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Curriculum for ERCP and endoscopic ultrasound training in Europe: European Society of Gastrointestinal Endoscopy (ESGE) Position Statement

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MAIN RECOMMENDATIONS

The European Society of Gastrointestinal Endoscopy (ESGE) has recognized the need to formalize and enhance training in endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS). This manuscript represents the outcome of a formal Delphi process resulting in an official Position Statement of the ESGE and provides a framework to develop and maintain skills in ERCP and EUS. This curriculum is set out in terms of the prerequisites prior to training; recommended steps of training to a defined syllabus; the quality of training; and how competence should be defined and evidenced before independent practice.

1 Trainees should be competent in gastroscopy prior to commencing training. Formal training courses and the use of simulation in training are recommended.

2 Trainees should keep a contemporaneous logbook of their procedures, including key performance indicators and the degree of independence. Structured formative assessment is encouraged to enhance feedback. There should be a summative assessment process prior to commencing independent practice to ensure there is robust evidence of competence. This evidence should include a review of a trainee's procedure volume and current performance measures. A period of mentoring is strongly recommended in the early stages of independent practice.

3 Specifically for ERCP, all trainees should be competent up to Schutz level 2 complexity (management of distal biliary strictures and stones > 10 mm), with advanced ERCP requiring a further period of training. Prior to independent practice, ESGE recommends that a trainee can evidence a procedure volume of > 300 cases, a native papilla cannulation rate of ≥ 80 % (90 % after a period of mentored independent practice), complete stones clearance of ≥ 85 %, and successful stenting of distal biliary strictures of ≥ 90 % (90 % and 95 % respectively after a mentored period of independent practice).

4 The progression of EUS training and competence attainment should start from diagnostic EUS and then proceed to basic therapeutic EUS, and finally to advanced therapeutic EUS. Before independent practice, ESGE recommends that a trainee can evidence a procedure volume of > 250 cases (75 fine-needle aspirations/biopsies [FNA/FNBs]), satisfactory visualization of key anatomical landmarks in ≥ 90 % of cases, and an FNA/FNB accuracy rate of ≥ 85 %.

ESGE recognizes the often inadequate quality of the evidence and the need for further studies pertaining to training in advanced endoscopy, particularly in relation to therapeutic EUS.

SOURCE AND SCOPE

This position statement is an official statement of the European Society of Gastrointestinal Endoscopy (ESGE). It provides recommendations for a European core curriculum aimed at providing high quality training in ERCP and EUS. The recommendations presented are based on a consensus among endoscopists considered to be experts in the field of ERCP and EUS who are involved in training and training courses in Europe.

Introduction

The European Society of Gastrointestinal Endoscopy (ESGE) has identified quality in endoscopy as a major priority [1]. It is recognized that there continues to be an accelerated development of new and complex diagnostic and therapeutic endoscopic interventions and a lack of specific guidance for providing high quality training for many of these techniques has been identified in many countries [2]. Of all the commonly performed endoscopic procedures, endoscopic retrograde cholangiopancreatography (ERCP) is associated with the highest risk of serious complications and with a recognized mortality [3]. Furthermore, endoscopic ultrasound (EUS) is an important adjunct to ERCP, and also continues to evolve as a therapeutic modality in its own right. Therefore, ESGE has identified the requirement for a consensus on how to optimize training in ERCP and EUS as an important part of improving the quality of endoscopy [1].

In 2017, the ESGE board convened the Curricula Working Group, which was responsible for developing curricula that defined the minimum training standards for more advanced and therapeutic endoscopic practice that may often go beyond the core endoscopy training curricula in each country. This process has been outlined previously [2] and position statements on three endoscopy topics have already been published [4–6].

ABBREVIATIONS

ASGE	American Society of Gastrointestinal Endoscopy
CPN	celiac plexus neurolysis
DOPS	Direct Observation of Procedural Skills
ERCP	endoscopic retrograde cholangiopancreatography
ESGE	European Society of Gastrointestinal Endoscopy
EUS	endoscopic ultrasound
FNA	fine-needle aspiration
FNB	fine-needle biopsy
JAG	Joint Advisory Group on GI Endoscopy
JETS	JAG Endoscopy Training System
PFC	pancreatic fluid collection
RAF-E	Rotterdam Assessment Form for ERCP
TEESAT	The EUS and ERCP Skills Assessment Tool
UGI	upper gastrointestinal
WHO	World Health Organization

The recommendations presented in this curriculum, a total of 31, are given along with their quality of evidence and strength of recommendation in ▶ **Table 1**. They are based on a consensus among experts in ERCP and EUS who are involved in training.

Aims

The aim of this position statement is to recommend best practice to optimize ERCP and EUS training in Europe, based on the currently published evidence and knowledge. This paper focuses on training and aims to help trainees develop, evidence, and maintain their skills in ERCP and EUS.

Methods

In 2019, R.B. invited G.J. to develop a working subgroup of ERCP and EUS practitioners with an open call via ESGE communications. The curriculum was developed using consensus

▶ **Table 1** Summary of recommendations, with quality of evidence and strength of recommendation.

Number	Recommendation	Quality of evidence	Strength of recommendation
ERCP and EUS training in general			
1	Every endoscopist should have achieved competence in UGI endoscopy before commencing training in ERCP or EUS (i. e. having personal experience of at least 300 gastroscopies and meeting the ESGE quality measures for UGI endoscopy)	Low	Strong
2	Simulation-based training represents a positive development to accelerate the trainee's learning curve and should be encouraged. When available, trainees should start training by undertaking structured supervised ERCP/EUS simulator-based training before commencing hands-on training in the workplace	Very low	Weak
3	Where it is available, simulation-based training should evolve in a stepwise approach for training: virtual reality and mechanical simulators should be used during early training, followed by hands-on endoscopy training	Very low	Weak
4	Trainees should undertake formal courses to complement ERCP/EUS training	Low	Strong
5	ERCP and EUS trainees should engage with a range of learning resources to supplement formal courses and experiential learning	Very low	Strong
6	ERCP and EUS training should follow a structured syllabus to guide what is covered in workplace learning, formal training courses, and self-directed study	Very low	Strong
7	A minimum training period of 12 months of high volume training is likely to be required to obtain minimum proficiency in both ERCP and diagnostic EUS. At least a further year of dedicated training is likely to be required for trainees to reach competence in advanced ERCP (Schutz 3 and 4) and therapeutic EUS. Should there be an interruption to training, a longer period may be required	Very low	Strong
8	A significant proportion of ERCP and EUS training should be based in high volume training centers that are able to offer trainees a sufficient wealth of experience for at least 12 months	Very low	Strong
9	An ERCP/EUS training center should ideally be able to provide: ▪ facilitation of trainee involvement in multidisciplinary meetings ▪ onsite hepaticopancreaticobiliary surgery and interventional radiology ▪ ERCP and EUS simulation ▪ support for trainee involvement in research and service improvement initiatives	Very low	Weak
10	A trainee's principal trainer should ideally have more than 3 years' experience of independent ERCP and/or EUS practice	Very low	Weak
11	A trainee's principal trainer should be performing adequate volumes of EUSs and/or ERCPs to demonstrate maintenance of their own competence	Very low	Strong

▶ **Table 1** (Continuation)

