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Performance measures for endoscopic ultrasound: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative – Update 2025

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ABSTRACT

The European Society of Gastrointestinal Endoscopy (ESGE) recommends that endoscopy services across Europe adopt the following six key performance measures for endoscopic ultrasound (EUS) for monitoring and evaluation in daily practice at center and endoscopist level: (**1**) informed patient consent (100 % of procedures); (**2**) adequate documentation of landmarks (≥ 90 % of procedures); (**3**) structured training and supervision for trainees, preferably using assessment tools (≥ 20 %); (**4**) standardized description of pancreatic cystic lesions (≥ 85 %); (**5**) diagnostic tissue acquisition with EUS-guided fine-needle aspiration/fine-

needle biopsy for solid lesions (≥85%); (**6**) adverse events (<5% in cystic and <3% in solid lesions). A recommendation to administer antibiotics for EUS-guided puncture of cystic lesions, included in the previous ESGE quality improvement document, has been omitted in the current version based on recent evidence.

ABBREVIATIONS

AE	adverse event
ASGE	American Society for Gastrointestinal Endoscopy
ERCP	endoscopic retrograde cholangiopancreatography
ESGE	European Society of Gastrointestinal Endoscopy
EUS	endoscopic ultrasound
EUS-FNA	EUS-guided fine-needle aspiration
EUS-FNB	EUS-guided fine-needle biopsy
GI	gastrointestinal
IPMN	intraductal papillary mucinous neoplasm
KPM	key performance measure
MRI	magnetic resonance imaging
PCL	pancreatic cystic lesion
PICO	Population/Patient, Intervention/Indicator, Comparator/Control, Outcome
QIC	quality improvement committee

Introduction

The European Society of Gastrointestinal Endoscopy (ESGE) is prioritizing the quality of endoscopy services [1]. The ESGE has published guidance documents recommending how to monitor and improve endoscopic quality for various endoscopic procedures [2–6]. For endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS), a joint guidance document was published in 2018 [7]. Owing to the increased use of EUS and the importance of its quality, the ESGE here presents guidance dedicated specifically to diagnostic EUS. This document provides an update and extension of the EUS section of the 2018 document and presents key performance measures (KPMs) for EUS applicable across Europe [7].

Methodology

Consistent with previous ESGE guidance documents in quality improvement, KPMs are required to demonstrate a significant impact on clinically relevant outcomes, be clearly defined, and allow for simple and robust measurement [2–7].

We applied the multistep approach to developing KPMs at ESGE, which has been described in detail previously [1]. The Working Group consisted of 12 individuals (the authors of this document) who met at virtual meetings once a month from August 2023 to January 2025. Additionally, a physical meeting took place in April 2024 at ESGE Days in Berlin. During the development process, the Working Group was divided into four subgroups, each working in depth on one to three KPMs.

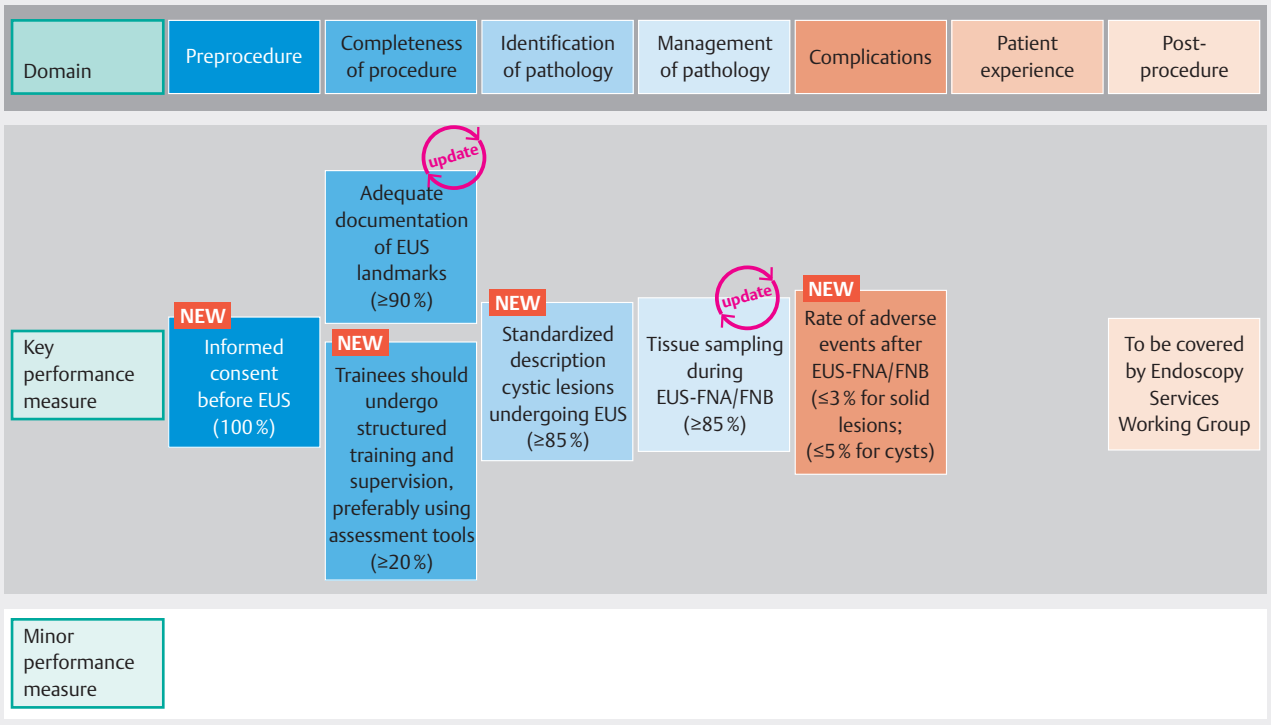
We initiated the process by reviewing all KPMs related to EUS from the previous joint ERCP/EUS quality improvement committee (QIC) paper. Additionally, newly developed KPMs were included. We aimed to apply the PICO framework (P, Population/Patient; I, Intervention/Indicator; C, Comparator/Control; O, Outcome). This framework guided the evidence searches supporting the KPMs, both for the updated and the newly developed measures. The literature was searched non-systematically by subgroup members dedicated to each of the proposed KPMs, with additional relevant publications provided by the complete working group.

