

ORIGINAL ARTICLE

Endoscopic retrograde cholangiopancreatography training conditions, results from a pan-European survey: Between vision and reality

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Abstract

Background: Endoscopic retrograde cholangiopancreatography (ERCP) still has a relatively high complication rate, underscoring the importance of high-quality training. Despite existing guidelines, real-world data on training conditions remain limited. This pan-European survey aims to systematically explore the perceptions surrounding ERCP training.

Methods: A survey was distributed through the friends of United European Gastroenterology (UEG) Young Talent Group network to physicians working in a UEG member or associated states who regularly performed ERCPs.

Results: Of 1035 respondents from 35 countries, 649 were eligible for analysis: 228 trainees, 225 trainers, and 196 individuals who regularly performed ERCP but were neither trainees nor trainers. The mean age was 43 years, with 72.1% identifying as male, 27.6% as female, and 0.3% as non-binary. The majority (80.1%) agreed that a structured training regimen is desirable. However, only 13.7% of trainees and 28.4% of trainers reported having such a structured program in their institutions. Most

Karim Hamesch, Oscar Cahyadi, Sophie Schlosser, and Jonas Jaromir Staudacher contributed equally to this work.

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respondents (79.7%) supported the concept of concentrating training in centers meeting specific quality metrics, with 64.1% suggesting a threshold of 200 annual ERCPs as a prerequisite. This threshold revealed that 36.4% of trainees pursued training in lower-volume centers performing <200 ERCPs annually. As many as 70.1% of trainees performed <50 annual ERCPs, whereas only 5.0% of trainers performed <50 ERCPs annually. A low individual trainee caseload (<50 ERCPs annually) was more common in lower-volume centers than in higher-volume centers (82.9% vs. 63.4%).

Conclusions: The first pan-European survey investigating ERCP training conditions reveals strong support for structured training and the concentration of training efforts within centers meeting specific quality metrics. Furthermore, this survey exposes the low availability of structured training programs with many trainees practicing at lower-volume centers and 71% of all trainees having little hands-on exposure. These data should motivate to standardize ERCP training conditions further and ultimately improve patient care throughout Europe.

KEYWORDS

advanced endoscopy training, complications, endoscopic quality improvement, endoscopy education, ERCP training, guidelines, performance measures, real-world, structured training, training measures

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) is the primary endoscopic procedure for the therapy of pancreaticobiliary pathologies, which includes pancreaticobiliary stones and malignant or benign strictures of the biliary tree and pancreatic duct. Despite technological advancements and widespread use, ERCP remains associated with one of the highest risks of adverse events (AE) and mortality among endoscopic procedures.^{1,2}

Success and AE rates are influenced by patient and procedural characteristics as well as operator's skills.^{3,4} This underscores the critical need for high-quality training to ensure patient safety and ultimately improve patient outcomes. Existing data on ERCP training often originate from high-volume centers, potentially introducing bias.⁵ Moreover, since ERCP caseloads dropped due to a rapid decline of diagnostic ERCPs, an increasing number of centers encounter the challenge of having fewer but more complex ERCPs for a similar number of trainees.⁶ In an appropriate setting, trainee involvement in ERCP is safe and not associated with increased AE.^{7,8} While structured courses may boost trainee confidence, their impact on procedural outcomes remains unclear.⁹ Different recommendations on preferred training conditions in ERCP exist, for example, from the European Society for Gastrointestinal Endoscopy (ESGE),¹⁰ the U.K. Joint Advisory Group,¹¹ and the American Society for Gastrointestinal Endoscopy.¹² These statements support the importance of structured training and recommend meeting indirect quality metrics, such as a specific number of ERCPs or a native papilla cannulation rate before independent practice. Competency in ERCP is often defined as a native papilla cannulation rate $\geq 90\%$, which typically would be achieved after

at least 200–300 procedures.^{10–12} However, it is crucial to acknowledge an inter-individual difference in the number of procedures needed to reach competency. Despite their relatively low quality of evidence, these statements are important as they provide a goal to be achieved during ERCP training. Furthermore, real-world data regarding ERCP training conditions and adherence are scarce despite existing guidelines. Hence, this pan-European survey aims to provide real-world evidence by exploring perceptions of ERCP training conditions from both trainees and trainers across all United European Gastroenterology (UEG) member states for the first time.

METHODS

Survey creation and pretest

A survey on ERCP training conditions consisting of 55 items, branching depending on response path, was drafted by members of the JUGA Study group, the working group “Young Gastroenterology” of the German Society for Gastroenterology, Digestive and Metabolic Diseases (DGVS). The survey was pretested initially in the JUGA study group and subsequently tested through the network of the friends of Young Talent Group (YTG) of the UEG.

Survey circulation and inclusion criteria

From 30 May to 1 August 2023, an anonymized online survey using the data secure web tool SoSciSurvey in English was accessible. The

Friends of YTG distributed the survey link to all national societies. The questions included Likert scales (scale from 1 to 5) as well as single- and multiple-choice questions. Likert-scale questions were designed as 1 = absolutely not agree, 2 = not agree, 3 = neutral, 4 = agree, and 5 = absolutely agree. Inclusion criteria for survey participation were being a physician with a current employment in a UEG member state or in a UEG-associated state and ongoing regular ERCP practice.

Ethical approval and statistical analysis

Details are given in the supplement.

RESULTS

Characterization of participants

In total, 649 out of 1035 respondents were eligible for analysis. Two hundred and twenty-eight were identified as trainees (35.1%), 225 as trainers (34.7%), and 196 regularly performed ERCPs without being in either category (30.2%; Table 1). The participants were from 35 European and North African countries (Figure S1, Table S1). The mean age of all subjects was 43.0 ± 10.2 years, with 72.1% identifying as male, 27.6% as female, and 0.3% as non-binary (Table 1). Trainees had a mean age of 37.5 ± 5.0 years, trainers of 49.6 ± 10.3 years, and ERCPists, who were neither trainees nor trainers, of 44.9 ± 10.6 years. Regarding gender distribution, 41.2% of trainees were female, while 19.6% of trainers and 20.4% of participants who were neither trainees nor trainers were female. Most participants, especially trainers, worked at university hospitals (45.5%) and in higher-volume centers (68.9%), defined by >200 ERCPs annually (the threshold defining a higher- or lower-volume center varies in the literature). A commonly found threshold is 200 procedures/year, which we used here.¹³ Most trainees were residents in training for gastroenterology (39.5%), and most trainers were consultants (58.7%). On average, participants performed endoscopy for 12.7 years and conducted ERCPs for 9.7 years. Most trainees began training after 2020 (79.4%; 181/228 trainees) with 20 trainees who began their training in 2020 (8.8%), 37 in 2021 (16.2%), 82 in 2022 (36.0%), and 42 in 2023 (18.4%).