Number	Recommendation	Quality of evidence	Strength of recommendation
12	ERCP and EUS competence should be defined as the ability to independently assess the need for and carry out successful and safe procedures, with good patient satisfaction across a range of case difficulties and clinical contexts	Low	Strong
13	Formal assessments tools (e. g. Direct Observation of Procedural Skills [DOPS] and The EUS and ERCP Skills Assessment Tool [TEESAT]) should be used regularly during ERCP and diagnostic and therapeutic EUS training to track the acquisition of trainees' competence and to support trainee feedback	Moderate	Strong
14	Trainees should be encouraged to undertake self-assessment and keep a contemporaneous log-book of all cases, which includes the degree of trainer support that was needed for each aspect of the procedure	Low	Strong
15	A trainee should undergo a formal summative assessment process prior to commencing independent practice in ERCP and EUS	Low	Weak
16	The attainment of competence in ERCP and EUS is not a single event, but a career-long process. It is recommended that, once competent in ERCP and EUS, endoscopists should be supported to continue a period of mentored practice with an experienced colleague	Very low	Strong
ERCP training			
17	ERCP competence should be considered in two stages: ▪ basic ERCP (Schutz level 1 and 2 procedures) ▪ advanced ERCP (Schutz level 3 and 4 procedures)	Low	Strong
18	Competence in ERCP should take account of predicted procedure complexity. All those delivering independent ERCP practice should achieve competence in basic ERCP (i. e. Schutz 1 and 2 levels of complexity)	Low	Strong
19	Competence in advanced procedures (Schutz level 3 and 4) may be achieved after reaching competence in basic ERCP and requires additional formal training following the commencement of independent practice	Low	Strong
20	The number of ERCPs performed may be a surrogate marker of competence, but in isolation is an inexact means to demonstrate competence. Most trainees are likely to need to have performed > 300 ERCPs to be in a position to demonstrate competency	Moderate	Strong
21	The following performance measures should be used to indicate a trainee's competence in basic ERCP to continue to independent mentored practice: ▪ selective native papilla cannulation rate of ≥ 80 % as an intention to treat[1] ▪ complete stone clearance (< 10 mm) in ≥ 85 % cases following successful selective cannulation[2] ▪ successful stenting of distal biliary strictures of ≥ 90 % of cases following successful selective cannulation[2] Following a period of mentored independent practice, to bring these performance measures into line with the ESGE Quality Improvement Initiative for ERCP and EUS, they should be: [1]at least 10 % higher [2]5 % higher	Moderate	Strong
22	An individual undertaking ERCP independently should be able to demonstrate an overall post-ERCP pancreatitis rate of ≤ 10 %	Low	Weak
EUS training			
23	Competence in radial EUS is not a prerequisite to commence linear-array EUS	Low	Weak
24	Competence in diagnostic EUS is a prerequisite for therapeutic EUS. Competence in ERCP is mandatory for therapeutic EUS, and competence in therapeutic luminal endoscopy is advantageous	Very low	Strong
25	EUS training should be defined as two stages: diagnostic EUS, including tissue acquisition, and therapeutic EUS	Very low	Strong
26	EUS-guided FNA/FNB can be commenced early in training, once safe handling and stable positioning of the echoendoscope has been accomplished	Low	Weak
27	Once competent in diagnostic EUS, training in therapeutic EUS may commence with less complex procedures (such as EUS-guided drainage of PFCs) and, when competence has been achieved, may progress to more advanced interventions (including EUS-guided gallbladder or biliary drainage, or EUS-guided anastomosis creation)	Very low	Weak

▶ **Table 1** (Continuation)

Number	Recommendation	Quality of evidence	Strength of recommendation
28	The number of EUSs performed may be a surrogate marker of competence, but in isolation is an inexact means to demonstrate competence. Trainees are likely to need to have performed > 250 diagnostic EUSs to be able to demonstrate competency	Moderate	Strong
29	The following performance measures should be used to indicate a trainee's competence in diagnostic EUS: ▪ successful documentation of anatomical landmarks in ≥ 90 % of cases ▪ EUS-guided FNA/FNB accuracy rate of ≥ 85 %	Low	Strong
30	Trainees are likely to need to have performed 75 EUS-guided FNA/FNBs to be able to demonstrate competency in tissue acquisition	Low	Strong
31	Until more robust data are available, an endoscopist can be considered competent to undertake therapeutic EUS when they can demonstrate acceptable rates of clinical success and adverse events that equate to the rates described in published case series. It is recommended that at least the first 25 cases of any intervention should be performed under the supervision of an endoscopist experienced in that intervention	Low	Weak

ERCP, endoscopic retrograde cholangiopancreatography; ESGE, European Society of Gastrointestinal Endoscopy; EUS, endoscopic ultrasound; FNA, fine-needle aspiration; FNB, fine-needle biopsy; PFC, pancreatic fluid collection; UGI, upper gastrointestinal.

methodology, so the constitution of this working party was selected by G.J. and R.B. to ensure that the group was broadly representative in terms of a wide range of nationalities, levels of clinical experience, and clinical backgrounds, and also included trainee representation.

The first meeting of the subgroup was in April 2019. At this meeting, the overall aims of the project were defined and the methodology was agreed. At this kick-off meeting, three principal topics were identified, as previously defined by the ESGE [2]; from these, specific questions were developed using the Population, Intervention, Comparator, Outcome (PICO) format where possible:

a) Pre-adoption requirements to start training (skills required prior to engaging in ERCP/EUS training)
b) Training/learning steps (the steps to achieve competence in ERCP and EUS, including requirements for training programs)
c) Definition and assessment of trainee competence (the ESGE definition of competence for ERCP and EUS, and the evidence of competence in terms of prior training and performance measures to be attained before certification for independent ERCP/EUS practice).

Two subgroup members were nominated as the leads for each topic. A Delphi process was then used to review the evidence and develop consensus statements for each topic. Each topic was the subject of a systematic literature review using major databases (PubMed, Embase, and the Cochrane Library) from 1990 to April 2019. Any publications emerging during the Delphi process and manuscript writing were also considered for inclusion. Statements were drafted based on this evidence and subjected to an appraisal using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework [3, 7]. In situations where there was a paucity of evidence in an aspect of training that was deemed important, the groups drew upon expert opinion to develop statements that went forward into the Delphi process.

The statements were distributed electronically in August 2019. In October 2019, there was a second face-to-face meeting where the statements and supportive evidence were discussed in turn, resulting in further modification of the statements. The first round of anonymous electronic voting took place in November 2019 and was based on a 5-point Likert scale, ranging from "Strongly Disagree," through to "Strongly Agree." Any statement receiving at least an 80 % level of "agreement" or "strong agreement" was accepted.

Thereafter G.J. modified any statements based on feedback to improve their acceptability. The new statements were discussed in a teleconference in January 2020, before a second electronic vote between February and July 2020. Owing to the paucity of evidence, all statements should be considered GRADE weak, with low or very low quality evidence or based on expert opinion, with the exceptions of recommendations that consider the learning curves for ERCP and diagnostic EUS, which are based on moderate quality evidence.

1 ERCP and EUS training in general

A Pre-adoption requirements to start ERCP and EUS training

RECOMMENDATION 1

Every endoscopist should have achieved competence in upper gastrointestinal (UGI) endoscopy before commencing training in ERCP or EUS (i. e. having personal experience of at least 300 gastroscopies and meeting the ESGE quality measures for UGI endoscopy).