An assessment of the nature of the KPMs indicated that few were suitable for GRADE assessment because either they were based on ethical or medicolegal principals or there were no appropriate comparative studies with patient-related outcomes identified (**Appendix 1 s**, see online-only Supplementary Material) [8]. The KPMs were therefore evaluated exclusively using a Delphi process. During this Delphi process, KPMs were defined or excluded based on group discussions (**Table 1 s**) [9]. The Working Group conducted four rounds of voting to finalize the performance measures within the predefined domains. In each round, the Working Group members could comment on the proposed statements, and these were included in virtual meetings conducted after each Delphi round. Statements were revised or discarded if consensus was not achieved. The threshold for a consensus was set at 80% throughout the process. The target and minimum standards were included in the Delphi process and were derived from group discussions and the literature review.

To monitor performance at either center or individual endoscopist level, we determined the number of procedures to assess each KPM. To facilitate the broader application of KPMs in all units, including smaller units that may have limited case volumes, 50 consecutive cases have been recommended by the ESGE QIC. This is 50 cases less than the previously recommended number and allows more units to continuously assess their performance [7].

Performance measures for endoscopic ultrasound

Based on evidence gathered from the literature, nine clinical statements were developed, addressing potential KPMs across five domains. Consensus was reached for six statements through four rounds of voting (▶ **Fig. 1**), while three were discarded. All were assessed to be major performance measures. Endoscopy reporting systems are crucial to facilitating data collection on the identified KPMs [10].



▶ **Fig. 1** The domains and performance measures chosen by the endoscopic ultrasound (EUS) working group. FNA, fine-needle aspiration; FNB, fine-needle biopsy.

The six KPMs address different stages of endoscopic procedures. **Table 1 s** outlines the KPMs, the agreement level during the Delphi process, measurement methods, and recommendations for integration in daily practice; agreement scores and recommended thresholds are also included. The KPMs are presented below using the descriptive framework developed by the QIC. They include a summary of the evidence and are categorized by their respective quality domains.

1 Domain: Pre-procedure

Key performance measure	Informed patient consent before EUS
Description	Informed patient consent before EUS
Domain	Pre-procedure
Category	Process
Rationale	Informed patient consent is the basis of practice of any medical treatment or procedure. Besides its ethical impact with respect to the self-autonomy of our patients, the medicolegal perspective, including liability, may be based on the failure to obtain informed consent

(Continuation)

Key performance measure	Informed patient consent before EUS
Construct	**Denominator**: Patients undergoing EUS **Numerator**: Patients giving pre-procedure informed consent **Exclusions**: Patients who are unable to provide informed consent Calculation: Proportion (%) Level of analysis: Service and endoscopist level Frequency: Yearly audit of 50 consecutive EUS-guided fine-needle aspirations
Standard	Minimum standard: 100 % Target standard: 100 %
Consensus agreement	100 %

The recommendations for informed consent when performing EUS adhere to the ESGE Position Statement “informed consent for endoscopic procedures” [11]. Patients should have the capacity and suitable time to consent to the procedure including sedation, and a systematic transparent disclosure concerning the EUS procedure, including the potential for harm, is necessary. Informed consent for diagnostic EUS in an emergency setting is very rare and, in patients who lack capacity to

consent, there should be procedures to involve a legal representative or engage people close to the patient. Information regarding indications, adverse events (AEs), and alternative diagnostics may include the recommendations from the ESGE guidelines for diagnostic and therapeutic EUS [12, 13].