Characterization of centers

Using the threshold of 200 annual ERCPs, centers were divided into lower- and higher-volume centers. Fewer females worked at higher-volume compared to lower-volume centers (Table 2). There was no significant difference between higher- and lower-volume centers regarding the age of commencing endoscopy and ERCP training. On average, participants began endoscopy training at $31.2 (\pm 4.7)$ years and continued with ERCP training at $34.2 (\pm 4.6)$ years.

Key summary

Summarize the established knowledge on this subject

- Multiple guidelines exist regarding optimal training conditions of ERCPs.
- European endoscopists have not systematically analyzed real-world data on actual training conditions and adherence to guideline recommendations.

What are the significant and/or new findings of this study?

There is a misalignment between vision and reality in ERCP training in Europe:

- **Few Structured ERCP Training Programs:** The first pan-European study with 649 participants from 35 countries revealed that 71.2% of trainees reported a lack of structured ERCP training, indicating widespread issues in implementing structured training programs despite official guidelines.
- **Low Rates of Quality Tracking:** 79.9% of participants favored concentrating ERCP training on centers meeting quality metrics. However, most institutions do not track and provide feedback on quality indicators such as cannulation rates, serious adverse events (AE), and mortality, which are crucial for ensuring optimal care and reducing complications.
- **Centralization Desired:** Two-thirds of trainers recommend at least 200 ERCPs per year as a quality indicator, but 36.4% of trainees pursued training in lower-volume centers with <200 annual ERCPs.
- **Trainee Caseload Discrepancy:** While 95% of trainers reported performing ≥ 50 ERCPs annually, 70.9% of trainees performed <50 ERCPs, rising to 82.3% at lower-volume centers. This rate suggests that the current training exposure is insufficient for trainees to reach the recommended 200–300 ERCPs before working independently.

Higher-volume centers had more physicians (3.7 vs. 2.5) and trainees (2.5 vs. 1.7) performing ERCP at their institutions than lower-volume centers. There was no relevant difference in the time participants from higher-volume and lower-volume centers performed basic endoscopies and ERCPs.

Demand for institutional quality indicators and current practice

Most participants (79.9%) agreed that ERCP training should be concentrated at centers meeting specific quality metrics (Figure 1a). However, individual quality indicators concerning ERCP

TABLE 1 Characteristics of survey participants.

		Overall	Trainee	Trainer	Neither ^a
N (%)		649	228 (35.1)	225 (34.7)	196 (30.2)
Gender	Female	178 (27.6)	94 (41.2)	44 (19.5)	40 (20.4)
	Male	464 (72.1)	132 (57.9)	179 (79.6)	153 (78.0)
Age		43.0 (10.2)	37.5 (5)	49.6 (10.3)	44.9 (10.6)
Main place of work	Primary provider	62 (9.6)	26 (11.4)	9 (4.0)	27 (13.8)
	Secondary provider	129 (19.9)	46 (20.2)	38 (16.9)	45 (23.0)
	Tertiary provider	133 (20.5)	44 (19.3)	37 (16.4)	52 (26.5)
	University hospital	295 (45.5)	106 (46.5)	132 (58.7)	57 (29.0)
	Privat practice	19 (2.9)	0 (0)	9 (4.0)	12 (6.1)
Center volume	Higher-volume (>200 annual ERCPs)	436 (68.9)	137 (60.1)	187 (83.1)	112 (57.1)
	Lower-volume (≤200 annual ERCPs)	197 (31.1)	83 (36.4)	35 (15.6)	79 (40.3)
Current position	Resident/in training for gastroenterology	101 (15.5)	90 (39.5)	2 (0.9)	9 (4.6)
	Board certified gastroenterologist	153 (23.6)	74 (32.5)	29 (12.9)	50 (25.5)
	Consultant/attending/senior physician	245 (37.8)	52 (22.8)	100 (58.7)	93 (47.4)
	Chief of department/chief of endoscopy	126 (19.4)	9 (3.9)	87 (38.7)	30 (15.3)
	Private practice	17 (2.6)	0 (0)	6 (2.7)	11 (5.6)
Time of performing endoscopy (years)		12.7 (9.9)	6.3 (3.9)	18.5 (10)	13.6 (10.3)
Time of performing ERCP (years)		9.7 (9.7)	3.1 (2.5)	15.6 (9.9)	10.6 (10.0)

Note: Absolute frequency (relative frequency) for categorical variables, mean value (standard deviation) for metric variables.

Abbreviation: ERCP, endoscopic retrograde cholangiopancreatography.

^aERCPists not involved in training (neither trainer nor trainee).

are tracked and regularly discussed in less than half of the institutions. There were more trainers that reported regular tracking of their quality indicators than trainees (130 vs. 72) and more trainees than trainers, who did not state regular tracking (115 vs. 69).

The trainers agreed that the most important institutional quality indicator for ERCP training was the successful cannulation rate (80.0%) (Figure 2a). However, the papillary cannulation rate is tracked in less than 50% of higher-volume centers and even fewer lower-volume centers.

Following the papillary cannulation rate, 66.2% of the trainers recommend the number of annual ERCP procedures as a quality indicator (Figure 2a). Most participants (64.1%) considered 200 ERCPs annually as appropriate, which is a broadly recommended threshold (Figure 1b). Most respondents from higher-volume centers recommended an annual number of 201–300 ERCPs as a prerequisite for centers to offer ERCP training, whereas respondents from lower-volume centers predominately stated 151–200 annual ERCPs. However, in reality, most centers perform between 201 and 300 ERCPs per year. Despite this, more than one-quarter of trainees (27.3%) are trained at centers with <150 ERCPs annually, and more than a third (36.4%) at centers with <200 annual ERCPs. Trainers tended to propose higher volumes per center. For instance, 62.4% of trainees stated that at least 200 annual ERCPs should be a

prerequisite, while 71.6% of trainers did so. ERCPists not involved in training showed a comparable distribution as trainers, with 71.6% stating that >200 annual ERCPs was a suitable threshold.