Level of agreement 100 %.

Both ERCP and EUS require the skilled execution of endoscope maneuvers to obtain a stable position in order either to undertake specific therapy or to obtain optimal endosonographic images. Proficiency in diagnostic gastroscopy, as defined by the ESGE performance measures [8], is therefore a prerequisite before training in both ERCP and EUS, and experience of therapeutic upper gastrointestinal (UGI) endoscopy and colonoscopy is also desirable.

B Training/learning steps in ERCP and EUS

RECOMMENDATION 2
Simulation-based training represents a positive development to accelerate the trainee's learning curve and should be encouraged. When available, trainees should start their training by undertaking structured supervised ERCP/EUS simulator-based training before commencing hands-on training in the workplace.
Level of agreement 82 %.

Simulation-based training refers to different educational tools that allow for repetitive instruction in a non-patient care environment, without stress and risks. In endoscopy, it includes [9–11]:

- mechanical simulators
- animal models – in vivo and ex vivo (hybrid)
- computer-based/virtual reality simulators.

Each of these has its own characteristics, advantages, and disadvantages, but they all aim to help trainees to practice navigation skills and learn the basic milestones, as shown in **Table 1 s**, see online-only Supplementary material [12–14].

Trainees just starting in ERCP and EUS will benefit from becoming familiar with accessories and practicing endoscopic and accessory maneuvers in a simulated setting with less cognitive overload. Early training that includes simulation-based training should be encouraged as an adjunct to attendance during endoscopy lists, formal courses, and e-learning tools. A structured simulation-based training program developed with specific goals should be defined. As endoscopic interventions increase in their scope and complexity, hands-on training on patients, even for experienced trainees, is often limited owing to concerns about maintaining patient safety in new and/or complex procedures, and simulation can fulfil an important role.

RECOMMENDATION 3
Where it is available, simulation-based training should evolve in a stepwise approach for training: virtual reality and mechanical simulators should be used during early training, followed by hands-on endoscopy training.
Level of agreement 91 %.

Several studies have proposed the implementation of simulator training in endoscopic training, given the potential for more rapid progression up the early learning curve [14–17]. Training in advanced endoscopy in ERCP/EUS should include in-room ERCP/EUS observation of live cases and then evolve as follows:

1. independence in UGI endoscopy and experience of therapeutic luminal endoscopy
2. virtual reality and mechanical simulators during early training
3. hands-on basic ERCP/diagnostic EUS training
4. ex vivo or in vivo simulators later in training and for advanced training of more complex procedures
5. hands-on advanced ERCP/therapeutic EUS training
6. ex vivo and in vivo simulators for acquiring expertise in new interventions, or maintaining competence in low volume procedures.

RECOMMENDATION 4
Trainees should undertake formal courses to complement ERCP/EUS training.
Level of agreement 100 %.

Formal courses/workshops in ERCP and EUS training are defined as a structured course with clear learning objectives, expert faculty, and a range of learning methods. Supervised hands-on training is encouraged and, depending on the competence delegates demonstrate, this can be on simulators and/or patients. Formal ERCP courses have been shown to change practice and improve confidence [18], and have been shown to improve performance in workshops using mechanical simulators [15, 17]. There is evidence from the UK that an intense 5-day colonoscopy course could lead to a sustained positive impact on performance [19].

These courses should be led by faculty who are experienced and skilled trainers. Learning methods should include theory sessions, facilitated group discussions, live demonstrations, and closely supervised hands-on sessions. The hands-on sessions should be on simulators in early training and on real cases for courses involving more experienced trainees, and should result in individualized feedback. Course directors should seek formal quality assurance of their courses from national or regional training organizations if these structures are in place.

RECOMMENDATION 5
ERCP and EUS trainees should engage with a range of learning resources to supplement formal courses and experiential learning.
Level of agreement 100 %.

Trainees are encouraged to participate in self-directed learning during training to:

- develop a knowledge base to support contemporary evidence-based practice
- underpin their appreciation of normal and abnormal anatomy, and improve pathology recognition
- be familiar with safe and effective ERCP and EUS techniques.

Self-directed learning should take advantage of the significant range of training resources now available: textbooks, guidelines, e-learning modules, web-based instructional video cases, congress proceedings, and live endoscopy workshops.

RECOMMENDATION 6

ERCP and EUS training should follow a structured syllabus to guide what is covered in workplace learning, formal training courses, and self-directed study.
Level of agreement 100 %.

Performing ERCP and EUS safely and effectively requires fundamental knowledge, and technical and non-technical skills. It is recommended that training covers the following domains.

- Pre-procedure:
  - knowledge of the risks, indications, and alternatives for ERCP, and diagnostic and therapeutic EUS, and the ability to explain these to a patient and/or their carer to obtain valid informed consent
  - understanding the principles of safe conscious sedation, deep sedation, and general anesthesia
  - knowledge of mediastinal and upper abdominal anatomy (plus pelvic/perirectal anatomy if undertaking per-rectal EUS), and an understanding of related imaging: ultrasound, computed tomography, magnetic resonance imaging, and functional imaging
  - understanding of the guidance on the use of prophylactic antibiotics and the management of patients on antiplatelet and anticoagulant medications
  - knowledge of the hardware and its ergonomic configuration in the endoscopy room (fluoroscopy, processors, and endoscopes, including being able to troubleshoot scope malfunction)
  - familiarity with the safe use of accessories used in ERCP and EUS, allowing the ability to select accessories and guidewires appropriately in different situations
  - contribution to decision-making and patient counselling in pancreaticobiliary disease by contributing to outpatient clinics, ward care, and specialist multidisciplinary meetings.
- Intraprocedure:
  - ensuring effective teamwork and promoting an environment to minimize risk and medical error in endoscopy (e. g. World Health Organization [WHO] endoscopy safety checklist, team debrief after case, involvement in mortality and morbidity audit)
  - effective in-room leadership and communication
  - appropriate patient positioning
  - safe esophageal and duodenal intubation
  - duodenoscope and echoendoscope handling and positioning
  - selection of ERCP accessories, EUS needles, and guidewires appropriate for the required intervention
  - structured systematic performance of diagnostic endoscopy and execution of therapy, for example:
    - station assessment in EUS
    - in ERCP, appropriate algorithm selection for difficult selective cannulation, safe sphincterotomy, stent choice and deployment, and stone management
    - steps for safe and effective tissue acquisition and handling in EUS
  - optimization and storage of endosonographic and fluoroscopic imaging, whilst minimizing ionizing radiation exposure to the patient and to clinical staff, which for EUS includes the amplification or time gain compensation, color Doppler imaging, contrast-enhancement, and elastography
  - application of measures to prevent post-ERCP pancreatitis and cholangitis.
- Post-procedure:
  - effective comprehensive report writing
  - recognition and appropriate early management of complications
  - defining and communicating post-procedure instructions for care
  - explaining the onward short- and long-term management plan to the patient and/or their carers.

RECOMMENDATION 7

A minimum training period of 12 months of high volume training is likely to be required to obtain minimum proficiency in both ERCP and diagnostic EUS. At least a further year of dedicated training is likely to be required for trainees to reach competence in advanced ERCP (Schutz 3 and 4) and therapeutic EUS. Should there be an interruption to training, a longer period may be required.
Level of agreement 96 %.

