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Original research

UK and Ireland Joint Advisory Group (JAG) consensus statements for training and certification in diagnostic endoscopic ultrasound (EUS)

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ABSTRACT

Background and aims International endoscopy societies vary in their approach for credentialing individuals in endoscopic ultrasound (EUS) to enable independent practice; however, there is no consensus in this or its implementation. In 2019, the Joint Advisory Group on GI Endoscopy (JAG) commissioned a working group to examine the evidence relating to this process for EUS. The aim of this was to develop evidence-based recommendations for EUS training and certification in the UK.

Methods Under the oversight of the JAG quality assurance team, a modified Delphi process was conducted which included major stakeholders from the UK and Ireland. A formal literature review was made, initial questions for study were proposed and recommendations for training and certification in EUS were formulated after a rigorous assessment using the Grading of Recommendation Assessment, Development and Evaluation tool and subjected to electronic voting to identify accepted statements. These were peer reviewed by JAG and relevant stakeholder societies before consensus on the final EUS certification pathway was achieved.

Results 39 initial questions were proposed of which 33 were deemed worthy of assessment and finally formed the key recommendations. The statements covered four key domains, such as: definition of competence (13 statements), acquisition of competence (10), assessment of competence (5) and postcertification mentorship (5). Key recommendations include: (1) minimum of 250 hands-on cases before an assessment for competency can be made, (2) attendance at the JAG basic EUS course, (3) completing a minimum of one formative direct observation of procedural skills (DOPS) every 10 cases to allow the learning curve in EUS training to be adequately studied, (4) competent performance in summative DOPS assessments and (5) a period of mentorship over a 12-month period is recommended as minimum to support and mentor new service providers.

Conclusions An evidence-based certification pathway has been commissioned by JAG to support and quality assure EUS training. This will form the basis to improve quality of training and safety standards in EUS in the UK and Ireland.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Endoscopic ultrasound (EUS) is an advanced endoscopic procedure involving real time acquisition and interpretation of radiological images.
- ⇒ Indicators of competence include the ability to T-stage lesions, tissue acquisition through fine needle aspiration or biopsy and demonstration of image acquisition through photo documentation.
- ⇒ Development of competence is difficult and requires dedicated training in high-volume centres. There is no well established pathway for training and accrediting in EUS.

WHAT THIS STUDY ADDS

- ⇒ We have outlined a formalised framework for training and accreditation in EUS through a modified Delphi process for the first time in the UK and Ireland.
- ⇒ Accreditation criteria include having performed at least 250 procedures before an assessment of competency can take place (including 125 pancreatic cases), 75 cases involving FNA/B (>85% adequacy rate) and photo documentation in >90% cases.
- ⇒ Trainees need to be rated as “independent” by two different assessors to be signed off as competent in EUS.

INTRODUCTION

Endoscopic ultrasound (EUS) is an advanced endoscopic procedure, which combines endoscopy with acquisition and interpretation of radiological images. To achieve competency in EUS requires dedicated and supervised high-quality training. In 2011, a working party published a consensus on the future of UK EUS service provision and training.¹ Their proposed training framework included: an understanding of safe and appropriate endoscopic practice, a working knowledge of the clinical management



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HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE, OR POLICY

- ⇒ This pathway is being launched in conjunction with the Joint Advisory Group on GI Endoscopy Training System (JETS) EUS logbook.
- ⇒ There has been lack of high-quality evidence related to training in EUS. Data from JETS will provide a national picture on trainees' progress, which will inform future research on learning curves on EUS.
- ⇒ This framework will allow EUS centres to implement a structured and dedicated training pathway for advanced endoscopy trainees. This will address the unmet need for competent endosonographers in the UK and Ireland.

of those conditions for which EUS may be requested, an understanding of the strengths and weaknesses of EUS in comparison to alternative imaging modalities, an understanding of regional anatomy, the principles of medical ultrasound, an appreciation of tissue acquisition for cytopathology and histopathology assessment. However, it did not highlight specific ways in which trainees should be credentialled for independent practice.

In 2018, the European Society of Gastrointestinal Endoscopy (ESGE) published key performance indicators (KPIs) for the practice of endoscopic retrograde cholangiopancreatography (ERCP) and EUS.² Although the focus was primarily ERCP, recommendations for EUS included the identification of pathology in terms of tissue sampling and documenting EUS landmarks.

In the UK, the Joint Advisory Group on Gastrointestinal Endoscopy (JAG) is responsible for setting standards of endoscopy training and certification.³ JAG certification is a national and standardised process in the UK whereby a trainee formally credentials for independent endoscopic practice. It has been awarded since 2011 for gastroscopy, flexible sigmoidoscopy and colonoscopy⁴ and the pathways for ERCP and gastroscopy have recently been published.^{5,6}

Following consultations with the UK Specialist Advisory Committees, an expert committee was commissioned by JAG Quality Assurance of Training Working Group to prepare for a Delphi process to work towards a certification process for diagnostic EUS.

Aims and scope

The aim of this Delphi process was to develop a robust set of recommendations which would form the framework of EUS certification for trainees within the UK. Specifically, recommendations were made in the following areas:

1. Definition of competence.
2. Acquisition of competence.
3. Assessment of competence.
4. Postcertification mentorship.

The following aspects were not included within the scope of this guideline:

- ▶ Therapeutic EUS procedures.
- ▶ Rectal EUS and endobronchial ultrasound.
- ▶ Paediatric EUS.
- ▶ Upskilling for established independent endoscopists.
- ▶ Trainees or practitioners in whom the majority of EUS training has been undertaken outside the UK or before implementation of this document.