2 Domain: Completeness of procedure

Key performance measures	Adequate documentation of EUS landmarks (update)
Description	Percentage of EUS reports that contain appropriate documentation of relevant landmarks (▶ **Table 1**)
Domain	Completeness of procedure/identification of pathology
Category	Process
Rationale	Endoscopists should identify and describe all landmarks in the report (according to indication)
Construct	**Denominator**: All EUS procedures **Numerator**: EUS procedures where EUS landmark documentation is adequate **Exclusions**: EUS-guided therapy. Sampling of already well-defined lesions where further anatomical overview is irrelevant Calculation: Proportion (%) Level of analysis: Service and, if necessary, individual Frequency: Yearly, for a sample of 50 consecutive procedures. If the minimum standard is not reached, analysis on an individual level should be performed
Standards	Minimum standard: 90 % Target standard: 95 %
Consensus agreement	100 %

This updated performance measure, which was initially introduced in the previous ESGE guideline, includes appropriate identification of landmarks and should be documented in at least 90 % of patients undergoing EUS [7]. Although this KPM falls under the completeness of procedure domain, in procedures with pre-procedural reporting or description of a tumor, the KPM slides into the identification of pathology domain, as detailed in ▶ **Table 1**. Each EUS examination is driven by the indication. Therefore, although the components of a complete EUS investigation will vary, the visualization and documentation of specific and standardized landmarks per indication gives a measure of the quality of the procedure.

An EUS report should include a detailed description of the endosonographic findings, and image documentation of normal and abnormal landmarks. A complete EUS report is essential to provide accurate data, especially when the findings provide clinical benefit to the patient and/or have the potential to modify the treatment strategy, facilitating multidisciplinary team management of patients and guiding the clinical and therapeutic decision-making process. As in the previous Position Statement, depending on the indication for EUS, the recommend landmarks (▶ **Table 1**) should be documented during the procedure, including the relevant and related images. Likewise, the appropriate oncological staging classification should be recorded, if indicated. Furthermore, entering the indication for EUS could permit the generation of a matching template report where certain EUS landmarks and characteristic findings are logically inserted. Moreover, there has been a keen interest in defining the EUS stations as a way to provide a practical and standardized approach to the EUS examination of specific organs [14–19]. In 2021, successful documentation of anatomical landmarks in ≥ 90 % of cases and an EUS-guided fine-needle aspiration/biopsy (EUS-FNA/FNB) accuracy rate of ≥ 85 % were suggested as being two indicators of a trainee's competence in diagnostic EUS, and we still consider a minimum standard of 90 % suitable for documentation of landmarks [20].

▶ **Table 1** Landmarks to be assessed by endoscopic ultrasound (EUS) according to the indication for the procedure.

Indication for EUS	Relevant landmarks for visualization and documentation
Mediastinal lesion/esophageal cancer	Mass/tumor
	Mediastinum (lymph nodes)
	Gastroesophageal junction
	Celiac axis and hepatogastric ligament (lymph nodes)
	Left lobe of the liver (to rule out metastatic disease)
Diseases of the pancreaticobiliary system	Visualization of the entire pancreatic parenchyma and pancreatic duct (signs of chronic pancreatitis, pancreatic cyst), ampullary area, common bile duct (stricture, dilatation stones), gallbladder, intrahepatic bile ducts, portal vein confluence, aorta and its main branches
Rectal cancer	Visualization of the tumor: location, extension, infiltration of surrounding structures
	Visualization of surrounding structures: genitourinary structures, iliac vessels, sphincter apparatus, lymph nodes
Subepithelial masses[1]	Visualization of the mass (tumor) including the exact location within the gastrointestinal wall layer, differentiation of the wall layers, signs of infiltration, lymph nodes

[1] Synonym: submucosal tumor.

Key performance measures	Formal assessment through validated tools should be used regularly during EUS training to track the learning curves of trainees and to support their feedback
Description	Percentage of EUSs performed by trainees where a formal assessment through validated tools is conducted
Domain	Completeness of procedure
Category	Process

(Continuation)

Key performance measures	Formal assessment through validated tools should be used regularly during EUS training to track the learning curves of trainees and to support their feedback
Rationale	Time and number of procedures for trainees to achieve competence using performance tools
Construct	**Denominator**: Trainees performing EUS **Numerator**: Rate of EUSs performed by a trainee with a formal assessment of competence through validated tools **Exclusions**: EUS procedures performed by a trainee where the formal assessment through validated tools is not conducted Calculation: Proportion (%) Frequency: Yearly, for a sample of 50 consecutive procedures. If the minimum standard is not reached, analysis on an individual level should be performed
Standards	Minimum standard: 20 % Target standard: 20 %
Consensus agreement	100 %

The fundamental aspects of training in EUS center around quality indicators and these were initially reported by the American College of Gastroenterology (ACG)/American Society for Gastrointestinal Endoscopy (ASGE) [21]. These quality indicators were later built upon, with international consensus leading to the publication of a core curriculum for EUS basic skills [22]. Continuous assessment of progression is fundamental in acquiring EUS skills, and it requires structured feedback and tracking of the stepwise acquisition of competencies by the trainee.