In the following section, it will be demonstrated that the rates at which trainees achieve competence in different aspects of EUS and ERCP vary [20–22]. The factors contributing to this variation relate to the innate skills, previous experience, and dedication of the trainee; the skills of the trainer; and the quality of the training program and training environment. Therefore, defining a minimum period of training in ERCP and EUS is difficult and could be challenged. However, there is still the need to structure training into programs, so an indication of the minimum period required for the majority of trainees to reach competence is needed. A training period of at least 12 months is likely to be required for trainees to undertake the

indicated minimum number of procedures required for competence (300 ERCPs, 250 diagnostic EUSs). Even in very high volume training centers in Europe, at least another year of dedicated training is likely to be required for a trainee to attain competence in advanced ERCP and therapeutic EUS.

Whether interruptions to training affect the learning curve of trainees is unclear. Short breaks to colonoscopy training (less than 6 weeks) in a US study had only a small effect on cecal intubation rate, but the detrimental effect increased for each subsequent 4-week break [23]. In the large studies of learning curves for gastroscopy and colonoscopy using the UK Joint Advisory Group on GI Endoscopy (JAG) Endoscopy Training System (JETS); the nationwide electronic training portfolio), training breaks of up to 6 months were not shown to be detrimental to learning curves [24, 25]. There is no equivalent data for ERCP and EUS training. The length of the interruption to training that may affect a trainee's acquisition of competence is likely to vary widely owing to factors such as prior experience and the training intensity upon restarting training.

RECOMMENDATION 8

A significant proportion of ERCP and EUS training should be based in high volume training centers that are able to offer trainees a sufficient wealth of experience for at least 12 months.

Level of agreement 96 %.

Training centers that can provide adequate procedure experience for ERCP and EUS are likely to be referral centers/specialist centers for patients with pancreaticobiliary disorders, and oncological centers requiring the support of an advanced endoscopy service. It is recognized that regional hospitals providing an effective and important ERCP and EUS service play a vital role in training. However, trainees will benefit from spending a significant proportion of their time in specialist centers that can provide a multidisciplinary environment for the management of patients. It is evidenced that procedure experience is an important determinant of competence [26–28], but also there is evidence from UK colonoscopy training that the intensity of training (the rate at which cases are accrued) may have a positive effect on training [25]. It follows therefore that ERCP and EUS training should include a significant period of time in a high volume center, which will ensure that a trainee is able to undertake a sufficient volume of procedures in a short amount of time to achieve competence.

RECOMMENDATION 9

An ERCP/EUS training center should ideally be able to provide:

- facilitation of trainee involvement in multidisciplinary meetings (Level of agreement 100 %)
- onsite hepaticopancreaticobiliary surgery and interventional radiology (Level of agreement 100 %)
- ERCP and EUS simulation (Level of agreement 82 %)
- support for trainee involvement in research and service improvement initiatives (Level of agreement 96 %).

These centers will provide the trainee with experience of all aspects of the syllabus (recommendation 17), such as procedure planning, involvement in the planning of interventional strategies, management of complications, and trainee involvement in the whole inpatient stay. The benefits of simulation are more likely to be provided by recognized ERCP and EUS training units in specialist centers.

RECOMMENDATION 10

A trainee's principal trainer should ideally have more than 3 years' experience of independent ERCP and/or EUS practice.

Level of agreement 96 %.

RECOMMENDATION 11

A trainee's principal trainer should be performing adequate volumes of EUSs and/or ERCPs to demonstrate maintenance of their own competence.

Level of agreement 96 %.

Being an effective endoscopy trainer is challenging and made more difficult when a procedure is both technically difficult and carries significant risks of patient harm. Arguably the best trainers are those equipped with effective teaching skills (engagement, performance-enhancing feedback skills etc.). However, whilst evidence is lacking, it follows that a trainer's own experience in ERCP and EUS is likely to influence their effectiveness as a trainer. With experience, an endoscopist moves from being a novice to becoming an expert.

Adult cognitive load theory is relevant to both endoscopy trainees and trainers [29, 30], and states that an individual's working memory can only process a finite amount of information at any one time and this creates a "bottleneck" for learning. Cognitive load theory identifies three types of cognitive load that impact on working memory: the intrinsic load (performance of essential aspects of the task), the extraneous load (non-essential aspects of the task), and the germane load (the deliberate use of cognitive strategies that facilitate learning). One aspect of being an expert is practicing with "unconscious

competence," such that experts have a reduced "intrinsic load" so are better able to observe and inform all facets of the training encounter to the benefit of the trainee's learning and development.

There is no evidence to support a strong recommendation on how long an endoscopist should have been practicing independently before becoming a principal trainer, but the consensus time was a minimum of 3 years.

Trainers should consider undertaking a recognized "train the endoscopy trainer" course to improve their skills as a trainer. Effective feedback benefits training outcomes. It has been shown that colonoscopy trainees randomized to receive feedback, rather than no feedback, had significantly improved cecal intubation rates [31]. It follows therefore that courses that instruct trainers in the fundamentals of adult learning theory to improve their skills as trainers, such as providing a framework for effective feedback, setting goals for each session, and using consistent training terms benefit trainees [29, 32]. JAG in the UK, and the American Society for Gastrointestinal Endoscopy (ASGE) in the USA recommend "train the trainers" courses that are specific to the endoscopic modality.

C Definition and assessment of trainee competence for ERCP and EUS

RECOMMENDATION 12

ERCP and EUS competence should be defined as the ability to independently assess the need for and carry out successful and safe procedures, with good patient satisfaction across a range of case difficulties and clinical contexts.

Level of agreement 100 %.

This definition of ERCP and EUS competence pins competence to whether the endoscopist can undertake effective and safe procedures, and recognizes the importance of patient experience and the range of case complexity and contexts. ASGE defines competence as the minimum level of skill, knowledge, and/or expertise derived through training and experience that is required to safely and proficiently perform a task or procedure [33].

RECOMMENDATION 13

Formal assessments tools (e. g. Direct Observation of Procedural Skills [DOPS] and The EUS and ERCP Skills Assessment Tool [TEESAT]) should be used regularly during ERCP and diagnostic and therapeutic EUS training to track the acquisition of trainees' competence and to support trainee feedback.

Level of agreement 96 %.

Assessment is central to determining an individual's competence. Formative assessments are conducted by trainers to highlight a trainee's strengths and weaknesses, so as to improve the quality of the feedback and to improve performance [16, 34]. Siau et al. used data from the UK national trainee e-portfolio to provide evidence that the ERCP DOPS formative assessment has validity and reliability and is to be used for summative assessment [28]. The reliability of the DOPS was shown to improve when the assessment of performance was based on the degree of supervision required by the trainee [27]. Wani et al. have validated the TEESAT for use in competence assessment for ERCP and EUS, and it is recommended for use in North American advanced endoscopy programs [22, 35, 36].

The DOPS and TEESAT are broadly alike in their structure, with the steps of the procedure deconstructed into domains, which are further divided into individual "performance items." The assessor is required to assess the quality of the performance for each item based on the degree of supervision/assistance that was required. Both assessments encourage reflection on the training episode.

Greater engagement with the process of formative assessment has been shown to be an independent predictor of performance [28]. ASGE recommends that at least 20 % of a trainee's cases are subject to assessment with the TEESAT [36]; in the UK, it is recommended that a formative DOPS assessment is undertaken approximately every 10 ERCPs.