A history of successful training was seen as a prerequisite for offering ERCP training, which most trainers defined as more than two ERCP trainees finishing their ERCP training in the last 5 years at an institution (Figure 1c). Respondents from higher-volume centers reported a mean number of 2.5 trainees currently trained at their institution, and from lower-volume centers, a mean number of 1.7 trainees.

23.3% of the trainers recommended an AE rate at ERCP training centers of below 10%. 45.0% of the trainers even proposed an even lower AE rate of 5%. Almost two-thirds of the trainers believe post-ERCP pancreatitis (PEP) should also be recorded as a quality indicator (Figure 2a). There is less agreement regarding perforation (31.6%), post-ERCP bleeding (28.9%), and mortality (28.4%). These specific AEs are not tracked in most higher-volume and lower-volume centers.

Structured ERCP training and self-assessment

80.1% of all participants stated that structured training for ERCP (e.g., based on the ESGE curriculum) is desirable or very desirable

TABLE 2 Characteristics of survey participants from ERCP centers with higher and lower volumes.

		Overall	Higher-volume (>200 annual ERCPs)	Lower-volume (≤200 annual ERCPs)
N (%)		649	436 (68.9)	197 (31.1)
Gender	Female	178 (27.6)	112 (25.7)	61 (31.0)
	Male	464 (72.1)	320 (73.4)	134 (68.0)
Age		43.0 (10.2)	44.1 (10.0)	43.7 (10.6)
Age of starting endoscopy training		31.2 (4.7)	30.9 (4.5)	31.6 (4.8)
Age of starting ERCP training		34.2 (4.6)	34.0 (4.5)	34.7 (4.5)
Current position	Resident/in training for gastroenterology	101 (15.7)	69 (15.8)	25 (12.7)
	Board certified gastroenterologist	153 (23.8)	98 (22.5)	52 (26.4)
	Consultant/attending/senior physician	245 (38.2)	170 (39.0)	71 (36.0)
	Chief of department/chief of endoscopy	126 (19.6)	90 (20.6)	35 (17.8)
	Private practice	17 (2.6)	6 (1.4)	10 (5.1)
Number of physicians performing ERCP at the institution		4.17 (1.4)	3.7 (1.4)	2.5 (1.2)
Number of trainees for ERCP training at the institution		2.4 (1.6)	2.5 (1.5)	1.7 (1.0)
Main place of work	Primary provider	62 (9.7)	25 (5.7)	35 (17.8)
	Secondary provider	129 (20.2)	56 (12.8)	71 (36.0)
	Tertiary provider	133 (20.9)	98 (22.5)	34 (17.3)
	University hospital	295 (46.2)	245 (56.2)	42 (21.3)
	Private practice	19 (3.0)	7 (1.6)	11 (5.6)
Time of performing endoscopy (years)		12.7 (9.9)	13.1 (9.7)	12.1 (10.5)
Time of performing ERCP (years)		9.7 (9.7)	10.1 (9.6)	9.0 (10.0)
Individual quality metrics tracked	No	269 (44.2)	173 (39.7)	90 (45.7)
	Unsure	59 (9.7)	33 (7.6)	23 (11.7)
	Yes	280 (46.1)	203 (46.6)	72 (36.5)
Structured ERCP training	No	414 (64.5)	272 (62.4)	136 (69.0)
	Unsure	102 (15.9)	65 (14.9)	33 (16.8)
	Yes	125 (19.5)	95 (21.8)	26 (13.2)
Mandatory self-assessment	No	524 (84.9)	311 (71.3)	152
	Unsure	48 (7.8)	17 (3.9)	7
	Yes	45 (7.3)	105 (25.3)	37
Moved to train ERCP	Yes	204 (31.5)	128 (29.4)	70 (35.6)

Note: Absolute frequency (relative frequency) for categorical variables, mean value (standard deviation) for metric variables.

Abbreviation: ERCP, endoscopic retrograde cholangiopancreatography.

(Figure 3a). In contrast, only 13.7% of trainees and 28.4% of trainers report working in an institution that offers structured ERCP training (Figure S2). This aligns with 71.2% of trainees, who stated that no structured ERCP training is offered at their workplace.

In most centers, mandatory courses (e.g., theoretical courses and/or hands-on training) in ERCP are not part of the training (higher-volume centers: 77.6%, lower-volume-centers: 71.8%). When courses are mandatory, mainly courses at external institutions or providers would be requested (Figure 3b). In 42.9% of the mandatory

courses, the required hours of course time are not defined. When necessary, the course time is mostly between 11 and 50 h (Figure 3c).

Most respondents (75.5%) report that a mandatory competency level in gastroscopy or colonoscopy training is required and mainly certified by the trainer (Figure S3). Most respondents from higher-volume centers needed between 501 and 1000 gastroscopies and between 201 and 300 colonoscopies, and those from lower-volume centers needed significantly less between 151 and 200 gastroscopies and between 151 and 200 colonoscopies.