Formative and summative assessments have been described to evaluate a trainee's performance, in order to improve training in EUS [20, 23]. These tools are easy to use and to interpret, and include the Direct Observation of Procedural Skills (DOPS) or The EUS and ERCP Skills Assessment Tool (TEESAT) [23–26]. 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 [25]. TEESAT was validated for ERCP and EUS, and it has become routinely used in North American advanced endoscopy programs [27–29]. The evaluated domains in both of the tools are technical, cognitive, and nontechnical, differing from others used for ERCP, such as the Bethesda ERCP Skills Assessment Tool (BESAT; no cognitive domains were evaluated) or Grading Scale for Overall Skill in ERCP (GSOSE; solely technical) [30, 31]. Furthermore, greater engagement during the formative assessment has been demonstrated to be an independent predictor of performance [32].

Recently, a European survey answered by 41 experts and 30 trainees from 18 countries showed that 65.9 % of centers do not perform any kind of formal assessment of trainee's performance, and more than half of the training programs measure traditional benchmarks and performance metrics without the support of any assessment tool [33]. Assessment tools may be adapted to the training environment and the regular use of a personalized assessment tool, offering a "performance item" checklist for those trainers who wish to develop their own tool to structure trainee feedback, can be considered [20].

As different assessment tools are employed in different countries, the current Position Statement does not recommend any one specific tool over another; however, we broadly endorse structured and formal training, and formal assessment in one of every five procedures, as also recommended by the ASGE [29].

3 Domain: Identification of pathology

Key performance measure	Standardized description of pancreatic cystic lesions undergoing EUS
Description	Percentage of EUS reports that contain appropriate documentation of cystic lesions (**Box 1**)
Domain	Identification of pathology
Category	Process
Rationale	In patients with cystic lesions undergoing EUS, it is recommended to use a standardized description to increase reproducibility
Construct	**Denominator**: Patients undergoing EUS examination of cystic lesions **Numerator**: Rate of appropriate description of cystic lesions undergoing EUS **Exclusions**: EUS-guided therapy or assessment of solid lesions Calculation: Proportion (%) Level of analysis: Service and endoscopist level Frequency: Yearly audit of 50 consecutive EUS procedures
Standard	Minimum standard: 85 % Target standard: 90 %
Consensus agreement	100 %

The diagnosis of pancreatic cystic lesions (PCLs) is increasing owing to the widespread use of cross-sectional imaging for diverse indications. Of all patients undergoing cross-sectional imaging, 0.5 %–45 % have a PCL detected [34]. Therefore, early and accurate assessment and, if needed, treatment of PCLs may significantly improve clinical outcomes. PCLs consist mostly of pancreatic pseudocysts and epithelial cystic neoplasms, including serous cystadenomas, intraductal papillary mucinous neoplasms (IPMNs), and mucinous cystic neoplasms (MCNs). IPMNs and MCNs are often designated as mucinous cysts and exhibit a potential for malignant transformation.

Guidelines recommend pancreatic protocol computed tomography (CT) or gadolinium-enhanced magnetic resonance imaging (MRI) with dedicated magnetic resonance cholangiopancreatography (MRCP) as preferred imaging for pancreatic cyst characterization, providing details on septae, nodules, wall thickening, duct communication, and ductal dilatation

▶ **Box 1** Standardized description of cystic lesions undergoing endoscopic ultrasound (EUS).

Relevant information and characteristics of PCLs to be reported
Size
Location
▪ Head, neck, body, tail
▪ Correlation with blood vessels
Communication with pancreatic duct: yes/no/not possible to exclude
▪ If yes: side branch IPMN, mixed-type
Diameter of pancreatic duct, mm
Septal wall
▪ Enhancement: yes/no
▪ Thickening: yes (mm)/no
Presence of central scar: yes/no
Microcystic or macrocystic aspect
▪ Uni-/multilocular
▪ Micro-/macrocystic
▪ Uni-/multifocal
Mural nodules
▪ Size
▪ Vascularity (after use of contrast): yes/no
Associated mass: yes/no
Dilatation of the CBD by the cyst: yes/no

CBD, common bile duct; IPMN, intraductal papillary mucinous neoplasm; PCL, pancreatic cystic lesion.

[35–37]. As MRI often lacks specificity, EUS (with or without intravenous contrast) and EUS-FNA are valuable tools, offering detailed assessment, cytology, and fluid analysis (glucose, carcinoembryonic antigen, amylase, and molecular markers). Intravenous contrast aids in distinguishing mucin from solid nodules and can guide biopsy [38–42]. Likewise, in selected cases, needle-based confocal laser endomicroscopy and through-the-needle biopsies may be used to secure a diagnosis of the cystic lesion [43–47].

