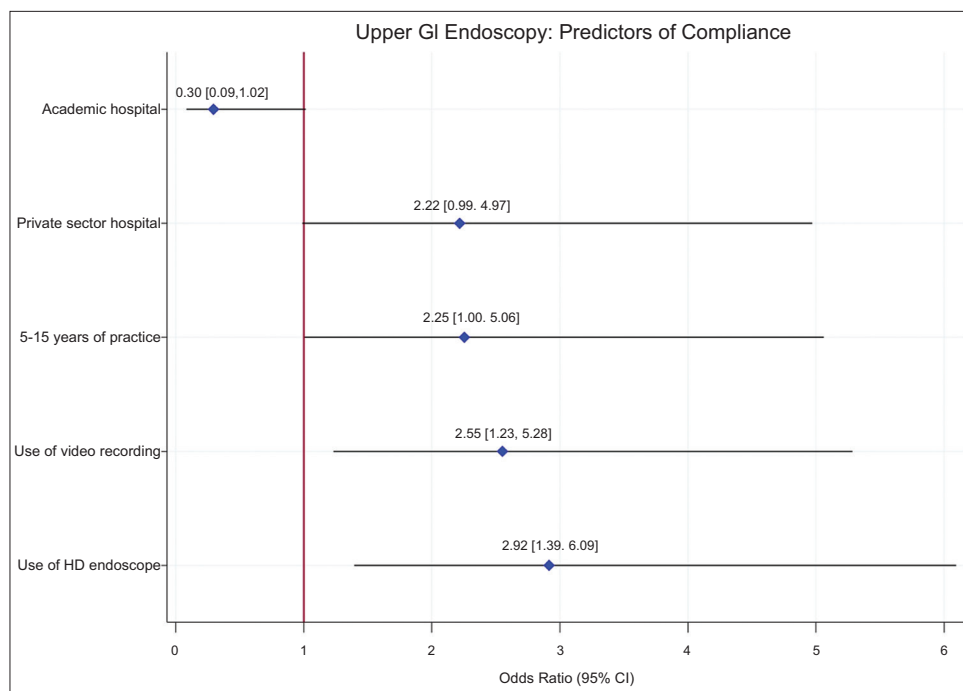


Figure 1 Multivariate analysis for factors associated with upper gastrointestinal (GI) endoscopy quality indicators compliance of 164 gastroenterologists that participated in the survey
HD, high-definition; CI, confidence interval

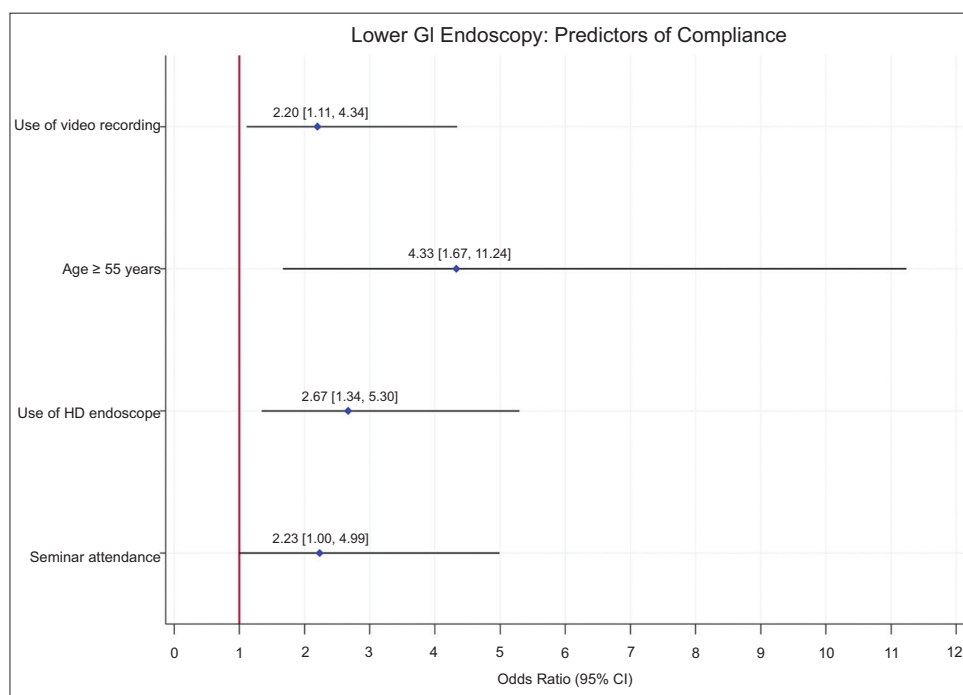


Figure 2 Multivariate analysis for factors associated with lower gastrointestinal (GI) endoscopy quality indicators compliance of 164 gastroenterologists that participated in the survey
HD, high-definition; CI, confidence interval; GI, gastrointestinal