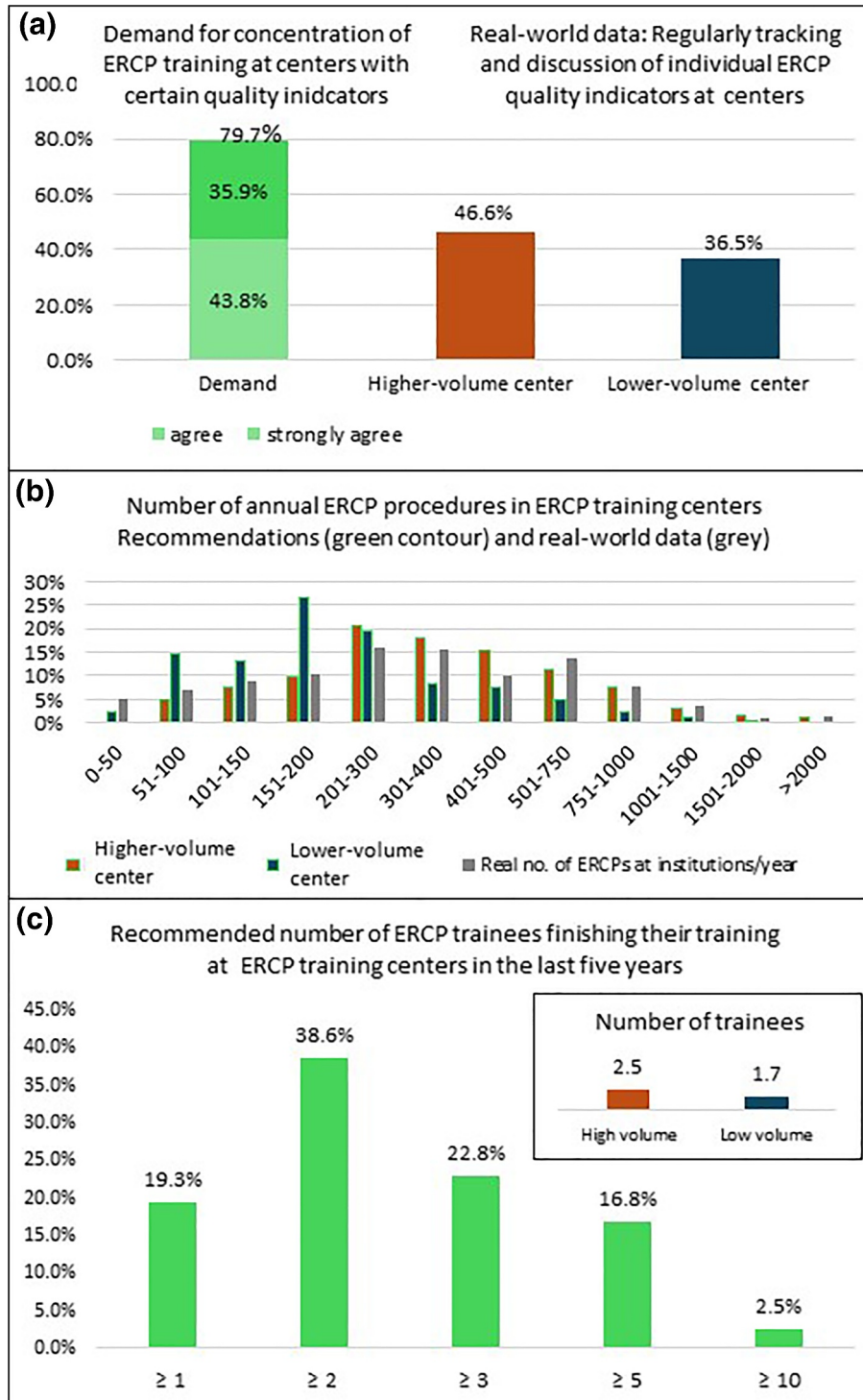


FIGURE 1 Concentration and volume quality indicators at ERCP training institutions. (a) Overall demand for the concentration of ERCP training at centers with specific quality indicators (79.7%) with the actual adoption rates for individually tracked quality indicator rates at higher- and lower-volume centers. (b) Overall demand for a minimum number of annual procedures for ERCP training centers in the perceptions of respondents from higher- and lower-volume centers with the actual annual ERCP rates at institutions/year. (c) Distribution of the demand of number of trainees finishing their training at a specific institution in the last 5 years in the opinion of the trainers and the real number of current trainees at higher- and lower-volume centers. ERCP, endoscopic retrograde cholangiopancreatography.

Training conditions: Perceptions and current practice

When trainers were asked about individual quality indicators, there was even more agreement (87.1%) than with the institutional quality

indicators that the papillary cannulation rate validates ERCP quality (Figure 4a). In the opinion of most trainers, regardless of centers' volume, a trainee should achieve a minimum native papilla cannulation rate of >80% before practicing independently (Figure 4b). In the