4 Domain: Management of pathology

Key performance measure	Tissue sampling during EUS-FNA/FNB (update)
Description	Frequency of obtaining a diagnostic tissue sample in EUS-FNA/FNB of solid lesions
Domain	Management of pathology
Category	Process
Rationale	Successful tissue acquisition of solid lesions during EUS-FNA/FNB

(Continuation)

Key performance measure	Tissue sampling during EUS-FNA/FNB (update)
Construct	**Denominator**: All EUS-FNA/FNBs of solid lesions **Numerator**: Rate of successful tissue acquisition from solid lesions during EUS-FNA/FNB **Exclusions**: Patients with post-surgical altered anatomy Calculation: Proportion (%) Level of analysis: Service and endoscopist level Frequency: Yearly audit of 50 consecutive EUS-FNA/FNBs
Standard	Minimum standard: 85 % Target standard: 95 %
Consensus agreement	91 %

Successful tissue acquisition is defined as obtaining a tissue sample that allows an accurate diagnosis. This updated KPM (**Table 1 s**), which raises the target standard from 90 % to 95 %, is based on new literature demonstrating high diagnostic accuracy with FNB needles and state-of-the-art techniques, and is aligned with a recently published EUS curriculum [7,48–52]. We recognize the clinical importance of successful tissue sampling in EUS. Considering the significant impact of EUS-guided fine-needle procedures (FNA or FNB), we believe this clinical quality indicator is essential as a KPM.

There are several factors that may influence the results of EUS-FNA/FNB and consequently can be optimized if the recommended threshold for this KPM is not reached [53]. Meta-analyses support the use of EUS-FNB with end-cutting needles for both pancreatic masses and subepithelial lesions [48,54] Likewise, the number of passes, fanning techniques, wet suction/slow-pull technique, and handling of the biopsy specimens may help to optimize the results [54–58]. Additionally, in the absence of rapid onsite evaluation (ROSE), which is costly and not widely available, the obtained specimens may be assessed through macroscopic onsite evaluation (MOSE), allowing visual inspection during the procedure [59,60]. These practices, recently outlined in an ESGE Technical Review, collectively enhance sample adequacy and diagnostic accuracy, helping to achieve diagnostic yield thresholds that support improved patient outcomes [61]. The percentage of patients in whom a diagnostic tissue sample is successfully obtained during EUS-FNA/FNB for solid lesions should be recorded.

5 Domain: Complications

Key performance measure	Adverse events in relation to EUS-FNA/FNB
Description	Percentage of EUS-FNA/FNBs from solid lesions with AEs (defined by an altered patient pathway owing to the AE)

(Continuation)

Key performance measure	Adverse events in relation to EUS-FNA/FNB
Domain	Complications
Category	Process
Rationale	In patients with suspected solid lesions, EUS-guided tissue acquisition may cause AEs; however, the risk should not exceed 3 %
Construct	**Denominator**: EUS-FNA/FNBs **Numerator**: Procedures with an AE **Exclusions**: EUS-guided therapy Calculation: Proportion (%) Level of analysis: Service and endoscopist level Frequency: Yearly audit of 50 consecutive EUS-FNAs
Standard	Minimum standard: 5 % for cystic lesions and 3 % for solid lesions (maximum standard) Target standard: 5 % for cystic lesions and 3 % for solid lesions (maximum standard)
Consensus agreement	100 %

Diagnostic EUS is generally regarded as a safe procedure. The incidence of AEs after EUS-guided tissue acquisition is low for solid pancreatic masses (2.1 %–3.4 %), pancreatic cysts (2.7 %–5.5 %), and subepithelial gastrointestinal (GI) lesions (1.3 %–7.7 %); however, it can reach up to 20 % for lower GI lesions [51, 62–66]. We based our recommendations on what should be considered the minimum standards for complication rates, following a balanced assessment of the literature and discussion during the Delphi process.

The rate of AEs associated with EUS-FNA and EUS-FNB needles has been reported to be comparable across diverse types of lesions and specifically for pancreatic lesions, according to recent systematic reviews [65, 67]. Conversely, regarding subepithelial lesions, a slightly higher rate of AEs has been observed with EUS-FNB compared with EUS-FNA (0.9 %–7.7 % vs. 1.0 %–4.5 %) [51]. Although an older randomized controlled trial reported fewer complications with the use of 25G FNA needles, more recently published reports have not found needle size to be a predictor of AEs [55, 68, 69]. The size and location of the tumor or the number of passes does not affect the AE rate [66].

EUS-guided tissue acquisition is considered by the ESGE to be a high risk procedure in terms of the risk of bleeding [70]. In patients not on antithrombotic therapy, the bleeding risk is 0.8 %–0.9 % and 0.2 % for severe bleeding [71, 72]. In patients on antithrombotic therapy, the overall bleeding risk is 4.5 % for patients on direct oral anticoagulants (DOACs), 2.8 %–2.9 % for those on warfarin, and even higher with heparin bridging [71, 73]. Discontinuation of antithrombotic treatment prior to EUS-guided tissue acquisition is generally recommended, but further studies are needed to evaluate the risk of thromboembolism in these patients [71].

In terms of other AEs, pancreatitis is encountered after EUS-guided tissue acquisition in 0.7 % of the cases for solid pancreatic lesions and 0.9 %–3.0 % for pancreatic cysts, while infection is noticed in 0.4 %–0.9 % of the cases for pancreatic cysts [65, 66, 74–77]. The association of preoperative EUS-guided tissue acquisition for pancreatic cancer with tumor seeding is controversial. The risk was 0.9 %–3.4 % in two retrospective studies [78, 79], particularly elevated when using a transgastric sampling approach for adenocarcinomas, while four other retrospective studies failed to establish an association between performing EUS-FNB and the presence peritoneal carcinomatosis [80–83].