METHODS**Guideline development**

A modified Delphi process was used to develop consensus-based recommendations on training and certification in EUS with representation from UK and Ireland training bodies, trainees and representation from key stakeholder societies which included:

- I. JAG for GI Endoscopy.
- II. British Society of Gastroenterology.
- III. UK and Ireland EUS Society (UKIEUS).
- IV. British Society of Gastrointestinal and Abdominal Radiology (BSGAR).
- V. Association of Upper Gastrointestinal Surgeons (AUGIS).
- VI. Pancreatic Society of Great Britain and Ireland.

The panel was representative of the structure of EUS services in the UK and Ireland where most EUS is performed in teaching hospitals by gastroenterologists and the invitees constituted a significant percentage of practising echoendosonographers. A cross section of 24 women and men representing both trainees and consultants independently practising in EUS were invited from the fields of radiology, surgery and gastroenterology and both district general and teaching hospitals. 19 agreed to participate in the process (online supplemental file 1). One of the participants (KS) has lead previous UK Delphi processes in colonoscopy, gastroscopy, flexible sigmoidoscopy and ERCP.⁵⁻⁸

Consensus process

The process started in December 2019. Due to the COVID-19 pandemic, meetings were conducted via teleconferencing. Problem areas for investigation were identified systematically in a two-stage process. In the first stage, problem areas were proposed among the working group leads to frame the discussion for each subsection. In the second stage, these initial proposals were circulated to the whole panel for consideration with refinements via open-ended discussions over two teleconferences. Participants were allocated to four working groups corresponding to the four domains of the guideline. Each working group was then tasked with answering the questions relevant to their section, using a Population, Intervention, Comparator and Outcome format where possible. Procedure-based outcomes were favoured over patient-based outcomes as there is very little evidence on the effect of training in EUS on patients. Literature searches were conducted by independent working groups on major databases including The Cochrane Database of Systematic Reviews, Embase and Medline. Appraisals of papers were performed independently by each subgroup. Results for each question were collated and summarised into a recommendation statement.

Recommendations were appraised using the Grading of Recommendation Assessment, Development and Evaluation framework.⁹ The level of evidence and strength of recommendation were provided for each statement. Given the paucity of evidence around EUS training, statements were permitted to receive discordant recommendations if the statements were deemed to be integral to training and certification.

Following the first round of open-ended discussion, the statements were subjected to two rounds of anonymised online voting (Typeform, Spain). Participants rated each statement on a 5-point Likert Scale (strongly disagree, disagree, neither agree nor disagree, agree and strongly agree). Eighty per cent or more agreement was the specified a priori threshold to accept a statement; ratings of 'agree' or 'strongly agree' indicated agreement. Panellists were able to submit anonymised feedback on statements. Statements that did not meet the 80% agreement