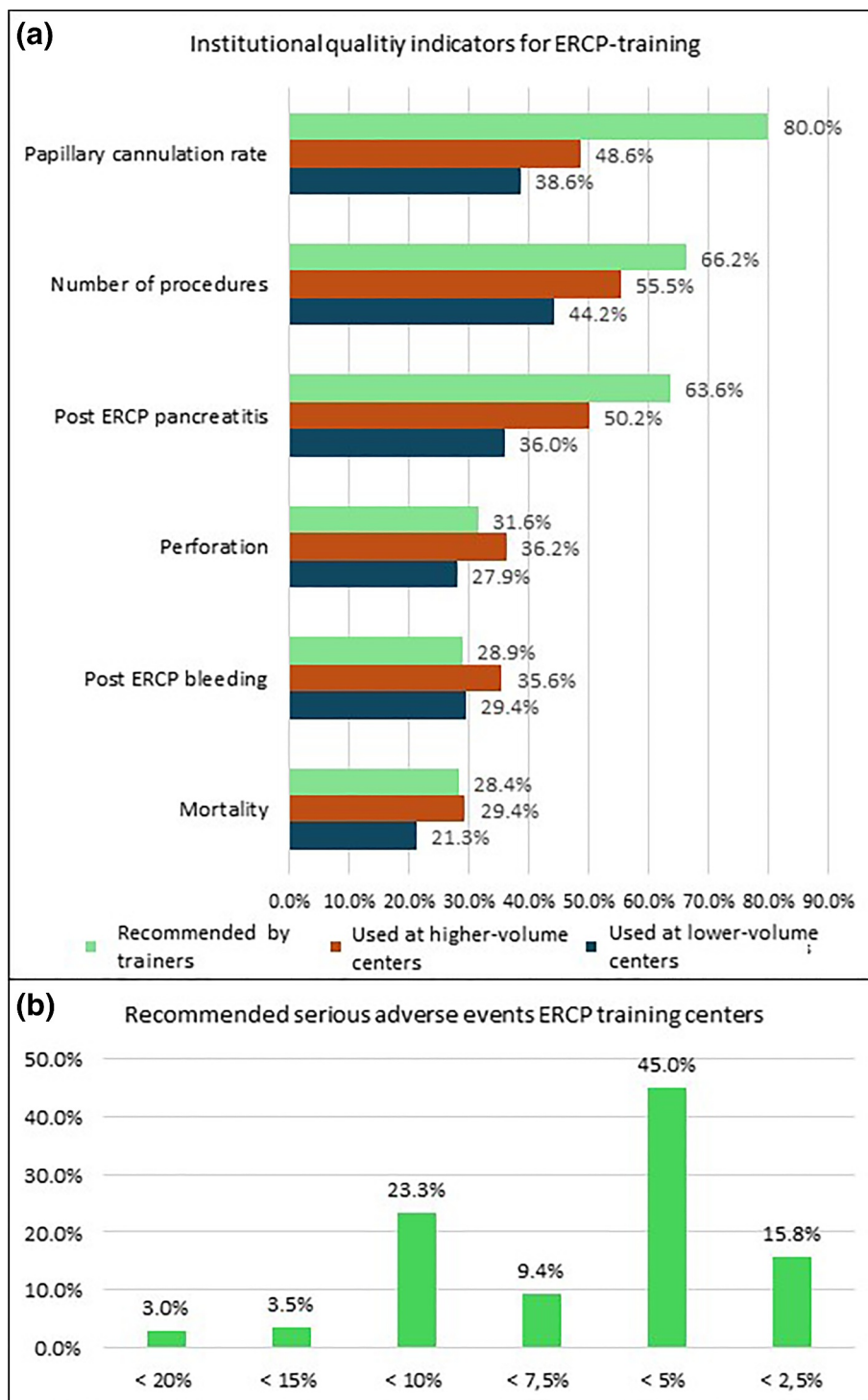


FIGURE 2 Institutional quality indicators for ERCP training institutions. (a) Institutional quality indicators for ERCP training recommended by trainers (in green) and adoption rate at higher- and lower-volume centers. Differences between adoption rates at higher- and lower-volume centers for papillary cannulation rates, number of procedures, post-ERCP pancreatitis, perforation, post-ERCP bleeding, and mortality. (b) Distribution of demand for the maximum rate of AE at a specific institution in the opinion of trainers. AE, adverse events; ERCP, endoscopic retrograde cholangiopancreatography.

opinion of most trainers, trainers should allow their trainees at least three to four cannulation attempts before intervening during ERCP (Figure 4c). Considering the published recommendation of around five cannulation approaches,¹⁴ only one-third of trainers shared that opinion.

The number of procedures (56.4%) and overall AE (57.0%) were not seen as relevant quality indicators for individuals according to the trainers (Figure 4a). Most respondents, regardless of center's volume, recommend that a trainee should perform at least 100 supervised procedures before practicing independently (Figure 5a).

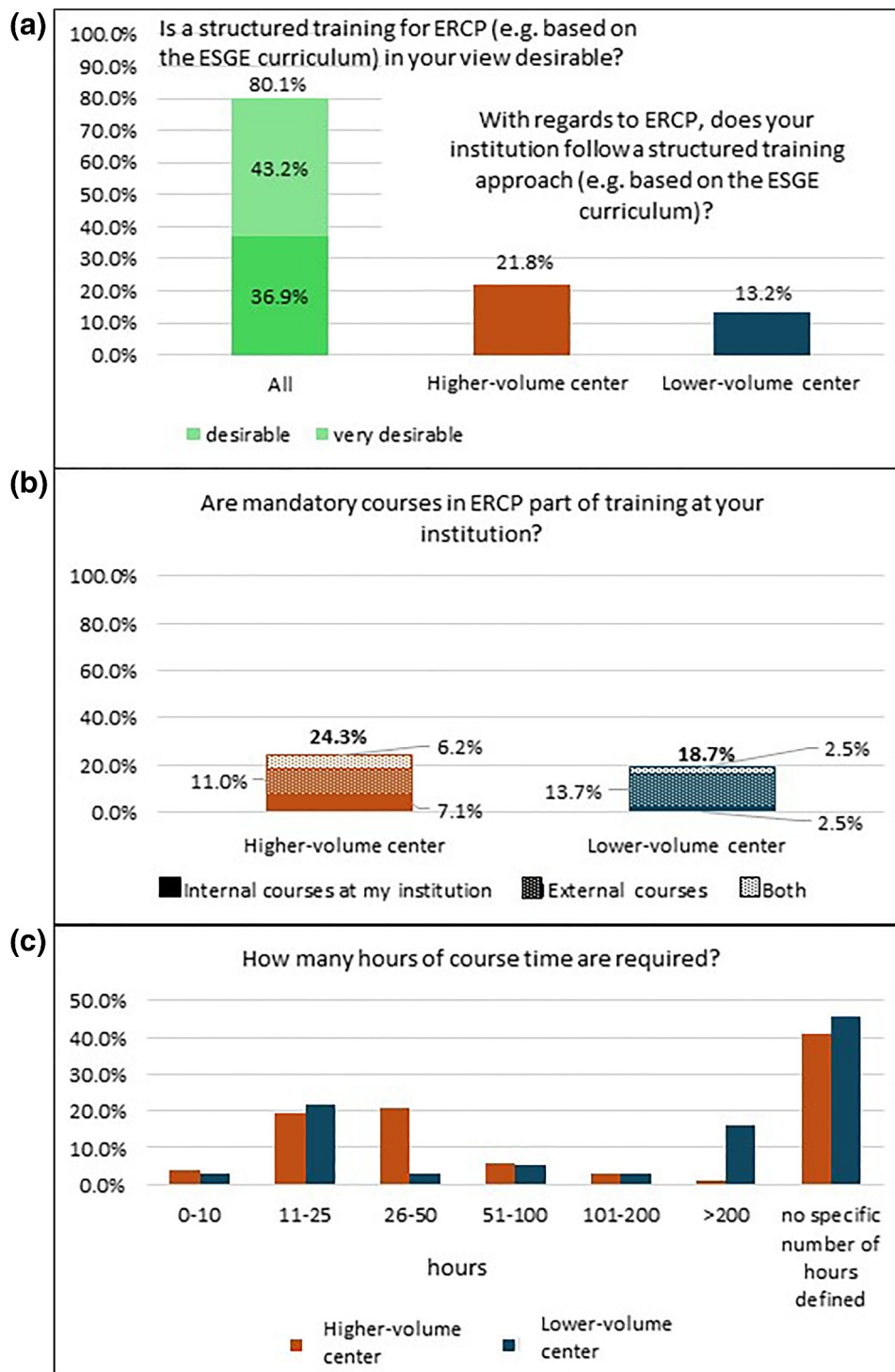


FIGURE 3 Demand and current practice for structured ERCP training. (a) Overall demand for structured ERCP training (80.1% of all respondents) with the actual adoption rates at higher- and lower-volume centers. (b) Inclusion and kind of mandatory ERCP courses by center volume. (c) Distribution of required courses for ERCP training. ERCP, endoscopic retrograde cholangiopancreatography; ESGE, European Society for Gastrointestinal Endoscopy.