Table 1). Notably, these rates exceed those reported in a recent Italian survey, where compliance reached only 26.6% for gastroscopy and 22.3% for colonoscopy [11]. In our study, endoscopist experience was a key determinant of adherence

to quality indicators in both upper and lower GI endoscopy. This is consistent with findings by Jover *et al*, who reported that endoscopist age and years of practice were independently associated with better colonoscopy quality [15]. Prior

Table 5 Multivariate logistic regression for the composite compliance endpoint for quality in lower gastrointestinal endoscopy for 164 gastroenterologists who participated in the survey

Variable	OR (95%CI)	P-value
Use of video recording		
No	Reference	
Yes	2.2 (1.11-4.34)	0.023**
Age		
<55	Reference	
>55	4.33 (1.67-11.24)	0.003***
Use of high-definition endoscopes		
No	Reference	
Yes	2.67 (1.34-5.3)	0.005***
Participation in quality related seminar relevant to endoscopy (past 5 years)		
No	Reference	
Yes	2.23 (1-4.99)	0.051*

*≤0.1 **≤0.05, ***≤0.01

OR, odds ratio; CI, confidence interval

studies also show that higher procedure volumes improve key indicators, such as ADR and cecal intubation rates, underscoring the positive effect of experience on endoscopic performance [10,17]; however, our survey did not address this variable. Multivariate analysis showed that access to video recording and the use of high-definition endoscopes were associated with better adherence to quality indicators. Nonetheless, only 6.7% of respondents routinely recorded procedures, and half of the responders did not use video at all, despite evidence that recording enhances quality, increases ADR, and supports self-assessment [18-21]. Regarding equipment, fewer than half of the responders reported exclusive use of high-definition endoscopes. These findings indicate the limited availability and use of advanced imaging technologies, underscoring the need for equipment upgrades and training in modern endoscopic techniques. Continuing education and clinical setting also influenced endoscopy quality practices. Most gastroenterologists (74.85%) had attended at least 1 training activity on endoscopy quality, and such participation was positively associated with adherence to key indicators, particularly in lower GI endoscopy—consistent with prior evidence demonstrating improved compliance after structured training [11,22,23]. Although adherence to certain upper GI quality indicators varied across practice environments, overall quality did not differ significantly between public and private services [24]. These findings highlight the importance of ongoing education and institutional support to ensure uniform application of quality standards across endoscopy units.

A major finding of the study was the low rate of procedure duration documentation and the inconsistent implementation of guideline-recommended photodocumentation. Overall, 70.7% of the responders did not record upper GI endoscopy duration, and only

62.2% consistently provided guideline-recommended photographic documentation (≥10 images). Comparable European data also show low adherence: in Italy, only 18.2% documented procedure time and about half achieved adequate photodocumentation, while Spanish studies report sufficient photodocumentation in only 35-70% of cases [11,25,26]. Given that longer inspection time and more extensive photodocumentation are linked to better mucosal evaluation and higher lesion detection, these gaps highlight opportunities to strengthen diagnostic quality [27,28]. In contrast, adherence to established classification systems was notably high in our cohort. The Los Angeles classification was used by 97% of endoscopists—similar to Italian data and substantially higher than the rates reported in the United States (42%) [4,11]. Likewise, 95% of responders applied the Prague classification for Barrett's esophagus, exceeding the 27-60% reported in previous European and international studies [29-31]. These findings indicate strong integration of guideline-recommended classification systems into routine clinical practice in Greece. Biopsy sampling is essential for detecting and staging premalignant upper GI lesions. In our study, adherence to ESGE MAPS II biopsy recommendations was high (96.3%), comparable to other European data (92.5%) [11,32]. Regarding Barrett's esophagus, 85.9% followed the Seattle protocol, a rate higher than previous reports, which range from 49% in a meta-analysis to 80% adherence in the cohort by Wani *et al*, and up to 93.8% in a recent US multicenter study [32-35]. However, only 33% of our responders maintained a structured Barrett's registry, despite guideline recommendations.