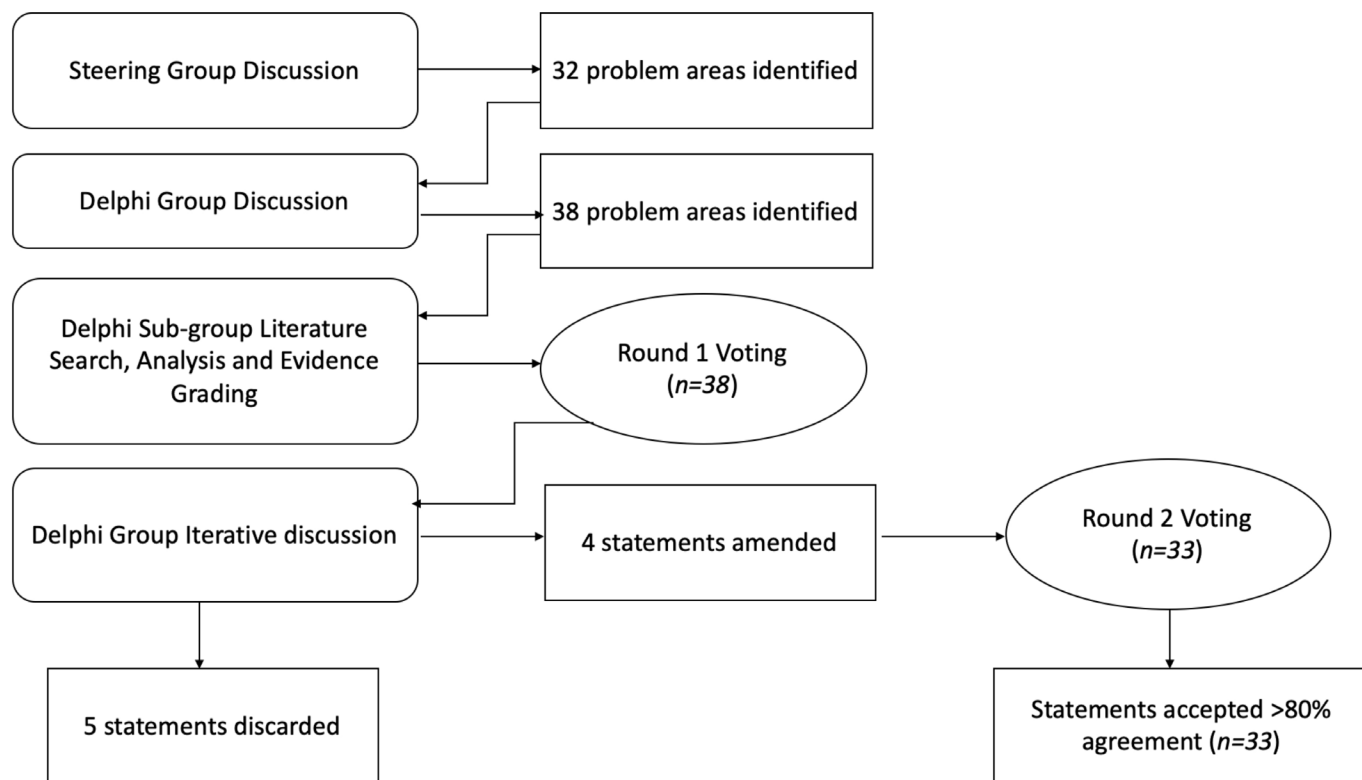


Figure 1 EUS Delphi consensus process. EUS, endoscopic ultrasound.

threshold after the first vote were subjected to iterative discussion via teleconference call and either discarded or amended for the final round of voting. Statements that did not achieve 80% agreement after the second round were discarded and the Delphi was closed. The process is outlined in [figure 1](#).

Statements were circulated to members of stakeholder societies (JAG, AUGIS, BSGAR) for analysis and appraisal with each given the opportunity of reply before statements were accepted. Statements were then included in the final EUS certification pathway ([figure 2](#)).

Recommendation statements

In total 33 recommendations statements were accepted for the following domains:

1. Definition of competence (13 statements).
2. Acquisition of competence (10 statements).
3. Assessment of competence (5 statements).
4. Postcertification mentorship (5 statements).

A full list of subsequent recommendations is highlighted in [table 1](#). The group also agreed auditable KPIs that would act as a benchmark for competent independent practice for incorporation into the JAG Endoscopy Training System (JETS) to bring EUS in line with other endoscopy accreditation in the UK

Definition of competence in performing diagnostic EUS

Diagnostic EUS is described as the imaging modality of EUS with and without tissue acquisition with fine-needle aspiration or biopsy (FNA/B) needles. (Strong recommendation, low-quality evidence).

Consensus: 89%

EUS is both an endoscopic and imaging modality and so competency in EUS can be defined as being able to perform independently both the endoscopic and imaging component of the procedure. Much of EUS involves lesion identification and

assessment so a competent operator must be able to perform tissue acquisition safely using FNA or FNB needles.¹ For a successful diagnostic EUS study without biopsy the endoscopist should be able to insert the echoendoscope to the desired level within the gastrointestinal tract dictated by the remit of the study, perform a structured station assessment and identify recognised anatomical landmarks specific to that study. (Strong recommendation, moderate quality evidence).

Consensus: 100%

There are two main types of study for diagnostic gastrointestinal EUS (1) upper gastrointestinal imaging (including the posterior mediastinum) and (2) hepatopancreaticobiliary (including retroperitoneal) EUS. Both involve the placement of the echoendoscope through the oesophagus, gastro-oesophageal junction and stomach; the latter also involves placement into the duodenal bulb and D2 in a safe manner while acquiring adequate imaging of relevant structures (online supplemental file 2). Operators may choose to practise in one or both disciplines and must be able to adequately visualise and if appropriate sample relevant structures.

The ASGE and ESGE recognise anatomical landmark identification as an important measure of quality endoscopy.¹⁰ A multicentred prospective study examining learning curves for EUS trainees incorporated landmark identification as part of competency assessment.¹¹ The extent of the EUS exam will vary depending on the clinical indication. As such, KPIs relating to procedure completion must be matched to the indication (online supplemental file 2).

EUS competence requires both cognitive and technical abilities and should be defined as the ability to independently carry out effective diagnostic procedures across a spectrum of case mix and context with acceptable safety. (Moderate recommendation, low-quality evidence)