The DOPS or the TEESAT are recommended as they are openly available for use and have been validated. If trainers wish to develop their own tool to structure trainee feedback, **Tables 2s** and **3s** outline a suggested "performance item" checklist that can be tailored for their use.

RECOMMENDATION 14

Trainees should be encouraged to undertake self-assessment and keep a contemporaneous logbook of all cases, which includes the degree of trainer support that was needed for each aspect of the procedure.

Level of agreement 100 %.

The definition of ERCP and EUS competence includes attainment of key performance measures, as well as a minimum number of procedures before a trainee can perform ERCP and EUS independently. It therefore follows that a trainee is encouraged to keep a record of all their endoscopy cases and the degree to which the trainer was involved. In the UK, trainees use a nationwide electronic portfolio (JETS) to log procedures and to provide a record of their formative assessments [37]. Ekkelenkamp et al. have shown that continuous self-assessment using the Rotterdam Assessment Form for ERCP (RAF-E) can demonstrate a trainee's learning curve and key performance measures [20, 38].

Tables 4s and **5s** outline suggested logbook fields to be completed by a trainee for each ERCP and EUS procedure. As a trainee documents the degree of supervision required for each

aspect of a procedure, a picture builds up as to the particular aspects of ERCP/EUS in which a trainee is already demonstrating competence. Furthermore, logbooks are an important source of evidence for a trainee's key performance measures, such as cannulation rate for ERCP and fine-needle aspiration (FNA) or fine-needle biopsy (FNB) accuracy in EUS.

RECOMMENDATION 15
A trainee should undergo a formal summative assessment process prior to commencing independent practice in ERCP and EUS.
Level of agreement 92 %.

ESGE proposes that the national legislature responsible for accreditation in endoscopy undertakes a formal assessment of trainees prior to independent ERCP and EUS practice. This process should include an independent review to determine that the procedure numbers and performance measures outlined in this document have been attained. This process can also review whether a trainee has undertaken formal training courses and their progress in formative assessment, when these have been brought into national training programs. Accreditation bodies should also consider a summative assessment, whereby a trainee is observed undertaking ERCPs and EUSs by independent assessors as a further robust test of competence beyond training experience and performance measures.

RECOMMENDATION 16
The attainment of competence in ERCP and EUS is not a single event, but a career-long process. It is recommended that, once competent in ERCP and EUS, endoscopists should be supported to continue a period of mentored practice with an experienced colleague.
Level of agreement 100 %.

When an endoscopist reaches the standards defined in the previous sections, it is not the end of the learning process, but merely a checkpoint at which independent practice can commence. This transition presents new challenges and is often daunting. ESGE proposes that endoscopists starting to practice independently are mentored by a more experienced colleague for a defined period of time. A mentor should be available to join or advise on a challenging case at the request of the endoscopist. Newly independent endoscopists should continue to keep a record of their cases to evidence that they are retaining acceptable key performance measures and complication rates as part of a regular appraisal process, and seek opportunities to upskill or undergo further supervised practice when necessary. There is no evidence to support a recommendation as to how long the mentoring period should be, but to be worthwhile a period of at least 6 months is likely to be required.

2 ERCP training

A Pre-adoption requirements to start ERCP

Trainees should be competent in gastroscopy prior to commencing ERCP training.

B Training/learning steps in ERCP

RECOMMENDATION 17
ERCP competence should be considered in two stages:
- basic ERCP (competence in Schutz level 1 and 2 procedures)
- advanced ERCP (Schutz level 3 and 4 procedures).

Level of agreement 100 %.

ESGE advocates using the Schutz classification to define basic and advanced ERCPs [39]. Competence in basic ERCP is therefore defined as competence in:
- selective cannulation
- extraction of stones > 10 mm
- treatment of a bile leak
- successful stenting of an extrahepatic biliary stricture
- placement of a prophylactic pancreatic stent.

Competence in advanced ERCP is defined as competence in:
- stenting of a hilar obstruction
- removal of intrahepatic stones
- any pancreatic therapy
- ampullectomy
- ERCP in surgically altered anatomy.

RECOMMENDATION 18
Competence in ERCP should take account of predicted procedure complexity. All those delivering independent ERCP practice should achieve competence in basic ERCP (i. e. Schutz 1 and 2 levels of complexity).
Level of agreement 100 %.

RECOMMENDATION 19
Competence in advanced procedures (Schutz level 3 and 4) may be achieved after reaching competence in basic ERCP and requires additional formal training following the commencement of independent practice.
Level of agreement 100 %.

Jaundice from extrahepatic biliary obstruction and cholangitis from gallstones represent the majority of indications for ERCP, and a patient presenting with these problems will often need treatment urgently. Therefore, it is essential that every endoscopist undertaking ERCP independently is competent in cases with this degree of difficulty. More complex indications

for ERCP (Schutz 3 and 4) are undertaken less commonly and should be undertaken in a high volume referral center, with surgical and radiological support, so competence in these procedures is not mandated for all trainees wanting to practice independent ERCP. Additional training is required to attain competence in advanced ERCP.

C Definition and assessment of trainee competence for ERCP and EUS

RECOMMENDATION 20

The number of ERCPs performed may be a surrogate marker of competence, but in isolation is an inexact means to demonstrate competence. Most trainees are likely to need to have performed > 300 ERCPs to be in a position to demonstrate competency.
Level of agreement 100 %.

It has been conventional for training programs to use procedure volume as a surrogate marker of competence, and unsurprisingly there is strong evidence endoscopists' experience of a procedure has consistently been shown to be a predictor of competence [25–27, 40]. However, there is significant variation in learning curves for ERCP [20, 22, 26, 28], as other trainee, trainer, and training program factors, such as prior endoscopic skills, trainer teaching skills, access to simulation, and training intensity, inform the rate at which competence is attained. Therefore, defining an absolute threshold in terms of numbers of procedures required for competence can be questioned, and there has been a move away from endoscopic competence being defined solely by procedure volume [33, 41, 42]. Despite this trend, endoscopy training program directors and new trainees need to have an idea of the approximate case numbers at which competence is likely to be attained (subject to other measures of competence).

Ekkelenkamp et al. in 2014 demonstrated in a single training center that only one of 15 trainees reached a native papilla cannulation rate of 85 % after 200 procedures [20]. A systematic review in 2015 included nine studies overall but, in the five looking at selective cannulation, the range of procedure volumes required was 79–300 [43]. In 2019 Siau et al. reported from the UK on the outcomes of formative ERCP assessment from the nationwide electronic training portfolio and demonstrated that the competency benchmark for selective cannulation of 89 % was only achieved after 300 procedures [28]. Also in 2019, Wani et al. reported on the learning curves of 62 advanced endoscopy trainees and concluded that the average trainee required 250 cases to achieve core skills in ERCP, and 305 cases for the more complex Grade 2 cases [44]. ESGE therefore recommends a trainee is likely to require an ERCP procedure volume of 300 cases before there can be an expectation of competence and, even then, competence must be better evidenced than by case numbers alone.

RECOMMENDATION 21

The following performance measures should be used to indicate a trainee's competence in basic ERCP to continue to independent mentored practice:

- selective native papilla cannulation rate of ≥ 80 % as an intention to treat[1] (Level of agreement 96 %)
- complete stone clearance (< 10 mm) in ≥ 85 % of cases following successful selective cannulation[2] (Level of agreement 91 %)
- successful stenting of distal biliary strictures in ≥ 90 % of cases following successful selective cannulation[2] (Level of agreement 91 %).