For lower GI endoscopy, colonoscopy completion and documentation practices varied. In our cohort, 74.4% of endoscopists reported cecal intubation rates higher than 95% and another 22% higher than 90%, consistent with Greek tertiary-center data (>90%) [10]. European findings are mixed: Spada *et al* reported 94.7% completion when documented, whereas Radaelli *et al* found an overall rate of 80.7%, with only 22.1% of centers exceeding 90% [36,37]. Countries with established registries, such as the Netherlands, report rates up to 94.8% [39]. Bowel preparation quality was well documented, with 90.85% of the responders using the BBPS, similar to Italian reports (94%) [38]. Although withdrawal time was not routinely recorded, more than 90% reported that they exceed the recommended 6 min, aligning with studies demonstrating more than 6 min inspection time in 88% of cases [42]. Cecal intubation, adequate bowel preparation, and sufficient withdrawal time all correlate with higher adenoma detection, emphasizing their importance [39,40]. Systematic reporting of ADR and polyp detection rate is not yet routine in Europe. Prior studies report ADR as low as 29-34% and up to 47%, reflecting substantial variability [11,41,42]. Greek data appear more favorable, with ADR estimates of 43-54% [43,44]. In our cohort, 71.8% reported an ADR >25%, although 22.1% did not measure ADR routinely, indicating a persistent gap. Standardized lesion description is also inconsistent internationally; only 77% of endoscopists utilized a morphological system in

a large European survey, and the Paris classification was applied in just 21% of cases [36,45]. In contrast, 62.8% of our respondents used the Paris classification systematically, and 34.1% occasionally. Cold snare polypectomy for diminutive and small polyps was routinely applied by 69.5% and 68.1%, aligning with ESGE/ASGE recommendations, whereas Italian data report a lower uptake [11]. Overall, Greek endoscopists show strong adherence to recommended polypectomy and classification practices. Up to 30% of the responders did not follow surveillance guidelines, often because of limited familiarity, disagreement, concern about missed lesions, or medicolegal issues [46-48]. In our study, although most gastroenterologists were aware of the recommendations, many still advised shorter-than-recommended follow-up intervals. Adverse event documentation is also inconsistent across Europe, with over half of Italian and German endoscopists not recording complications routinely [11,49]. In our cohort, adverse events were documented in 63.6% of upper GI endoscopies and 55.6% of colonoscopies, a rate higher than in some European reports but still suboptimal. The majority of respondents (76.8% for upper GI and 70.7% for lower GI) did not routinely record patient satisfaction, consistent with European data showing monitoring rates of only 12-25% [11,32]. This gap is meaningful, since a positive procedural experience improves quality, reduces anxiety, and enhances adherence to surveillance. Notably, when patient experience was formally evaluated in Greece, the results were excellent, with over 98% of patients willing to repeat the procedure with the same endoscopist [50].

This survey provides the first national overview of endoscopy quality practices in Greece across public and private endoscopy settings. However, the relatively low response rate may have introduced selection bias, as endoscopists interested in quality improvement were more likely to participate. The absence of data on non-responders limits the assessment of representativeness (Supplementary Table 2). Furthermore, the self-reported nature of the survey data represents an important limitation, as recall bias and social desirability bias may have resulted in overestimation of actual adherence. Organizing a national registry with mandatory quality assessment would allow for better data collection prospectively and superior representativeness.

In conclusion, this national survey demonstrates considerable variability in adherence to validated endoscopy quality indicators among Greek endoscopists. While several parameters—such as the use of standardized classification systems—show satisfactory compliance, important gaps persist in documentation, registry use, complication reporting and patient-experience assessment. These findings underscore the need for coordinated national strategies, including structured training and digital reporting systems, to standardize quality recording and align practice with European quality standards, ultimately improving patient outcomes.