Consensus: 89%

Proposed pathway for Training and Certification in Endoscopic Ultrasound		
Criteria 1) Personal 2) Unit	<p>PERSONAL Criteria: Commitment to EUS training and practice at consultant level JAG accreditation: - Desirable: competent in diagnostic OGD +/- with some experience in therapeutic OGD - Approval from Endoscopy Training Lead, trainer +/- Program Director</p> <p>TRAINING UNIT Criteria: - lead trainer has attended an EUS TTT course - commitment for delivery of training within a structured training programme (e.g. within a fellowship) - JAG accredited unit - initial meeting with trainee (outside of Endoscopy): introduction to the program</p>	
↓		
Training Begins		
Early Training	Register with JETS e-portfolio <i>If available, attend:</i> - Induction meeting and simulation sessions - abdominal ultrasound lists - period of "hands-off" e.g. 50 cases prior to starting e.g. by use of local libraries, online resources or better still in room observation Book JAG BASIC EUS skills course (& Certificate) Begin hands-on training in an EUS training Centre	Procedural Key Performance Indicators - Upload hands-on procedures to JETS - 1 DOPS every 10 procedures - Minimum of 1 reflection every 50 cases Regular appraisal with trainer e.g. - at no 50, 75, 100, 150, 200 and < 250
Later Training	↓	Attendance at HPB / UGI MDT meetings Text, journal, and online digital resources
	Continued hands-on + cognitive skills training Live courses	
↓		
Completion of Training		
Summative Assessment	<p>Eligibility: - At least 250 "hands on" EUS cases on JETS - (including 125 cases pancreatic cases) Within last 3 months - KPIs achieved in >= 15 cases - photo documentation of anatomical ultrasound landmarks > 90% - physically unassisted > 85% cases (min 10) Case remit achieved in > 85% - 75 cases should involve EUS FNA/B of which 50 are pancreatic or other solid lesions & adequacy > 85% - Rated for independent practice in over 80% of 5 recent formative DOPS within 3 months and none requiring maximum supervision</p> <p>DOPS to include at least: - 3 cases of pancreas, bile ducts, ampulla of Vater - 1 case oesophagogastric and posterior mediastinal / lymph node assessment</p>	<p>Summative process</p> <p>- Total of 2x summative DOPS - By 2x different assessors (1 of whom is not based in current endoscopy unit)</p> <p>- Competence in all items</p>
↓		
Trainee Certified as Independent in Diagnostic Endoscopic Ultrasound		
↓		
Mentorship and Service Provision		
Post Certification as a Service Provider	<p>EUS practitioners should benefit from - arrangements for support, performance monitoring and review - Practitioners should perform > 100 cases per year, including FNA(B) - appropriate caseload selection underpinned by attending MDTs relevant to the trainee's future practice and M+M meetings</p> <p>Candidates should have the opportunity to join their local network meeting (or create one)</p> <p>Independent practice in therapeutic EUS will require specific training</p>	<p>Period of Post - Certification Mentorship - Mentorship may take place outside their respective unit</p> <p>- Introduction meeting outside of the unit thus, setting expectations - then 3 monthly progress reviews - Initial 1-year time frame as a minimum - Final sign off meeting (informal agreements for further mentorship however can be made)</p>

Figure 2 JAG EUS certification pathway. DOPS, direct observation of procedural skills; EUS, endoscopic ultrasound; FNA/B, fine-needle aspirations/ biopsies; HPB, hepatobiliary; JAG, endoscopic ultrasound; JETS, JAG Endoscopy Training System; KPI, multidisciplinary team; MDT, multidisciplinary team; M+M, morbidity and mortality; OGD, oesophagogastrroduodenoscopy; TTT, train the trainers.

Table 1 Summary of recommendations for training and certification in EUS

1.1	Diagnostic EUS is described as the imaging modality of EUS with and without tissue acquisition with fine-needle aspiration or fine-needle biopsy needles.
1.2	For a successful diagnostic EUS study without biopsy the endoscopist should be able to insert the echoendoscope to the desired level within the gastrointestinal tract dictated by the remit of the study, perform a structured station assessment and identify recognised anatomical landmarks specific to that study (online supplemental file 2).
1.3	EUS competence requires both cognitive and technical abilities and should be defined as the ability to independently carry out effective diagnostic procedures across a spectrum of case mix and context with acceptable safety.
1.4	The endoscopist must be able to effectively identify and precisely describe the gastrointestinal wall layers and peri-lesional structures to demonstrate the likely origin of a submucosal mass or for T-stage evaluation.
1.5	Comprehensive understanding of the anatomical landmarks is mandatory for safe EUS guided tissue acquisition including for non-gastrointestinal tumours (eg, lung cancer, sarcoma) where understanding of relevant posterior mediastinal anatomical landmarks is necessary.
1.6	It is necessary to have a working knowledge of ultrasound, the ultrasound console, radiological descriptions of normal anatomy and radiological descriptions of pathological changes. The endoscopist must be able to acquire, optimise and capture ultrasound images.
1.7	Tissue acquisition: It is desirable that 75 EUS FNA/FNB (including 50 pancreatic lesions) are performed during training and the endosonographer will be required to demonstrate proficiency in the use of FNA/FNB EUS needles.
1.8	When performing tissue acquisition the endoscopist should demonstrate the ability to document sampled area, needle sizes used, type of needle along with no of passes for audit and safety purposes. A tissue adequacy rate of 85% should be the aim for solid pancreas masses.
1.9	An overall 30-day case complication rate of <5% of the EUS caseload is expected.
1.10	The endoscopist must demonstrate ability to write a comprehensive, structured, and descriptive EUS report with a final provisional diagnosis. All stations and the abnormality should be reported in detail including size, location, echogenicity, TNM staging (if appropriate) as well as peri- and postprocedural complications.
1.11	The endoscopist is expected to photo-document ultrasonographic anatomical landmarks relevant to the focus of the examination (see online supplemental file 4) in >90% of procedures and upload to PACS or appropriate software.
1.12	The endoscopist should photo-document ultrasonographic and endoscopic images of pathology identified using appropriate tools including Doppler, callipers to measure size and needle placement to upload to a picture archiving and communication system (PACS) or appropriate software.
1.13	The endoscopist demonstrates a professional attitude towards procedural safety and patient care including the practice of endoscopic non-technical skills of EUS (ie, communication skills, situational awareness, leadership and judgement).
2.1	JAG accreditation in gastroscopy is desirable. The endoscopist should be sufficiently competent to safely insert a gastroscope to D2 independently.
2.2	Trainees should demonstrate their desire and commitment to perform independent practice in EUS at consultant level.
2.3	For EUS certification, UK trainees are required to attend a JAG accredited basic EUS skills course, ideally in the early stages of their EUS training.
2.4	Trainees are recommended to use digital resources and attend live endoscopy courses and conferences to become familiar with EUS techniques and accessories.
2.5	Trainees are required to show evidence of attendance at multidisciplinary meetings
2.6	Training should be delivered at specific levels to include: A. Assessment of indications and potential complications for the procedure, individualised consent and review of imaging immediately prior to each case. B. Trainees should spend a period familiarising themselves with image acquisition and interpretation prior to echoendoscope handling. This should be a combination of observing EUS cases and spending time with ultrasonographers. C. Formal hands-on training should use the EUS Train the Trainers (TTT) training ladder. D. Postprocedure care and accurate report writing should also be a part of training. Trainees should audit their own practice during the training process and document any complications with evidence of reflection.
2.7	Training in ultrasound should be an essential facet of acquiring competence: A. Focused sessions on the use of the ultrasound console. B. Use of appropriate terminology, image optimisation and acquisition, accurate labelling, use of Doppler, etc and appropriate key images to capture. C. Contrast-enhanced ultrasound and elastography (can be acquired postcertification).
2.8	Trainers delivering training in EUS should have undertaken an endoscopy specific TTT course (preferably in EUS).
2.9	Trainers should ensure that their trainees are empowered to be able to give honest and critical feedback on their training. This is generic to all forms of endoscopy training and is a JAG requirement.
2.10	All trainees should have evidence of experience of a minimum of 250 EUS cases prior to assessment for certification.
3.1	Formative EUS DOPS assessments should be performed at least every 10 training procedures to track progression and provide objective evidence of skills acquisition and targeted feedback. EUS DOPS should include ultrasound imaging and endoscopy, but also previous cross-sectional image evaluation, fulfilment of procedure indication and non-technical skills.
3.2	Trainee should preferably log all training procedures onto the JETS e-portfolio.
3.3	Trainees must demonstrate the following KPIs to be eligible for summative assessment for certification in diagnostic EUS with/without tissue acquisition A. 'Competent for independent practice' overall in formative DOPS in 80% cases in last 3 months (minimum of 10 cases). B. Cases should include at least: i. One examination including oesophagogastric assessment, posterior mediastinal and lymph node assessment. ii. Three examinations including assessment of the whole pancreas plus bile duct including the ampulla of Vater. FNA/B diagnostic adequacy >85% of cases in last 3 months (minimum of 10 cases).
3.4	Formative EUS DOPS and KPI should be used in conjunction with other supporting certification criteria including: A. Attending EUS Basic Skills course. B. Completion of a minimum of 250 cases before summative assessment including 125 pancreatic assessments.
3.5	For successful completion of the Summative DOPS assessment, the trainee should be rated as 'ready for independent practice' in all items within 2 DOPS on predefined cases, by two different assessors: one of whom is not based at their current endoscopy unit.
4.1	Newly certified EUS practitioners should have a minimum period of mentorship lasting 1 year.
4.2	A JAG/UKIEUS defined list of mentors who can be approached by a mentee is desirable.