Following a period of mentored independent practice, to bring these performance measures into line with the ESGE Quality Improvement Initiative for ERCP and EUS, they should be:
[1]at least 10 % higher
[2]5 % higher.

Performance measures have been widely proposed and adopted in endoscopy to benchmark satisfactory performance [33, 45, 46]. In 2018, Domagk et al. presented performance measures for ERCP and EUS as part of the ESGE's quality improvement initiative [45]. It follows that ESGE proposes that the same performance measures are used to define the competence of a trainee prior to independent practice but, for expediency, the evidence underpinning these performance measures is not discussed in this paper.

Selective biliary cannulation is a fundamental skill in ERCP as without this no therapeutic intervention can proceed. However, it provides no information on an individual's ability to execute other specific aspects of ERCP, such as sphincterotomy or stent deployment, and therefore cannot be used in isolation as a measure of competence.

In patients with a native papilla and conventional anatomy, Domagk et al. proposed a selective biliary cannulation rate of ≥ 90 % (on an intention-to-treat basis). However, the consensus of the curriculum group was that achieving this standard may be difficult for trainees. ESGE defines a difficult biliary cannulation as more than five contacts with the papilla; more than 5 minutes spent attempting to cannulate following visualization of the papilla; or more than one unintended pancreatic duct cannulation or opacification [47]. The point at which a trainer takes over the procedure when cannulating will always vary between trainers, but it follows that, in the relatively common scenario of a cannulation becoming difficult, a trainer may well take over the endoscope. If the trainer is successful at cannulation with either conventional or adjunct techniques, the case would count as being an unsuccessful cannulation attempt for the trainee. Even very experienced and competent trainees skilled in adjunct cannulation techniques will encounter cases in which the trainer will be required to take over the procedure, for example where there are time-pressures on a list or issues

related to sedation or anesthesia, so they will not be in a position to reach the successful cannulation rates of equally competent independent endoscopists. When the trainee proceeds into independent practice then the majority of these cases would be achieved successfully, such that the individual's cannulation rate is likely to improve. It is therefore proposed that the definition of ERCP competence includes a selective cannulation rate of ≥ 80 %, with the aim of achieving the proposed ESGE standard of ≥ 90 % in the period following independent practice (preferably during a period of mentorship).

With the same logic, it is proposed that the definition of ERCP competence for a trainee includes successful stone clearance (≤ 10 mm) and successful stenting of an extrahepatic biliary obstruction with rates that are both 5 % lower than those proposed by Domagk for the ESGE quality improvement initiative (≥ 85 % and ≥ 90 %, respectively). The difference of 5 % between a trainee's performance standard and that proposed by ESGE is lower than that for cannulation. This is because trainers are likely to be prepared to allow trainees longer to execute these therapies because they are inherently less likely to cause harm than a difficult cannulation of a native papilla.

RECOMMENDATION 22
An individual undertaking ERCP independently should be able to demonstrate an overall post-ERCP pancreatitis rate of ≤ 10 %.
Level of agreement 91 %.

Post-ERCP pancreatitis is the most frequent complication following ERCP and can be devastating; it is considered by the ESGE to be the most appropriate indicator of the adverse event rate [45]. This complication rate threshold is largely drawn from a 2015 systematic review that was derived from randomized controlled trials only, including 13 296 patients, which documented an overall post-ERCP pancreatitis rate of 9.7 %, with a rate of 14.7 % in high risk patients.

3 EUS TRAINING

A Pre-adoption requirements to start EUS training

RECOMMENDATION 23
Competence in radial EUS is not a prerequisite to commence linear-array EUS.
Level of agreement 96 %.

Diagnostic EUS should only be commenced when competence in gastroscopy has been attained. Competence in linear-array EUS is essential to undertake tissue acquisition and EUS-guided therapy, but it has been shown that training with a radial echoendoscope does not improve the performance of subsequent training with a linear-array echoendoscope [48]. Most diagnostic EUS procedures can be performed with a linear-array echoendoscope, which may infer a particular advantage in the examination on the pancreas [49]. Therefore, ESGE proposes that it is not essential that training commences with radial EUS, or that radial EUS is learned alongside linear EUS.

RECOMMENDATION 24
Competence in diagnostic EUS is a prerequisite for therapeutic EUS. Competence in ERCP is mandatory for therapeutic EUS, and competence in therapeutic luminal endoscopy is advantageous.
Level of agreement 91 %.

Diagnostic EUS, including tissue acquisition, is considered a prerequisite for therapeutic EUS [50], given that effective target recognition and puncture with an accessory are the initial steps for any EUS-guided therapies. Furthermore, much of therapeutic EUS requires mastery of ERCP skills (such as the use of wires, stents, accessories, and fluoroscopy), so there is strong consensus that ERCP competence should be mandatory when training in therapeutic EUS [45, 50].

There is currently no established guidance for determining a trainee's competence to independently perform effective therapeutic EUS, although some consensus exists on how to train trainees to become therapeutic endosonographers [45, 48, 50]. Trainees should know the indications, limitations, risks, and alternatives for any proposed EUS intervention and should be able to explain this information to patients to obtain valid informed consent [33, 51]. At a trainer's discretion, trainees with enough experience of ERCP, but who are not yet certified for independent practice, can commence training in straightforward cases of therapeutic EUS. Competence in luminal endoscopy including experience in the management of endoscopic complications, such as perforation and bleeding, is also advantageous [50], given the rate at which these complications can occur in therapeutic EUS.

B Training/learning steps in EUS training

RECOMMENDATION 25
EUS training should be defined as two stages: diagnostic EUS, including tissue acquisition, and therapeutic EUS.
Level of agreement 100 %.

Although there is a variability between trainees [16, 21, 52], EUS is considered to be a demanding technique with a long and variable learning curve [21]. It is performed for several clinical indications [53]; the diagnostic indications for EUS are wide-ranging and the number of distinct interventional procedures for EUS are increasing. As such, a competent endosonographer needs to master not only scope and accessory handling skills, but also how to interpret and differentiate between normal anatomy and pathology.

The training should be considered in two stages. It should start with diagnostic EUS, which encompasses all aspects of diagnostic EUS (luminal and pancreaticobiliary EUS, including tissue acquisition [54, 55]). Once this has been achieved, training in therapeutic EUS can commence.

Transrectal EUS has emerged as an important adjunct in the diagnosis and treatment of pelvic pathology. However, many endosonographers do not undertake lower gastrointestinal EUS, and others consider it quite a low volume indication. The working group did not have representation from any coloproctology surgeons, so considered the specific training requirements of transrectal EUS beyond the scope of the curriculum.

RECOMMENDATION 26
EUS-guided FNA/FNB can be commenced early in training, once safe handling and stable positioning of the echoendoscope has been accomplished.
Level of agreement 91 %.

Commencing EUS-guided FNA/FNB (supervisor directed, trainee performed) may safely be considered early in training once effective scope handling has been achieved [56].

RECOMMENDATION 27
Once competent in diagnostic EUS, training in therapeutic EUS may commence with less complex procedures (such as EUS-guided drainage of pancreatic fluid collections [PFCs]) and, when competence has been achieved, may progress to more advanced interventions (including EUS-guided gallbladder or biliary drainage, or EUS-guided anastomosis creation).
Level of agreement 100 %.