There was a relatively low agreement with the two in the guidelines recommended cut-offs of 200 supervised ERCPs (14.2%) or 300 supervised ERCPs (6.2%). Trainees at higher-volume centers mostly performed 151–200 ERCPs per year compared to 0–50 ERCPs per

year performed by trainees at lower-volume centers (Figure 5c). In line with this, 82.9% of trainees at lower-volume centers performed less than 50 ERCPs annually compared to 63.4% at higher-volume centers. Trainers at higher-volume centers mostly performed

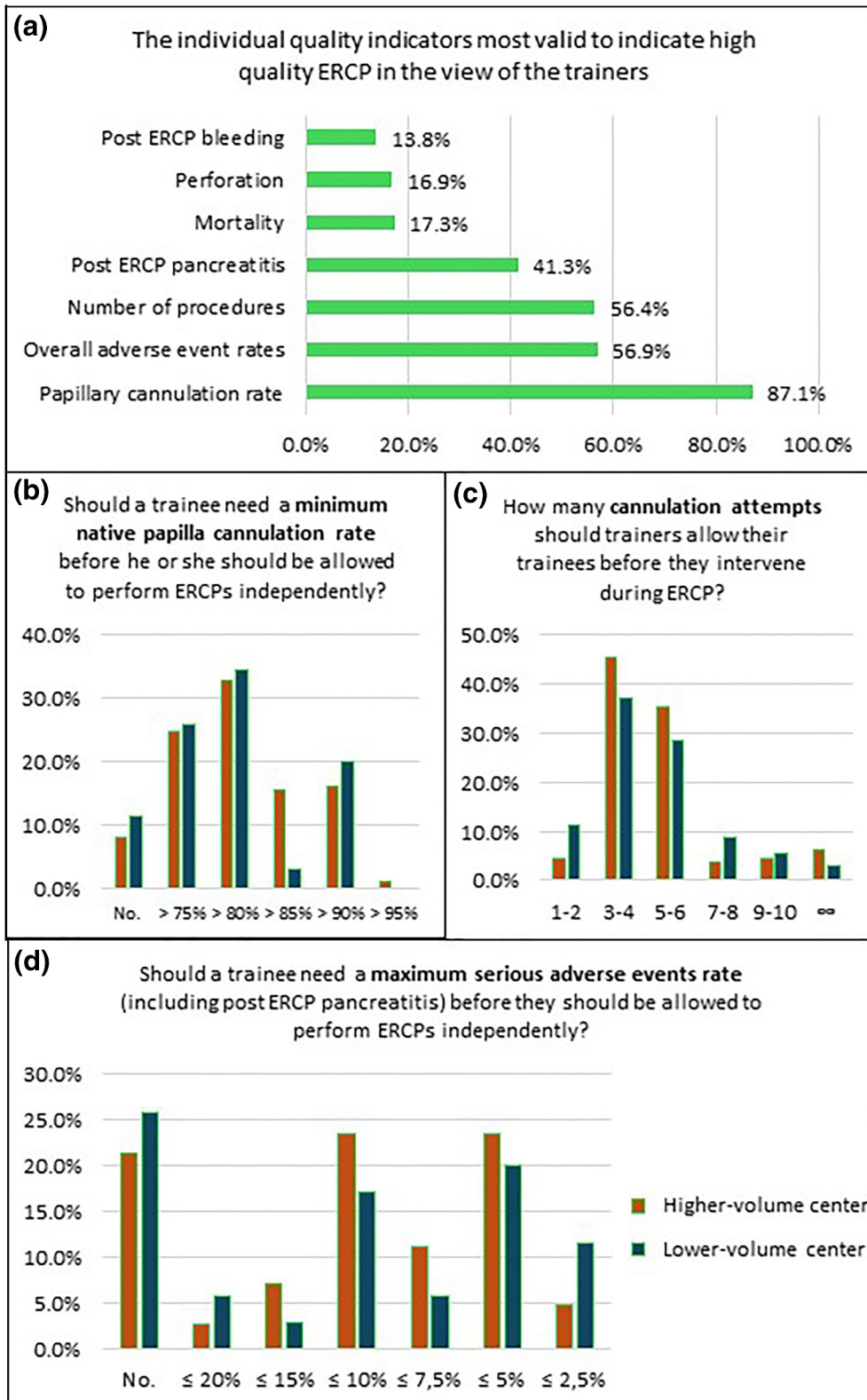


FIGURE 4 Assessment of ERCP training and performance standards. (a) Rates of individual quality indicators are most valid in indicating high-quality ERCP in the opinion of trainers. (b) Distribution of a minimum native papilla cannulation rate before a trainee should be allowed to perform ERCP independently in the opinion of trainers from higher- and lower-volume centers. (c) Distribution of the number of cannulation attempts trainers should allow their training before they intervene in the opinion of trainers from higher- and lower-volume centers. (d) Distribution of a maximum AE before a trainee should be allowed to perform ERCP independently in the opinion of trainers from higher- and lower-volume centers. AE, adverse events; ERCP, endoscopic retrograde cholangiopancreatography.