Continued

Table 1 Continued

4.3	EUS practitioners should perform 100 cases per year, of an adequate case mix including FNA. They should regularly review their performance via audit of KPI, presentation at M+M meetings, 360 assessments and via the annual appraisal system.
4.4	In single operator practices, EUS practitioners should have the opportunity to join local networks and if they do not exist, they should make efforts to form them.
4.5	Independent practice in therapeutic EUS will require specific training.

DOPS, direct observation of procedural skills; EUS, endoscopic ultrasound; FNA/B, fine-needle aspirations/biopsies; JETS, JAG Endoscopy Training System; KPI, key performance indicator; UKIEUS, UK and Ireland EUS Society.

Competency is a complex set of behaviours built on the components of knowledge, skills, attitudes and competence as 'personal ability'.¹² To achieve competency an operator must develop both the technical ability to perform EUS (eg, scope handling) and develop their knowledge base of ultrasound imaging to interpret real time images for diagnosis and act on their findings.

The endoscopist must be able to effectively identify and precisely describe the gastrointestinal wall layers and perilesional structures to demonstrate the likely origin of a subepithelial mass or for T-stage evaluation and lymph node evaluation. (Strong recommendation, low-quality evidence)

Consensus: 100%

The ability to identify the layer of origin of subepithelial lesions is crucial to determining the likely underlying diagnosis and involvement of surrounding structures. T-staging has been studied and validated as a surrogate marker of competent performance.¹³

A comprehensive understanding of the anatomical landmarks is mandatory for safe EUS-guided tissue acquisition for gastrointestinal lesions and non-gastrointestinal tumours (eg, lung cancer, sarcoma) where understanding of relevant posterior mediastinal and retroperitoneal anatomical landmarks is necessary. (Strong recommendation, low-quality evidence)

Consensus: 95%

Many authors agree that the rationale in understanding anatomical landmarks is key to interpreting EUS imaging.^{2, 14–16} Moreover, a variety of authorities have highlighted the need for a comprehensive learning tool for trainees to be able to assess all aspects of training.¹⁷ Tissue acquisition is undertaken frequently as part of routine EUS practice.¹⁸ Trainees must demonstrate an understanding of landmarks to be able to safely undertake tissue acquisition in this context.

It is necessary to have a working knowledge of ultrasound, the ultrasound console, radiological descriptions of normal anatomy and pathological changes. The endoscopist must be able to acquire, optimise, capture and label ultrasound images. (Strong recommendation, low-quality evidence).