Therapeutic EUS continues to evolve and is associated with significant risks of major complications, and with a limited number of cases for training. Therapeutic EUS should be performed only in centers with a multidisciplinary team that includes interventional endoscopists, surgeons, and interventional radiologists. There are few data and limited studies regarding a threshold for the minimum number of procedures before assessing competence in therapeutic EUS.

Training should commence with drainage of PFCs and celiac plexus neurolysis (CPN), as they are both relatively high volume procedures. Although evidence is lacking, it has been suggested that training in therapeutic EUS should follow sequentially to reflect increasing complexity [50]:

- step 1 – EUS-guided CPN and PFC drainage
- step 2 – EUS-guided gallbladder drainage
- step 3 – EUS-guided biliary drainage (e. g. hepaticogastrostomy, choledochoduodenostomy, hepaticoenterostomy, rendezvous procedures)
- step 4 – EUS-guided pancreatic duct drainage
- step 5 – EUS-guided anastomosis creation (e. g. gastroenteric or bilioenteric anastomosis).

Training in CPN can be considered early in advanced EUS training. Moreover, the expanding field of EUS-guided cancer therapy needs to be incorporated into training (brachytherapy, fiducial marker placement, ablative therapies).

C Assessment issues for EUS

RECOMMENDATION 28
The number of EUSs performed may be a surrogate marker of competence, but in isolation is an inexact means to demonstrate competence. Trainees are likely to need to have performed >250 diagnostic EUSs to be able to demonstrate competency.
Level of agreement 100 %.

EUS requires both cognitive and technical abilities, so a trainee's procedure volume does not necessarily correlate with their performance. As with ERCP, variables such as prior trainee experience and the quality of the trainer and training environment are likely to inform the number of cases a trainee needs to perform in order to commence safe and effective independent practice. However, procedure numbers are important for training leads to develop advanced endoscopy programs. Furthermore, trainees need to have their expectations managed as to what procedure volume is likely to be typically required to meet defined performance measures [44, 57, 58]. Wani et al. prospectively evaluated the learning curves for 37 EUS trainees and concluded that the average trainee achieved core EUS competence after 225 cases, although the range was notable (median EUS procedure numbers 400, range 200–750) [44]. Therefore, ESGE proposes that a minimum of 250 EUS procedures are required before a trainee is likely to demonstrate acceptable performance measures and competence.

RECOMMENDATION 29
The following performance measures should be used to indicate a trainee's competence in diagnostic EUS:

- successful documentation of anatomical landmarks in ≥90 % of cases
- EUS-guided FNA/FNB accuracy rate of ≥85 %.

Level of agreement 96 %.

Again, ESGE proposes that the performance measures advocated in the ESGE quality improvement initiative defined by Domagk et al. are considered as benchmarks for independent practice [45]. The visualization and documentation of anatomical landmarks and the issue of successful tissue sampling are central to EUS. Trainees should be able to demonstrate that they are performing to the required level as evidence of their

competence in EUS. **Table 3s** lists "performance items" for diagnostic EUS and includes suggested anatomical landmarks.

RECOMMENDATION 30
Trainees are likely to need to have performed 75 EUS-guided FNA/FNBs to be able to demonstrate competency in tissue acquisition.
Level of agreement 86 %.

A study by Wani et al. concluded that the average trainee required 110 EUS-FNAs during training to achieve competence [44]. ESGE recommends that trainees are likely to require a minimum of 75 FNA/FNB procedures before they are likely to demonstrate competence.

RECOMMENDATION 31
Until more robust data are available, an endoscopist can be considered competent to undertake therapeutic EUS when they can demonstrate acceptable rates of clinical success and adverse events that equate to the rates described in published case series. It is recommended that at least the first 25 cases of any intervention should be performed under the supervision of an endoscopist experienced in that intervention.
Level of agreement 96 %.

Two studies have assessed the impact of experience on the outcomes of therapeutic EUS. Harewood et al. reported in 2003 that experience of over 20 cases improved the outcomes of PFC drainage [59]. A 2008 study reported that trainees should independently perform 25 EUS-guided PFC drainage procedures to be proficient [60]. On account of these studies being undertaken in the evolution of the technique and assuming that the endoscopist is competent in ERCP, the consensus guidelines of the Asian EUS group is for trainees to undertake 5–10 procedures under supervision as the minimum requirement to obtain competency in PFC drainage [61]. The group do not recommend a case number for EUS-CPN or EUS-guided biliary or pancreatic drainage. ESGE proposes that trainees should expect to require 10–25 PFC drainage procedures before expecting to demonstrate competency for drainage of PFCs.

Oh et al. reported that experience of 33 cases is required for EUS-guided hepaticogastrostomy [62], and similarly James et al. reported 40 cases being required for effective hepaticoenterostomy [63]. Teoh et al. reported the findings from an international multicenter registry and concluded that 25 cases were required for competence in EUS-guided gallbladder drainage [64]. Given the limited number of cases, even in specialist centers, acquisition of experience in these complex procedures is an issue. For the current generation coming through endoscopy training, ESGE proposes that these procedures should be learned by endoscopists competent in ERCP and diagnostic EUS, and that supervision should be in place for at least the first 25 cases. It is accepted however that the learning curves of each trainee are different and competence should be objectively demonstrated.

Competence in therapeutic EUS requires a strong understanding of the indications, benefits, risks, and alternatives for the procedure. ESGE recommends that endoscopists audit their rates of success and adverse outcomes for diagnostic and therapeutic EUS both whilst learning these procedures under supervision and when undertaking these cases independently. The acceptable rates of success and adverse events will be different for each EUS-guided intervention, and for endoscopists to practice independently their success and complications should be comparable to the rates published in the largest peer-reviewed series, and be adjusted when techniques are refined and improved evidence emerges.

Conclusions

As part of the mission of the ESGE to identify quality in endoscopy as a major priority, we present this Position Statement on training in ERCP and EUS. The working group included representation from across Europe and included different backgrounds in training and a range of career experience. Standard Delphi methodology was used to propose and agree statements pertaining to the prerequisites for ERCP and EUS training; the steps in training and the quality of training; and the definition and assessment of competence in ERCP and EUS prior to independent practice. These proposals have no legal implication, but serve to recommend best practice in training. It is hoped they will be of use to National Societies, program directors, and trainees in improving the provision and standard of ERCP and EUS training.

Many of the statements are drawn from low or very low quality evidence, so are derived from the expert opinion of the curriculum working group through consensus. Arguably the best quality evidence is that related to learning curves and the rate at which competence is attained in terms of procedure numbers. However, this is a source of controversy as there has been an understandable move away from competence being measured solely on the basis of the procedure volume of the trainee. ESGE has proposed that procedure numbers are retained as they serve as guidance to lead trainers responsible for organizing training programs, as well as to trainees who will benefit from a benchmark to determine when full competence in ERCP and EUS is likely to be attained. ESGE emphasizes however that the procedure volume of a trainee is no longer sufficient evidence of competence and recommends that key performance measures are attained and that consideration is given by national institutions to a formal summative assessment process prior to independent practice.

There remain major challenges to delivering effective ERCP and EUS training. It has been proposed that simulation forms a central part of training, although access to effective simulation is highly variable. There is also inconsistent availability of formal endoscopy courses and "train the trainer" workshops, both of

▶ **Table 2** Potential research questions to be prioritized.