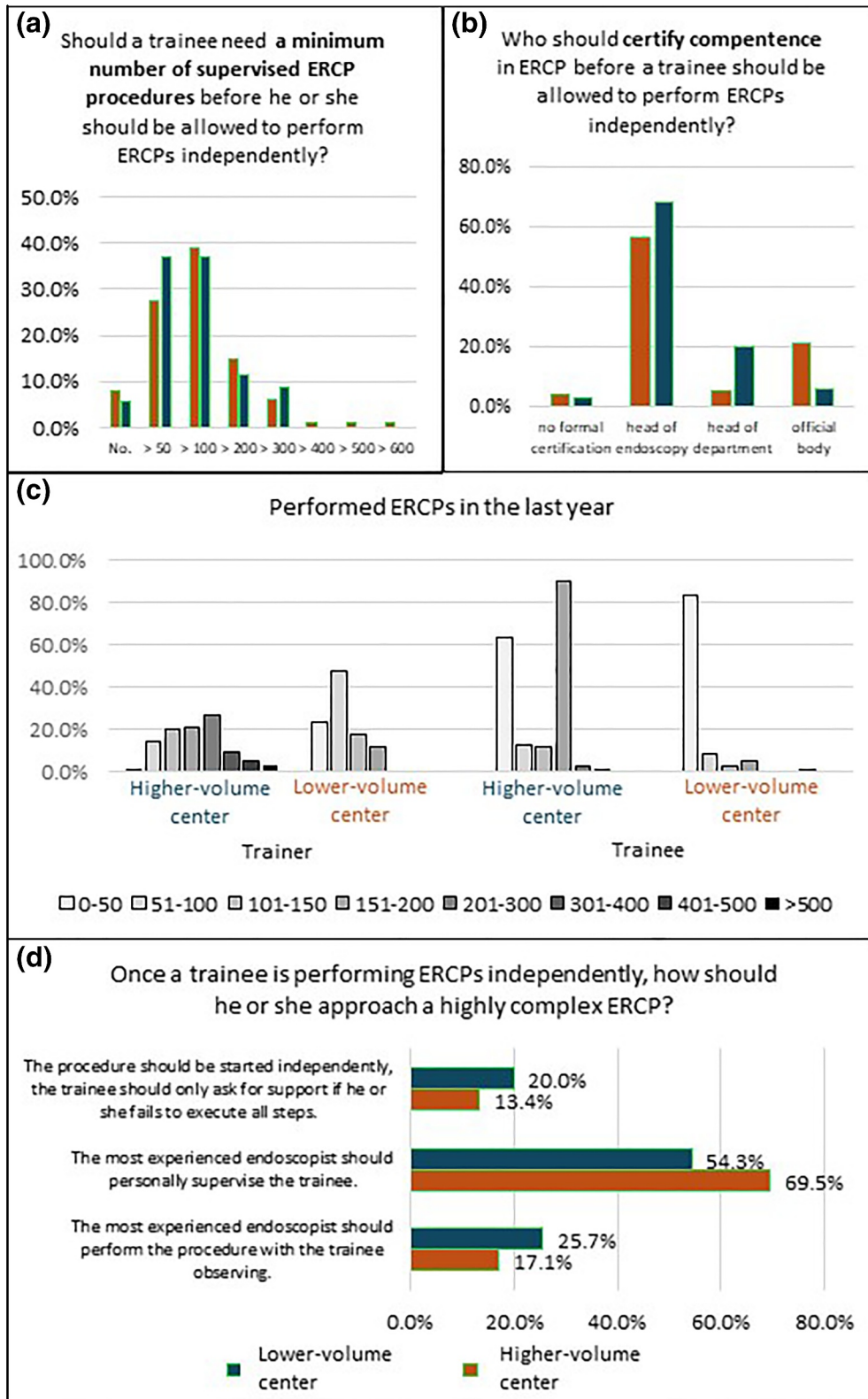


FIGURE 5 Trainer perspectives on ERCP training criteria and competency certification. (a) Minimum number of ERCP procedures a trainee should be supervised in the opinion of the trainers at higher- and lower-volume centers. (b) Distribution of the kind of competence certification in ERCP a trainee, should receive to be allowed to perform ERCPs independently in the opinion of the trainers from higher- and lower-volume centers. (c) Actual number of ERCPs performed in the last year by trainers and trainees of higher- and lower-volume centers. (d) Preferred approach in the opinion of trainers from higher- and lower-volume centers on how trainers and trainees should manage a highly complex ERCP. ERCP, endoscopic retrograde cholangiopancreatography.

between 201 and 300 ERCPs per year, and at lower-volume centers, 51–100 ERCPs per year.

Most trainers from both higher-volume (23.5%) and lower-volume centers (17.1%) support an overall threshold of AE rate of less than 10%, with nearly a quarter (higher-volume: 23.5%; lower-volume: 20.0%) advocating for a threshold of even below 5% (Figure 4d). Nevertheless, a significant portion of trainers (higher-volume center: 21.4%; lower-volume center: 25.7%) would not set a specific cut-off for AE for trainees.

Most trainers believed that ERCP competence should be certified by the head of endoscopy (higher-volume center: 56.7%, lower-volume center 68.6%) (Figure 5b). 20.9% of trainers from higher-volume centers even advocated for certification by an official body.

Once a trainee is performing ERCPs independently, the majority of trainers recommended that the most experienced endoscopist should personally supervise the trainee when approaching a highly complex ERCP rather than the trainee starting the procedure independently or having the most experienced endoscopist perform the procedure (Figure 5d).

Almost one-third (31.4%) had to move to other institutions to pursue their training, with a slightly higher proportion in lower versus higher volume centers (35.5% vs. 29.4%). The most common reasons were a lack of training opportunities at their initial institution (24.1%) (Figure S4), insufficient number of ERCP procedures (18.4%), and no ERCP training program available (15.1%). 13.2% stated that they moved due to a lack of individual support.

DISCUSSION

This is the first pan-European study investigating real-world ERCP training conditions with 649 participants across 35 countries. The majority of trainees (71%) reported the absence of structured ERCP training despite the high desire for it and this was observed in both lower- and higher-volume centers, irrespective of geographical location. These numbers were even lower than those reported in a recent study which found formal curricula in 53.7% of centers.¹⁵ This finding could be explained by the bias of only surveying 71 physicians at high-volume centers from 18 European countries compared with our survey, which was broadly distributed to all ERCPists. This finding suggests that despite existing official guidelines in some countries, implementation of structured ERCP training in most training centers in Europe has not been successful so far. Exploring the reasons for the low rates of available structured training is important to identify solutions, which can be used to establish standardized structured training. A discussion across European national societies can help facilitate an obligation to implement structured curricula in most centers.

ERCP is a procedure that carries potentially life-threatening risks. Therefore, monitoring quality indicators is crucial as recommended by the guidelines to ensure optimal care, reduce AE, and enhance healthcare quality.¹⁶ This survey revealed that the majority supported a concentration of ERCP training in centers fulfilling certain quality

metrics. However, most institutions do not track quality indicators or discuss these with endoscopists regularly. Most trainers agreed that the cannulation rate is the most important quality indicator for ERCP training. Nevertheless, this is not monitored routinely. The monitoring rates for other quality indicators, such as AE, PEP, perforation, post-ERCP bleeding, and mortality, are even lower. Whether quality assurance programs such as benchmarking could be implemented to enhance quality management should be discussed, since this would ultimately lead to the best possible patient care.

Two-thirds of trainers recommend the annual ERCP caseload as a quality indicator, with the predominant recommendation that training centers should perform at least 200 annual ERCPs. In contrast, more than a third of trainees are trained at centers with <200 annual ERCPs. Of note, as many as 71% of trainees perform <50 annual ERCPs. The low trainee caseload aligns with the study of Campos et al., which also showed low hands-on exposure of trainees.¹⁵ In their study at high-volume centers with more than 500 annual ERCP procedures, no trainee performed <50 annual ERCPs, highlighting the difference in caseload between lower versus higher volume centers. Current guidelines recommend 200–300 ERCPs before commencing independent ERCP practice, which agreed by the majority of both trainees and trainers. However, if the training of the trainees with <50 annual ERCPs continues at the same pace, these trainees would need at least 6 years to achieve the proposed ESGE threshold (300 ERCPs). Only a minority of 7.0%, who performed >300 annual ERCPs finished their training within 1 year, which is the average duration for an advanced endoscopy fellowship in many countries.