Consensus: 95%

The acquisition and description of images in EUS should be considered in the same way as conventional ultrasound. It is beyond the scope of this Delphi process to consider competency assessment in clinical ultrasound.¹⁹ For endosonographers wishing to demonstrate minimum knowledge of ultrasound the following knowledge base is recommended:

- ▶ Basic ultrasound physics.
- ▶ Operation of machine control (eg, depth, zoom, gain, focus, image capture).
- ▶ Image optimisation.
- ▶ Relevant normal and abnormal sonography anatomy and physiology.
- ▶ Specific application and limitations of ultrasound applied within EUS.

The Royal College of Radiologists recommend guidelines for the provision of an ultrasound service.²⁰ Their standards

for imaging interpretation outline the following framework for examination²¹:

- ▶ Remit of the study.
- ▶ Normal findings.
- ▶ Unequivocal abnormal findings, both anticipated and unanticipated.
- ▶ Findings that may be normal (including their anatomical variants) or abnormal
- ▶ Relevant negatives.

Abnormal findings must be analysed for relevant imaging characteristics such as shape, definition and contour, enhancement pattern, and echogenicity to discern whether the findings fulfil a pathological process or may represent a normal variant such as age-related change. Non-radiology trainees should consider shadowing radiologists performing transabdominal ultrasound to familiarise themselves with image acquisition techniques, radiological lexicon and, crucially, reporting.

The Delphi group were unanimous in recommending trainees from a non-radiological background undertake a period of attendance at ultrasound and cross-sectional imaging lists with a radiologist to gain appreciation of indications, terminology and language of reporting of scans, as well as commencing the early phase of EUS training with a 'hands-off' approach to familiarise themselves with ultrasound image acquisition and interpretation. Tissue acquisition: It is desirable that 75 EUS FNA/FNB (including 50 pancreatic lesions) are performed during training and the endosonographer will be required to demonstrate proficiency in the use of FNA/FNB EUS needles (Strong recommendation, low-quality evidence).

Consensus: 100%

There are limited, poor-quality, retrospective studies that suggest EUS-FNA/B training is safe²² and that formal training results in an increased diagnostic sensitivity in pancreatic solid lesion sampling.²³ In one study, diagnostic accuracy >80% was achieved after 250 procedures; therefore, the learning curve may be longer and require a considerable number of procedures to achieve high diagnostic accuracy (in the absence of Rapid Onsite Evaluation).²⁴ While the evidence suggests that competency in sampling the pancreas is achieved around this mark, the group agreed that a lifetime procedure account of 75 reflected the additional experience required in sampling non-pancreatic lesions. In training centres with a low volume of pancreatic pathology, it is reasonable for case numbers to be derived from a mix of solid lesions including gastrointestinal stromal tumours (GISTs). There is robust evidence that FNB outperforms FNA in terms of diagnostic accuracy and tissue core rate and should be first line for solid lesions.^{25–28}

When performing tissue acquisition the endoscopist should demonstrate the ability to document sampled area, needle sizes used, type of needle along with number of passes for audit and safety purposes. A tissue adequacy rate of 85% should be the aim for solid pancreas masses. (Strong recommendation, moderate quality evidence).

Consensus: 100%

Tissue adequacy is defined as obtaining sufficient tissue to allow an accurate diagnosis, that is, the percentage of cases in which a specific histological diagnosis was made (eg, benign or malignant). 'Inadequate' samples should not be excluded from calculation of an endosonographer's KPIs and samples that are 'suspicious' but not definite for a diagnosis should be considered inadequate.

An overall 30-day case complication rate of <5% of the EUS caseload is expected. (Strong recommendation, moderate quality evidence).

Consensus: 100%

While EUS is not without risk, it is generally regarded as a relatively safe procedure. Rates of complication for FNA are low. In a multicentre retrospective observational study in tertiary referral centres in Japan focused on adverse events with EUS-FNA the incidence was 1.7% in a cohort of 13 566 cases.²⁹ Multiple studies have reported complications rate of between 1% and 3%.^{30 31} Aspiration of pancreatic cystic lesions seems to have a higher complication rate of 6%³² although most are mild. The ESGE technical guideline encompassing a systematic review of literature related to FNA reported a morbidity between 0% and 2.5%.³³ Based on this, we have recommended a complication rate of <5% but with an aspiration of being <3%.

The endoscopist must demonstrate ability to write a comprehensive, structured and descriptive EUS report with a final provisional diagnosis. All stations and the abnormality should be reported in detail including size, location, echogenicity, TNM staging (if appropriate) as well as periprocedural and postprocedural complications and recommendations. (Strong recommendation, low-quality evidence).

Consensus: 95%

The purpose of a report is to communicate an answer to the clinical question posed in a way the referrer will understand and be able to action if appropriate.³⁴ The operator should use appropriate radiological terminology and we suggest adhering to the Royal College of Radiologists quality standards, which recommend a report is structured as follows²¹:

- ▶ Clinical details, review of previous imaging, remit of the EUS study.
- ▶ A description of the findings and correlation with previous findings.
- ▶ A conclusion or summary of the key findings in the clinical context.
- ▶ Advice on the next step of management (when appropriate).

The endoscopist is expected to photo-document ultrasonographic anatomical landmarks relevant to the focus of the examination (online supplemental file 4) in >90% of procedures and upload to a picture archiving communication system (PACS) or appropriate software (weak recommendation, low-quality evidence).