Conclusions

These performance measures, developed through evidence-based consensus, can be applied to EUS within the endoscopy community. Given the somewhat unexplored nature of this field, GRADE methodology was not applicable owing to the lack of relevant studies and we instead based our recommendations on a strict Delphi process. The association between KPMs in EUS and clinical outcomes is not as well established as in colonoscopy and even upper GI endoscopy [84–87]. This highlights a key research priority, primarily to audit the proposed KPMs and evaluate their impact on clinical outcomes.

A key update in the current paper is the recommendation not to support routine antibiotic prophylaxis before EUS-FNA/FNB of PCLs (**Appendix 1 s**). This contrasts with the ASGE (2015) guideline and the current ESGE (2017) guideline, both of which supported prophylaxis based on limited evidence [56, 88]. New data, including a randomized controlled trial and two supporting meta-analyses, show that infection rates after EUS-FNA of PCLs are very low (< 1 %), regardless of antibiotic use [74, 89, 90]. These findings support omitting prophylaxis in cases where the cyst is completely aspirated and are in line with a recently published Technical Review by the ESGE, which included a comprehensive review of the literature and provided a strong recommendation with moderate quality of evidence against the routine use of antibiotic prophylaxis in this setting [61].

This paper, like other ESGE quality improvement documents, is intended to be a working document used by national member societies, endoscopy units, or individual endosonographers to monitor their EUS performance and pinpoint areas with potential for improvement. Implementing performance measures is crucial to identify services and individual endoscopists with lower performance levels. It is important to note that there are no legal implications associated with the ESGE QIC initiative, as these documents are not guidelines, but rather guidance on monitoring quality across all aspects of GI endoscopy. Feedback from these audits can be used to recognize areas that can be ameliorated with the goal of improving quality, surpassing the proposed minimum thresholds. This is not aimed at penalizing specific endoscopists, but rather as a guiding tool to enhance patient outcomes and provide necessary training and support to endoscopists.

A potential barrier may be the perceived financial implications of setting up a quality control system. The ESGE is currently providing users with a web-based app (https://www.esge.com/esge-quality-check-app), which facilitates an anonymous system for inserting the variables to calculate KPMs. We believe that, as hospital accreditation gains importance, hospital administrations will be more inclined to support such initiatives.

The goal of setting performance measures is to improve the quality of endoscopy. We encourage individual endoscopists and heads of endoscopy units to adopt these performance measures promptly. Given EUS is amongst the most complex endoscopic examinations, it is imperative to establish performance measures to monitor both endoscopist and unit performance. Furthermore, it is our responsibility to our patients to overcome individual or financial barriers to ensure the highest quality of endoscopy services and to establish research priorities that will inform the next generation of performance measures.

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Contributors' Statement

John Gásdal Karstensen: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing - original draft. Wafaa Ahmed: Data curation, Investigation, Writing - review & editing. Andrea Anderloni: Data curation, Investigation, Writing - review & editing. Dirk Domagk: Conceptualization, Data curation, Investigation, Writing - review & editing. Antonio Facciorusso: Data curation, Investigation, Methodology, Writing - review & editing. Marcus Hollenbach: Data curation, Investigation, Writing - review & editing. Evangelos Kalaitzakis: Data curation, Investigation, Writing - review & editing. Jan Werner Poley: Data curation, Investigation, Writing - review & editing. Suzane Ribeiro: Data curation, Investigation, Writing - review & editing. Andrada Seicean: Data curation, Investigation, Writing - review & editing. Ilaria Tarantino: Data curation, Investigation, Writing - review & editing. Monika Ferlitsch: Conceptualization, Data curation, Investigation, Methodology, Project administration, Supervision, Validation, Writing - review & editing.

Competing interests

J.G. Karstensen has provided consultancy for Ambu (2021 to present), Biodexa (2024 to present), Boston Scientific (2020 to present), Olympus (2025), and SNIPR BIOME (2019 to present), and has received speaker's fees from Olympus (2025) and Norgine (2018 to present). A. Anderloni has received consultancy and speaker's fees from Boston Scientific and Olympus (2020 to present). D. Domagk has provided free consultancy for Nexus E&L (June 2023 to present). M. Hollenbach has received honoraria for lectures and expert panels from Fuji (2019 to 2023). J.-W. Poley has received consultancy and speaker's fees and travel support from Pentax Medical (2015 to present), and provided consultancy to Boston Scientific (2105 to present). I. Tarantino has received consultancy fees from Olympus (2022 to present). W. Ahmed, A. Facciorusso, E. Kalaitzakis, S. Ribeiro, A. Seicean, and M. Ferlitsch declare that they have no competing interests.