Summary Box

What is already known:

- International societies, such as the European Society of Gastrointestinal Endoscopy (ESGE) and the American Society for Gastrointestinal Endoscopy, have developed thorough frameworks of quality indicators for both upper and lower gastrointestinal (GI) endoscopy
- Strict compliance with these standards is associated with a reduction in post-endoscopy cancer rates and improvement in patient outcomes
- Adherence to endoscopic quality indicators varies among endoscopists, because of differences in training, facilities, equipment, and data recording systems

What the new findings are:

- This national survey provides a systematic assessment of Greek endoscopists' awareness and adherence to established quality indicators in upper and lower GI endoscopy
- Endoscopist's experience was a key determinant of adherence to quality indicators in both upper and lower GI endoscopy, with more experienced practitioners showing higher compliance with ESGE metrics
- Greek endoscopists show strong adherence to recommended polypectomy and classification practices, although consistent adenoma detection rate measurement and standardized reporting require further improvement

References

1. National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Board on Health Care Services; Board on Global Health; Committee on Improving the Quality of Health Care Globally. Crossing the Global Quality Chasm: Improving Health Care Worldwide. Washington (DC): National Academies Press (US); 2018 Aug 28.
2. Bisschops R, Rutter MD, Areia M, et al. Overcoming the barriers to dissemination and implementation of quality measures for gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and United European Gastroenterology (UEG) position statement. *Endoscopy* 2021;**53**:196-202.
3. Romańczyk M, Felińska Z, Januszewicz W. How to measure quality in upper GI endoscopy. *Best Pract Res Clin Gastroenterol* 2025;**76**:102025.
4. Areia M, Esposito G, Leclercq P, et al. Performance measures for upper gastrointestinal endoscopy: a European Society of

- Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative - Update 2025. *Endoscopy* 2025;**57**:1268-1297.
5. Nagula S, Parasa S, Laine L, Shah SC. AGA clinical practice update on high-quality upper endoscopy: expert review. *Clin Gastroenterol Hepatol* 2024;**22**:933-943.
 6. Yadlapati R, Early D, Iyer PG, et al. Quality indicators for upper GI endoscopy. *Am J Gastroenterol* 2025;**120**:290-312.
 7. Rex DK, Anderson JC, Butterly LF, et al. Quality indicators for colonoscopy. *Gastrointest Endosc* 2024;**100**:352-381.
 8. Kaminski MF, Thomas-Gibson S, Bugajski M, et al. Performance measures for lower gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative. *Endoscopy* 2017;**49**:378-397.
 9. Protopapas AA, Stournaras E, Neokosmidis G, Stogiannou D, Filippidis A, Protopapas AN. Endoscopic sedation practices of Greek gastroenterologists: a nationwide survey. *Ann Gastroenterol* 2020;**33**:366-373.
 10. Karamaroudis S, Stamou A, Vorri SC, et al. Monitoring of colonoscopy quality indicators in an academic endoscopy facility reveals adherence to international recommendations. *Ann Transl Med* 2018;**6**:263.
 11. Zagari RM, Frazzoni L, Fuccio L, et al. Adherence to European Society of Gastrointestinal Endoscopy quality performance measures for upper and lower gastrointestinal endoscopy: a nationwide survey from the Italian Society of Digestive Endoscopy. *Front Med (Lausanne)* 2022;**9**:868449.
 12. Wang Y, Huang Y, Chase RC, et al. Global burden of digestive diseases: a systematic analysis of the global burden of diseases study, 1990 to 2019. *Gastroenterology* 2023;**165**:773-783.
 13. Peery AF, Crockett SD, Murphy CC, et al. Burden and cost of gastrointestinal, liver, and pancreatic diseases in the United States: update 2018. *Gastroenterology* 2019;**156**:254-272.
 14. Jover R, Zapater P, Bujanda L, et al; COLONPREV Study Investigators. Endoscopist characteristics that influence the quality of colonoscopy. *Endoscopy* 2016;**48**:241-247.
 15. Bisschops R, Areia M, Coron E, et al. Performance measures for upper gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative. *Endoscopy* 2016;**48**:843-864.
 16. Hellenic Society of Gastroenterology. Gastro Map. Available from: <https://www.hsg.gr/gastro-map/> [Accessed 12 June 2026].
 17. Bhangu A, Bowley DM, Horner R, Baranowski E, Raman S, Karandikar S. Volume and accreditation, but not specialty, affect quality standards in colonoscopy. *Br J Surg* 2012;**99**:1436-1444.
 18. Forbes N, Boyne DJ, Mazurek MS, et al. Association between endoscopist annual procedure volume and colonoscopy quality: systematic review and meta-analysis. *Clin Gastroenterol Hepatol* 2020;**18**:2192-2208.
 19. Scaffidi MA, Walsh CM, Khan R, et al. Influence of video-based feedback on self-assessment accuracy of endoscopic skills: a randomized controlled trial. *Endosc Int Open* 2019;**7**:E678-E684.
 20. Rex DK, Hewett DG, Raghavendra M, Chalasani N. The impact of videorecording on the quality of colonoscopy performance: a pilot study. *Am J Gastroenterol* 2010;**105**:2312-2317.
 21. Madhoun MF, Tierney WM. The impact of video recording colonoscopy on adenoma detection rates. *Gastrointest Endosc* 2012;**75**:127-133.
 22. van den Broek FJ, Reitsma JB, Curvers WL, Fockens P, Dekker E. Systematic review of narrow-band imaging for the detection and differentiation of neoplastic and nonneoplastic lesions in the colon (with videos). *Gastrointest Endosc* 2009;**69**:124-135.
 23. Alcaraz Serrat JA, Córdova H, Moreira L, et al. Evaluation of long-term adherence to oesophagogastroduodenoscopy quality indicators. *Gastroenterol Hepatol* 2020;**43**:589-597.
 24. Fradkov E, Goldowsky A, Quiles K, Williams R. A quality improvement educational intervention to increase knowledge of cardiogastroenterology amongst medical trainees and nursing staff. *MedEdPORTAL* 2017;**13**:10642.
 25. Kruse FM, Stadhouers NW, Adang EM, Groenewoud S, Jeurissen PPT. Do private hospitals outperform public hospitals regarding efficiency, accessibility, and quality of care in the European Union? A literature review. *Int J Health Plann Manage* 2018;**33**:e434-e453.
 26. Córdova H, Sánchez-Montes C, Delgado-Guillena PG, et al. Quality indicators for esophagogastroduodenoscopy: a comparative study of outcomes after an improvement programme in a tertiary hospital. *Gastroenterol Hepatol* 2017;**40**:587-594.
 27. Lisboa-Gonçalves P, Libânio D, Marques-Antunes J, Dinis-Ribeiro M, Pimentel-Nunes P. Quality of reporting in upper gastrointestinal endoscopy: effect of a simple audit intervention. *GE Port J Gastroenterol* 2018;**26**:24-32.
 28. Teh JL, Tan JR, Lau LJ, et al. Longer examination time improves detection of gastric cancer during diagnostic upper gastrointestinal endoscopy. *Clin Gastroenterol Hepatol* 2015;**13**:480-487.
 29. Boys JA, Azadgoli B, Martinez M, Oh DS, Hagen JA, DeMeester SR. Adequacy of EGD reporting: a review of 100 reports from 100 endoscopists. *J Gastrointest Surg* 2021;**25**:1117-1123.
 30. Westerveld D, Khullar V, Mramba L, et al. Adherence to quality indicators and surveillance guidelines in the management of Barrett's esophagus: a retrospective analysis. *Endosc Int Open* 2018;**6**:E300-E307.
 31. Singh M, Gupta N, Gaddam S, et al. Practice patterns among U.S. gastroenterologists regarding endoscopic management of Barrett's esophagus. *Gastrointest Endosc* 2013;**78**:689-695.
 32. Dunn SJ, Neilson LJ, Hassan C, Sharma P, Guy C, Rees CJ. ESGE Survey: worldwide practice patterns amongst gastroenterologists regarding the endoscopic management of Barrett's esophagus. *Endosc Int Open* 2016;**4**:E36-E41.
 33. Pimentel-Nunes P, Libânio D, Marcos-Pinto R, et al. Management of epithelial precancerous conditions and lesions in the stomach (MAPS II): European Society of Gastrointestinal Endoscopy (ESGE), European Helicobacter and Microbiota Study Group (EHMSG), European Society of Pathology (ESP), and Sociedade Portuguesa de Endoscopia Digestiva (SPED) guideline update 2019. *Endoscopy* 2019;**51**:365-388.
 34. Roumans CAM, van der Bogt RD, Steyerberg EW, et al. Adherence to recommendations of Barrett's esophagus surveillance guidelines: a systematic review and meta-analysis. *Endoscopy* 2020;**52**:17-28.
 35. Kolb JM, Davis C, Williams JL, Holub J, Shaheen N, Wani S. Wide variability in dysplasia detection rate and adherence to Seattle protocol and surveillance recommendations in Barrett's esophagus: a population-based analysis using the GIQuIC national quality benchmarking registry. *Am J Gastroenterol* 2023;**118**:900-904.
 36. Spada C, Koulaouzidis A, Hassan C, et al. Colonoscopy quality across Europe: a report of the European Colonoscopy Quality Investigation (ECQI) Group. *Endosc Int Open* 2021;**9**:E1456-E1462.
 37. Radaelli F, Meucci G, Minoli G; Italian Association of Hospital Gastroenterologists (AIGO). Colonoscopy practice in Italy: a prospective survey on behalf of the Italian Association of Hospital Gastroenterologists. *Dig Liver Dis* 2008;**40**:897-904.
 38. Belderbos TD, Grobbee EJ, van Oijen MG, et al. Comparison of cecal intubation and adenoma detection between hospitals can provide incentives to improve quality of colonoscopy. *Endoscopy* 2015;**47**:703-709.
 39. Testoni PA, Notaristefano C, Soncini M, et al; INCIPIT (INtegrated Colonoscopy Improvement Program in Italy) group. An Italian prospective multicenter study on colonoscopy practice and quality: What has changed in the last 10 years. *Dig Liver Dis* 2023;**55**:99-106.
 40. Harewood GC, Sharma VK, de Garmo P. Impact of colonoscopy preparation quality on detection of suspected colonic neoplasia.