Consensus: 84%

EUS practice should be standardised with ultrasound to be able to save a representative range of images to PACS software to provide a record of the examination to allow for case review and audit purposes.²⁰ Photo documentation of landmarks dependent on the indication of the examination form part of the KPIs (outlined in online supplemental file 2).

The endoscopist should photo document ultrasonographic and endoscopic images of pathology identified using appropriate tools including Doppler, callipers to measure size and needle placement to upload to PACS or appropriate software. (weak recommendation, low-quality evidence).

Consensus: 95%

Systematic documentation of the EUS procedure through image acquisition uploaded on to an image sharing portal such as PACS allows multidisciplinary teams (MDTs) and other clinically interested parties to easily review a case and demonstrates the operator is competent in what they are examining.

The endoscopist demonstrates a professional attitude towards procedural safety and patient care including the practice of endoscopic non-technical skills (ENTS) of EUS (ie, communication skills, situational awareness, leadership and judgement). (Strong recommendation, low-quality evidence).

Consensus: 100%

The evidence in this area is limited predominantly to non-controlled surveys of participants undertaking non-technical skills training in the form of simulation who demonstrate increased self-reported confidence in performing non-technical skills tasks.³⁵ One blinded randomised control trial (RCT) did demonstrate a simulation-based curriculum (including ENTS) resulted in endoscopists performing superiorly on colonoscopies assessed using the JAG direct observation of procedural skills (DOPS).³⁶ The same group published a further RCT in 2020, which demonstrated focused non-technical skills training to novice trainees in colonoscopy improved the clinical performance of their colonoscopies.

Acquisition of competence in EUS

JAG accreditation in gastroscopy is desirable. The endoscopist should be sufficiently competent to safely insert a gastroscop to D2 independently. (Strong recommendation, very low-quality evidence).

Consensus: 95%

Trainees commencing EUS training should be competent at upper GI endoscopy and should be able to pass the gastroscop safely to D2. The group agreed that formal JAG accreditation is desirable, however, is not mandated as this may prejudice non-gastroenterology trainees wishing to embark on an EUS training programme. ESGE also acknowledges that trainees should be competent in gastroscopy before undertaking ERCP or EUS in line with their previously published quality standards.^{14 37} It is likely that further scope-handling training will be required due to the differences in using oblique viewing echoendoscopes.

Trainees should demonstrate their desire and commitment to perform independent practice in EUS at consultant level. (Strong recommendation, low-quality evidence).

Consensus: 90%

The considerable commitment on trainee and trainer to achieve trainee competence in EUS is such that forward planning and workforce management should be taken into consideration to ensure trainees' future careers will include the practice of EUS.

For EUS certification, UK trainees are required to attend a JAG accredited basic EUS skills course, ideally in the early stages of their EUS training. (Strong recommendation, low-quality evidence).

Consensus: 84%

An essential part of EUS training is the attendance at intensive skills courses.³⁸ Attendance at basic skills courses is already mandatory for certification in upper and lower GI endoscopy and ERCP.

Trainees are recommended to use digital resources and attend live endoscopy courses and conferences to become familiar with EUS techniques and accessories. (Strong recommendation, low-quality evidence).

Consensus: 100%

Theoretical knowledge acquired in addition to hands-on training can be acquired from lectures, textbooks, online seminars and websites.³⁵ This further complements the training process in a safe and effective manner.

Trainees are required to show evidence of attendance at Multi-disciplinary Meetings. (Strong recommendation, very low-quality evidence).

Consensus: 100%

This is an essential part of the learning process. Attendance at both benign and cancer MDTs is crucial to understand the rationale for the test and the information desired by the referrer. It is also an opportunity to be exposed to cross-sectional imaging modalities that may aid the EUS examination.

Training should be delivered at specific levels to include:

- Assessment of indications and potential complications for the procedure, individualised consent and review of imaging immediately prior to each case.
- Trainees should spend a period familiarising themselves with image acquisition and interpretation prior to echo-endoscope handling. This should be a combination of observing EUS cases and spending time with ultrasonographers.
- Formal hands-on training should use the EUS train the trainers (TTT) training ladder.
- Post procedure care and accurate report writing should also be a part of training.

Trainees should audit their own practice during the training process and document any complications with evidence of reflection. (Strong recommendation, low-quality evidence)

Consensus: 89%

This highlights the importance of a safe and considered approach before, during and after each procedure. A standardised method to training, as taught on the EUS TTT course, will benefit both trainer and trainee (online supplemental file 3). Reviewing imaging prior to procedures is a key component of training that trainers should aim to promote through the development of a dedicated archive of cases for learning and assessment.

Training in ultrasound should be an essential facet of acquiring competence:

- The trainee requires focused sessions on the use of the ultrasound console.
- Use of appropriate terminology, image optimisation and acquisition, accurate labelling, use of Doppler, etc and appropriate key images to capture.
- Contrast-enhanced US and elastography can be acquired postcertification. (Strong recommendation, low-quality evidence)

Consensus: 89%

Safe endoscope handling and ultrasound image acquisition and developing a skill set for the interpretation of ultrasound images for diagnosis are essential features to competent EUS practice and should be embedded in daily teaching.

Trainers delivering training in EUS should have undertaken an endoscopy specific TTT course (preferably in EUS). (Strong recommendation, very low-quality evidence)

Consensus: 95%

EUS trainers should have completed a TTT course, preferably in EUS to standardise key components of the training process. The EUS TTT course covers the principles of adult learning, adding to the trainer's skillset in endoscopic and sonographic teaching to provide a safe and comprehensive training experience.