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Supplementary Material

Performance measures for endoscopic ultrasound: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative – Update 2025

Appendix 1s: PICOs

Pre-procedure

Antibiotic prophylaxis: Adequate indication for administration of antibiotics in patients undergoing EUS

Professor Dirk Domagk & Dr Marcus Hollenbach

PICO no	Clinical Question	Population	Intervention	Comparator	Outcomes	Minimum standard	Target standard
1	Should prophylactic antibiotic administration administered before EUS-guided puncture of cystic lesions?	Patients undergoing EUS-FNA/FNB from cystic lesions	Administration of antibiotics	No administration of antibiotics	Preventing an inflammation / infection	90%	95%

Identification of Pathology

Tissue sampling during EUS-FNA/FNB (update)

Professor John Gásdal Karstensen

PICO no	Clinical Question	Population	Intervention	Comparator	Outcomes	Minimum standard	Target standard
12	In patients with solid lesions, what is the target rate of successful tissue acquisition during EUS-FNA/FNB?	Patients with solid lesions undergoing EUS-FNA/FNB	EUS-FNA/FNB	None	Correlation between the rate of successful diagnostic tissue acquisition and patient survival	In patients with solid lesions, what is the target rate of successful tissue acquisition during EUS-FNA/FNB?	85%

Table 1s Overview of Delphi rounds

Topic		Round 1	Comments	Statement for Round 2	Round 2	Comments	Statement for Round 3	Comm for R3	Round 3	Comments	Domain for KPM	PKPM	Round 4	Comments
Domain 1 - Pre-procedure														
Antibiotic prophylactics before EUS-guided puncture of cystic lesion	**Description:** The percentage of patients with prophylactics antibiotics before EUS-guided puncture of cystic lesions **Demoninator**: Patients undergoing EUS-guided puncture in cystic lesions **Numerator:** Patients receiving antibiotics **Exclusion:** Patients who are undergoing antibiotic treatment **Minimum standard:** 90% **Target standard:** 95%	87,50%	1. Both ASGE and ESGE recommend adminstration. However, the current evidence is not very robust and practise differs 2. The incidence of infectious complications in studies that used antibiotic prophylaxis was low (0 – 1.4 %), suggesting a protective effect. However, a retrospective comparative study showed no protective effect of peri-interventional antibiotic treatment, and there is a lack of prospective comparative studies. Despite the lack of convincing evidence, several guidelines recommend peri-interventional antibiotic treatment for EUS-FNA of PCLs. Due to potentially catastrophic consequences of mediastinal infection, guidelines and reviews regard EUS-FNA of mediastinal cysts to be contraindicated. By contrast, EBUS-TBNA of mediastinal cysts seems to carry an acceptable risk. Infectious complications after EUS-FNA of (peri-) rectal lesions are rare, not justifying peri-interventional antibiotics. 3. There is an evidence that it may not make any difference. Role to reduce antibiotic use given increasing antimicrobial resistance.	This PICO was discarded following the Delphi process										
Patients informed consent	**Description:** The percentage of patients with informed consent before undergoing EUS **Demoninator**: Patients undergoing EUS-guided puncture of cystic lesion **Numerator**: Patients giving preoperative informed consent **Exclusion:** Patients who are unable to provide informed consent **Minimum standard:** 95% **Target standard**: 95%	87,50%	All patients should be giving informed consent								**Domain 1 Pre-procedure**	**Informed patient consent before EUS**	100%	
Domain 2. Identification of pathology														
EUS with two passes	**Description:** Percentage of EUS conducted with two passes of imaging **Demoninator:** Patients undergoing EUS **Numerator:** Rate of EUS with two passes **Exclusion:** EUS-guided therapy. Sampling of already well-defined lesions where further anatomical overview is irrelevant **Minimum standard:** 80% **Target standard:** 90%	62,50%	1. No sufficient evidence and does not align with current guideline 2. should not also be 90/95%? Should we change to something along the lines of reproducible findings from 2 different views/ stations?	Was discarded following the Delphi process										
Adequate documentation of EUS landmarks	**Description:** Percentage of EUS reports that contain appropriate documentation of relevant landmarks: (Esophageal cancer: visualization of the tumor, mediastinum (lymph nodes), gastroesophageal junction, celiac axis (lymph nodes) and left lobe of the liver (to rule out metastatic disease). Diseases of the pancreato-biliary system: Visualization of the entire pancreas (signs of chronic pancreatitis, pancreatic cyst) pancreatic duct, common bile duct (stricture, dilation, stones). Rectal cancer: visualization of the tumor :location, extension, infiltration of surrounding structures; visualization of surrounding structures: genitourinary structures, iliac vessels, sphincter apparatus, lymph nodes) For subepithelial masses (synonym: submucosal tumor): Visualization of the mass (tumor) including the exact location within the gastric wall layer, differentiation of the wall layers, signs of infiltration, lymph nodes. **Demoninator:** All EUS procedures Numerator: EUS procedures where EUS landmark documentation is adequate **Exclusion:** EUS-guided therapy. Sampling of already well-defined lesions where further anatomical overview is irrelevant **Minimum standard**: 90% **Target standard:** 95%	100%	Subepithelial lesions - I would put gastrointestinal wall layer	**Adequate documentation of EUS**	100%	1. Should we add the relation with the aorta, diafragma of esophageal cancers? Our surgeons/radiotherapist always want to know if there is still a free plan between tumor and aorta. For the surgeons this can mean unresectability and for the radiotherapist (aorta- risk of bleeding). 2. I would add papillary region assessment to disease of bilio-pancreatic system					**Domain 2. Completeness of procedure**	**Adequate documentation of EUS landmarks (update)**	100%	
Trainees conducting EUS under supervision	**Description:** Percentage of EUS conducted by trainees, which are conducted under supervision **Demoninator:** Trainees performing EUS **Numerator:** Rate of EUS conducted by a trainee under supervision **Exclusion**: EUS procedures that are not conducted by trainees **Minimum standard:** 80% **Target standard:** 85%	87,50%	1. This is a tricky one, but very interesting. I can support it, but we may rephrase sligtly and include our doubts in the text 2. I am not quite sure whether I am getting the goal of the description correctly. Do we intend to figure out the quality of teaching/supervision in trainees or do we ask for keeping the EUS teaching as high as possible. 3. Is this the percentage during training? Initial phase should be 100%. Could we be more descriptive about it? 4. All trainees should be under some kind of supervision, Would be in favor of increasing the target standard.	**Trainees conducting EUS should undergo structured training and supervision preferably with assessments tools such as [Direct Observation of Procedural Skills (DOPS) or The EUS and ERCP Skills Assessment Tool (TEESAT)]**	100%		**Trainees conducting EUS should undergo structured training and supervision preferably with assessments tools such as [Direct Observation of Procedural Skills (DOPS) or The EUS and ERCP Skills Assessment Tool (TEESAT)]**	*Different assessment tools are recommended in different countries. We endorse structural training, but will not recommend a certain tool*	100%	I would prefer the following statement:Trainees conducting EUS should undergo structured training and supervision Structure training might be assessed by well established assessments tools such as [Direct Observation of Procedural Skills (DOPS) or The EUS and ERCP Skills Assessment Tool (TEESAT)]	**Domain 2. Completeness of procedure**	**Formal assessment through validated tools should be used regularly during EUS training to track the learning curve of the trainees and to support their feedback**	100%	
Photodocumentaries and annotation	**Description:** Percentage of EUS with adequate photodocumentaries and annotation of landmarks and pathological findings **Demoninator:** Patients undergoing EUS **Numerator:** Rate of adequate photodocumentaries and annotation **Exclusion:** EUS-guided therapy **Minimum standard:** 85% **Target standard:** 90%	100%	would increase to 90/95%	Was discarded following the Delphi process										
Standardized description of cystic lesions undergoing EUS	**Description:** Percentage of EUS reports that contain appropriate documentation of cystic lesions (Size, location, communication with PD, diameter PD, mural noduls enhanced/not, associated mass, septae wall) **Demoninator:** Patients undergoing EUS examination of cystic lesions **Numerator:** Rate of appropriate description of cystic lesions undergoing EUS **Exclusion:** EUS-guided therapy **Minimum standard:** 85% **Target standard:** 90%	100%	1. I strongly support the recommendations of a standardized documentation, but I am open to alterations of the specific content 2. same here 90/95								**Domain 2. Identification of pathology**	**Standardized description of pancreatic cystic lesions undergoing EUS**	100%	