Most trainees began training after 2020 (79.4%; 181/228 trainees). We could not exclude the fact that the COVID-19 pandemic has negatively influenced the trainee involvement of ERCP during the studied time period due to a dramatic decrease of up to 80% in endoscopic service during the COVID-19 era.¹⁷ Moreover, an international survey on training in gastroenterology reported a decreased number of endoscopy procedures performed by trainees in general.¹⁸

The data offer arguments for centralization, which appears to be a feasible way to maintain high quality and enable resources for structured training in line with guideline recommendations.^{19,20} A vital prerequisite is standardized reports of quality metrics to assess the performance of a center and the individual ERCPist.²¹ A possible tool for focusing on the “right centers” is a nationwide or even Europe-wide registry. Such registry would enable ERCPists to keep track on their caseload and, if a minimum caseload is required, to maintain certification.²² Another possibility for allocating resources would be classifying elective ERCP procedures according to their complexity level (e.g., utilizing the Schutz scale).²³ Following this classification, lower-volume centers would perform only/mainly less complex procedures and higher volume-centers would focus on more complex procedures. This approach may enable lower-volume centers to offer more training possibilities in less complex ERCPs (e.g., Schutz scale I, which should be performed independently by every trainee). In terms of training in advanced ERCPs, most complex procedures (e.g., hilar strictures, ampullectomy, pancreatic

interventions, or altered anatomy) are usually elective and non-urgent, enabling logistic preparations to be made for physicians wanting to learn such procedures. Another way to enable high-quality training may be rotations to higher-volume centers where trainees are supervised by experienced ERCPists. Another discussion point would be whether such complex procedures should only be learned by physicians pursuing a long-term career path at higher-volume centers, as these are not common and require more time to achieve competency. Taken together, from our point of view, the concentration of complex procedures in higher-volume centers may lead to the betterment of both, patient care and training.

Several limitations should be considered when interpreting this study's results. Firstly, due to the nature of the circulation of this survey, we cannot adequately calculate response rates, which are presumably relatively low. Reasons for non-participation are a matter of speculation, and the distribution of emails to national societies has varied. Therefore, response bias, inherent to survey research, is a limitation of this study. Secondly, as respondents could have been easily identified by trainee status and center, we decided against asking for the center of respondents due to privacy concerns, as we assumed that trainees would not respond due to fear of repercussions. This decision hampers us from connecting respondents working at the same institution and limits the possibility of discerning if differing responses from trainers and trainees are due to selection bias. Thirdly, the survey was explicitly created for this study and did not use validated tools to assess competency or training satisfaction. However, the results are coherent and come from a decent number of participants. Furthermore, the threshold of 200 ERCP to define higher- and lower-volume center is somewhat arbitrary. Considering the available evidence, this is the most commonly used cut-off in the literature. A recent meta-analysis indicated that using a specified cut-off for center volume leads to lower heterogeneity between studies, or more generally said, increased the reproducibility of findings.¹³

As the landscape of ERCP training in Europe is heterogeneous, we performed a two-tiered international pretest within the YTG network to make sure that our survey is suitable to capture training conditions in most institutions and countries. Still, some items in our survey probably do not fit the local circumstances of some respondents perfectly. Fourth, as there is hardly any evidence on the best way to teach ERCP (e.g., how to deconstruct procedural steps, the value of train-the-trainer courses or telemedical mentoring/proctorship, etc.), this survey did not touch on these aspects. Lastly, despite being the hitherto most extensive study involving participants from multiple countries, the dataset was too small to perform meaningful analyses on a national level. Despite these limitations, this study offers several strengths as it provides the first comprehensive insight into the real-world training conditions of ERCP involving a large number of participants from 35 countries.

In conclusion, the first pan-European survey on ERCP training conditions sheds light on the discrepancies between training perceptions and guideline recommendations. While structured training and concentration of training efforts within European centers

meeting specific quality metrics are desirable, the survey exposed the low availability of structured training programs and the rare tracking of quality metrics. Of note, the survey also exposed that a relevant portion of trainees perform few ERCPs despite practicing at higher-volume centers. These data should motivate to further standardize and improve ERCP training conditions and ultimately patient care throughout Europe.

AUTHOR CONTRIBUTIONS

Study concept and design: Karim Hamesch, Oscar Cahyadi, Stavros Dimitriadis, Marcus Hollenbach, Sophie Schlosser, and Jonas Jaromir Staudacher. Acquisition of data: All authors. Investigation and methodology: Karim Hamesch, Oscar Cahyadi, Stavros Dimitriadis, Marcus Hollenbach, Sophie Schlosser, and Jonas Jaromir Staudacher. Data curation and validation: Karim Hamesch, Oscar Cahyadi, Sophie Schlosser, and Jonas Jaromir Staudacher. Analysis and interpretation of data: Karim Hamesch, Oscar Cahyadi, Stavros Dimitriadis, Marcus Hollenbach, Sophie Schlosser, and Jonas Jaromir Staudacher. Drafting of the manuscript: Karim Hamesch, Oscar Cahyadi, Sophie Schlosser, and Jonas Jaromir Staudacher. Critical revision of the manuscript for important intellectual content: all authors. Figures: Sophie Schlosser. Tables: Karim Hamesch, Oscar Cahyadi, and Sophie Schlosser. Statistical analysis: Karim Hamesch, Oscar Cahyadi, Sophie Schlosser, and Jonas Jaromir Staudacher. Obtained funding: Karim Hamesch. Project administration and study supervision: Karim Hamesch, Oscar Cahyadi, Sophie Schlosser, and Jonas Jaromir Staudacher. All authors had full access to all the data and approved the final version of this manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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All authors declare: no support from any organization other than the below-mentioned ones for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 5 years; no other associations or activities that could appear to have influenced the submitted work. Hence, all authors declare themselves independent of funders concerning this manuscript.

DATA AVAILABILITY STATEMENT

The data are available from the first and last authors upon reasonable request.

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