To what degree can trainee learning curves and recommended minimum case volumes be improved with greater focus on:
▪ formal courses
▪ simulation
▪ trainer expertise
▪ "immersion training" (greater intensity of case experience)?
What levels of objective performance measures for ERCP and EUS are fair and attainable for trainees to attain prior to independent practice (e. g. cannulation rates)?
What effects do breaks in training have on ERCP and EUS learning curves?
What are the most valid and feasible ways to assess a trainee's competence prior to independent practice?
What constitutes ideal training for an endoscopist in lower volume, more complex, advanced therapeutic ERCP and EUS procedures, and how should competence be determined?
What is the suggested format for effective ERCP and EUS mentoring once independent practice has commenced?

ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound.

which have been shown to benefit training. Given the paucity of evidence behind many of the statements, ESGE encourages further study into all facets of training in ERCP, diagnostic EUS, and therapeutic EUS in particular. ▶ **Table 2** lists potential research questions that should be prioritized by investigators with an interest in enhancing ERCP and EUS services, safety, and training quality.

Training in therapeutic EUS remains a particular challenge. Even in specialist centers, the procedure numbers for therapeutic EUS are much lower than for ERCP and diagnostic EUS. The evidence with regard to learning curves for therapeutic EUS is less robust than the equivalent data for ERCP and diagnostic EUS. Furthermore, endoscopists training in these procedures may already be experienced practitioners of ERCP and EUS, so ensuring their appropriate supervision can be particularly difficult if the individual is already an independent endoscopist. The solutions to these problems will vary between nations, but may include access to simulation, a mentoring network, and robust ongoing audit of performance. ESGE discourages unsupported endoscopists learning new therapeutic procedures on patients.

For national societies and program directors to meet the proposals in this position statement will be challenging, but there is enough evidence to suggest that, if these recommendations are delivered, the objective of the ESGE to enhance quality in ERCP and EUS will have been furthered. Training in ERCP and EUS is long and challenging but very rewarding and ESGE hopes that this position statement benefits trainees embarking on this process and helps to produce independent endoscopists capable of delivering a safe and effective service for their patients.

Disclaimer

ESGE Position Statements represent a consensus of best practice based on the available evidence at the time of preparation. This is NOT a guideline but a proposal for training in ERCP and EUS. The statements may not apply in all situations and should be interpreted in the light of specific clinical situations and resource availability. Further studies may be needed to clarify aspects of these statements, and revision may be necessary as new data appear. Clinical considerations may justify a course of action at variance with these recommendations.

This ESGE Position Statement is intended to be an educational device to provide information that may assist endoscopists in providing care to patients. They are not rules and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment.

The legal disclaimer for ESGE guidelines applies to the present position statement [65].

Competing interests

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Supplementary material

Table 1s Different types of simulators, with their own advantages and disadvantages.

Simulator	Examples	Pros	Cons
Mechanical simulators	X-Vision ERCP [1]	Low cost	Low haptic feedback
	Boskoski–Costamagna ERCP Trainer [2]	Easy assembly, good haptic feedback, all procedures in ERCP can be trained including sphincterotomy and precut Credible option for the supplementation of clinical training	(Note: Has excellent haptic feedback and uses real accessories)
	EMS ERCP Trainer [3,4]		
	Jirapinyo et al. ERCP model [5]		
Animal models – in vivo	Itoi et al. ERCP model [6]	The most human-like endoscopic experience High perceived usefulness for learning ERCP Easy use	Ethical concerns Staff needs Specific scopes Practical issues (i.e. it is extremely difficult to position in front of the papilla in pigs) Costs
Animal models – ex vivo (hybrid)	Erlangen Endo-trainer / CompactEasie C ERCP [7,8]	Intermediate realistic feel Intermediate anatomy Intermediate cost	Long preparation time Specific scopes Scenario-based sessions
	MADA ERCP model [9]		
	Fukushima EUS-FNA model [10]		
	Mumbai EUS II [11,12]		
	Porcine model for ERCP [13] and EUS [14]		
	Ex-vivo porcine model for EUS-PFCD [15]		
Computer-based/ VR simulators	GI Mentor (Simbionix) ERCP [16]	Tactile feedback system Library of clinical cases Patients' feedback (pain…) Performance metrics displayed Multiple repetitions Easy to incorporate into a fellowship program	Cost Limited in advanced training Lower realism index
	Simbionix GI-Mentor II EUS training module [17]		
	EUS Meets Voxel-Man [18]		

ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound.

Supplementary material

Table 2s Performance item checklist to structure trainee feedback following an endoscopic retrograde cholangiopancreatography.

Appreciation of indication and alternatives
Patient preparation
Equipment set-up and checking
Consent
Sedation and monitoring
Intubation of esophagus
Visualization and position relative to ampulla
Patient Comfort
Selective cannulation of target duct
Wire management
Radiology: radiation minimization and image optimization
Decision-making with regard to appropriate therapy
Sphincterotomy
Sphincteroplasty
Stone therapy
Tissue sampling
Stenting – plastic
Stenting – metal
Actions to minimize complications (prevention of pancreatitis and cholangitis)
Recognition and management of complications
Report writing
Management plan
Communication and teamwork within room
Situational awareness
Leadership
Judgement and decision-making

Supplementary material

Table 3s Performance item checklist to structure trainee feedback following an endoscopic ultrasound.

Appreciation of indication and alternatives
Patient preparation
Equipment set-up and checking
Consent
Sedation and monitoring
Intubation of esophagus
Scope positioning for image optimization
Patient comfort
Radiology: radiation minimization and image optimization
Systematic review of stations
Visualization of: mediastinal stations celiac axis tail/body of pancreas and portal venous confluence spleen liver head and neck of pancreas uncinate process bile duct from hilum to ampulla ampulla gallbladder
Tissue sampling
Actions to minimize complications
Recognition and management of complications
Report writing, including accurate description of lesions and cancer staging
Management plan
Communication and teamwork within room
Situational awareness
Leadership
Judgement and decision-making

Supplementary material

Table 4s Suggested fields for a logbook for completion by a trainee after each endoscopic retrograde cholangiopancreatography (ERCP).

Supervisor
Age/sex of patient
ERCP indication
Native papilla
First ERCP
Case complexity (Schutz 1,2,3, or 4)
Sedation/anesthesia
Procedure success and degree of supervision* for: cannulation sphincter therapy tissue acquisition stone extraction other
Complications within 28 days
Notes on procedure/learning points

* Degree of supervision defined as: 1, trainer performs or takes over; 2, significant verbal and/or hands-on support; 3, minimal verbal support; 4, independent performance.

Supplementary material

Table 5s Suggested fields for a logbook for completion by a trainee after each endoscopic ultrasound (EUS).

Supervisor
Age/sex of patient
EUS indication
Case complexity
Sedation/anesthesia
Procedure success and degree of supervision* for: identification of anatomical landmarks assessment and description of lesion FNA/FNB EUS therapy
Accuracy of FNA/FNB
Clinical success of therapeutic intervention
Complications within 28 days
Notes on procedure/learning points

FNA, fine-needle aspiration; FNB, fine-needle biopsy.

* Degree of supervision defined as: 1, trainer performs or takes over; 2, significant verbal and/or hands-on support; 3, minimal verbal support; 4, independent performance.

Supplementary material

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