Topic		Round 1	Comments	Statement for Round 2	Round 2	Comments	Statement for Round 3	Comm for R3	Round 3	Comments	Domain for KPM	PKPM	Round 4	Comments
Domain 3. Complications														
Adverse events in relation to EUS-FNA/FNB	**Description:** Percentage of EUS-FNA/FNB from solid lesions with adverse events **Demoninator**: EUS-FNA/FNB from solid lesions **Numerator:** Adverse events rate **Exclusion:** EUS-guided therapy **Minimum standard**: 5% **Target standard:** 5%	100%	1. Is here minimum or maximum standard? 2. A lower AE rate reported in literature, however the guidance needs to be applicable across all centres carrying out FNB not just high volume	**Adverse events in relation to EUS-FNA/FNB (defined by altered patient pathway due to AE)**	90%	1. 3% 2. The definition of all AE should be well listed in the text	**Adverse events in relation to EUS-FNA/FNB (defined by altered patient pathway due to AE)**	*The minimum and target standards differ for cystic and solid lesions)*	100%		Domain 5. **Complications**	**Adverse events (AE) in relation to EUS-FNA/FNB**	100%	Minimum standard should be 0%
Domain 4. Procedure														
Tissue sampling during EUS-FNA/FNB	**Description**: Percentage of successful tissue acquisition from solid lesions from EUS-FNA/FNB **Demoninator:** All EUS-FNA/FNB of solid lesions performed **Numerator:** Rate of successful tissue acquisition of solid lesions during EUS-FNA/FNB **Exclusion:** Patients with post-surgical altered anatomy **Minimum standard:** 85% **Target standard**: 90%	100%									**Domain 4.** Management of Pathology	**Tissue sampling during EUS-FNA/FNB (update)**	91%	As said during the call, don't agree with 85% as minumum standard. I would propose 90%