- Gastrointest Endosc* 2003;**58**:76-79.
41. Lee TJ, Blanks RG, Rees CJ, et al. Longer mean colonoscopy withdrawal time is associated with increased adenoma detection: evidence from the Bowel Cancer Screening Programme in England. *Endoscopy* 2013;**45**:20-26.
 42. Groza AL, Ungureanu BS, Tefas C, Miutescu B, Tanău M. Correlation between adenoma detection rate and other quality indicators, and its variability depending on factors such as sedation or indication for colonoscopy. *Front Pharmacol* 2022;**13**:1041915.
 43. Penz D, Ferlitsch A, Waldmann E, et al. Impact of adenoma detection rate on detection of advanced adenomas and endoscopic adverse events in a study of over 200,000 screening colonoscopies. *Gastrointest Endosc* 2020;**91**:135-141.
 44. Michopoulos S, Axiaris G, Baxevas P, et al. Retroflexion, a costless endoscopic maneuver, increases adenoma detection rate in the ascending colon. *Ann Gastroenterol* 2021;**34**:53-60.
 45. Paspatis GA, Tribonias G, Manolaraki MM, et al. Deep sedation compared with moderate sedation in polyp detection during colonoscopy: a randomized controlled trial. *Colorectal Dis* 2011;**13**:e137-e144.
 46. Lux TJ, Herold K, Kafetzis I, et al. Closing the gap: a critical examination of adherence, inconsistency, and improvements in colonoscopy reporting practices. *Digestion* 2024;**105**:224-231.
 47. Shapiro JA, Holub JL, Dominitz JA, Sabatino SA, Nadel MR. Colonoscopy quality measures and adherence to follow-up guidelines among endoscopists participating in a U.S. endoscopy registry. *Gastrointest Endosc* 2025;**101**:168-177.
 48. Patel N, Tong L, Ahn C, Singal AG, Gupta S. Post-polypectomy guideline adherence: importance of belief in guidelines, not guideline knowledge or fear of missed cancer. *Dig Dis Sci* 2015;**60**:2937-2945.
 49. Adler A, Lieberman D, Ainalai A, et al. Data quality of the German screening colonoscopy registry. *Endoscopy* 2013;**45**:813-818.
 50. Triantafyllou K, Gkolfakis P, Triantafyllou M, et al. Long-term patient satisfaction of gastrointestinal endoscopic procedures. *Ann Gastroenterol* 2016;**29**:188-195.

Supplementary material

Supplementary Table 1 Unweighted and weighted (for sex and geographic region) composite compliance estimates

Endoscopy	Unweighted (%)	Weighted (%)	Difference
Upper GI	53.05%	55.59%	2.54%
Lower GI	45.73%	47.28%	1.55%

GI, gastrointestinal

Supplementary Table 2 Sensitivity analyses to assess the potential impact of non-response bias on the composite compliance estimates. HSG members: 668, respondents: 164

Scenario	Upper GI compliance	Lower GI compliance
Observed (respondents only, n=164)	53.05%	45.73%
Best case (100% non-respondents compliant)	88.47%	86.67%
Worst case (0% non-respondents compliant)	13.02%	11.23%
Conservative (50% of the observed rate among non-respondents)	33.04%	28.48%

HSG, Hellenic Society of Gastroenterology; GI, gastrointestinal