Trainers should ensure that their trainees are empowered to be able to give honest and critical feedback on their training. This is

generic to all forms of endoscopy training and is a JAG requirement. (Strong recommendation, very low-quality evidence)

Consensus: 100%

Despite the introduction of Direct Observation of Trainer Skills feedback by JAG, a recent survey of UK trainees demonstrated only 57% trainees felt able to give honest feedback to their trainer.³⁹ Given the complexity of teaching EUS, trainers should seek feedback and engender a collaborative training environment.

All trainees should have evidence of a lifetime 'hands-on' experience of a minimum of 250 EUS cases prior to assessment for certification. (Strong recommendation, moderate-quality evidence)

Consensus: 100%

The previous British expert consensus on EUS training recommended the following threshold numbers before assessment of competency: oesophagus, stomach or rectum—80; subepithelial lesions—20; pancreatobiliary—150 (at least half of which are likely pancreatic cancer).¹ A systematic review examined 8 studies assessing attainment of competency in EUS and encompassed 28 trainees and 7051 EUS procedures.⁴⁰ Three studies examined T staging (competency achieved in 65–231 procedures), 3 studies assessed EUS-FNA (competency achieved by 30–40 procedures) and 2 studies assessed comprehensive competency. Only 4 of 17 trainees reached competency by 225 to 295 EUS procedures. Further evidence that suggests a significant caseload of hands-on training is required prior to competency assessment highlighted the median number of EUS performed was 300 by which 82.3% trainees had achieved overall competence.⁴¹

Assessment of competence in EUS

Formative EUS DOPS assessments should be performed at least every 10 training procedures to track progression and provide objective evidence of skills acquisition and targeted feedback. EUS DOPS should include ultrasound imaging and endoscopy, but also previous cross-sectional image evaluation, fulfilment of procedure indication and non-technical skills. (Strong recommendation, low-quality evidence)

Consensus: 95%

Formative EUS assessments are used to complete endoscopic training in the UK.^{42–44} The use of specific formative EUS DOPS assessments grouped to enable assessment of specific technical and non-technical endoscopic skills are to be incorporated within the JETS e-portfolio.³⁹ The TEESAT assessment tool has been validated in North American fellowship programmes for EUS.^{10 11 45} This is not currently supported on the JETS eportfolio although four similar levels of outcomes reflect the amount of supervision required (maximal to none). Increasing the frequency of formative DOPS assessment increases the reliability of competency estimation⁴⁶ and has been identified as an independent predictor of competence.⁴²

Trainee should preferably log all training procedures onto the JETS e-portfolio. (Strong recommendation, low-quality evidence)

Consensus: 95%

The JETS e-portfolio is recognised by all UK endoscopy trainees and trainers. Validity is supported from other training modalities.⁴⁷ The JETS system enables the formulation of unassisted KPIs, which are embedded into EUS certification criteria. Evidence for a similar model using ERCP exists using the Rotterdam self-assessment ERCP form.^{48 49}

Trainees must demonstrate the following KPIs to be eligible for summative assessment for certification in diagnostic EUS±tissue acquisition:

- a. 'Competent for independent practice' overall on formative DOPS in 80% of cases in the last 3 months (minimum 10 examinations).
- b. Cases should include documented images and include at least:
 - 1 Examination including:
 - ▶ Oesophago-gastric assessment.
 - ▶ Posterior mediastinum/lymph node assessment.
 - 3 examinations including:
 - ▶ Full pancreas assessment.
 - ▶ Bile duct examination (including ampulla of Vater).
- c. Tissue acquisition with FNA/B diagnostic adequacy >85% of cases in the last 3 months (minimum 10 cases). (Strong recommendation, low quality evidence)

Consensus: 100%

KPI targets for competent independent practice should be measured by objective formative DOPS (online supplemental file 4). Increasing the frequency of formative DOPS assessment increases the reliability of competency.⁴⁶ A prospective, multi-centre US study using a similar outcome (TEESAT) to the UK formative (DOPS) form showed that at the conclusion of EUS training programme 82% of trainees achieved technical independent competence and 76% achieved cognitive independent competence in EUS.¹¹ Therefore, a similar level of independent practice achievement should be recorded in a significant number⁴⁸ to achieve a high chance of competence.

As the influence of EUS-FNA/B is significant this must be included as a KPI. The percentage of patients with a tissue sample allowing an accurate diagnosis of solid lesions should be recorded. The frequency of successful EUS-FNB of a solid lesion has been shown to be 92%–98% in multiple clinical trials^{25 50–53}; therefore, we would expect this level to be at least 85% (minimum standard in line with ESGE) and a target standard of 90% postcertification.

Formative EUS DOPS and KPI should be used in conjunction with other supporting certification criteria including

- a. EUS basic skills course.
- b. Evidence of at least 250 procedure entries on JETs including 125 cases with pancreatic assessment (Strong recommendation, low-quality evidence)

Consensus: 100%

A basic skills course is recommended to enable training pathway structure and development. Formative DOPS assessments are used to objectively evaluate competency development during training.¹¹ Therefore, we believe this number of procedures is required to achieve a high chance of competence for independent practice and achieve success at summative assessment.

For successful completion of the summative DOPS assessment, the trainee should be rated as 'ready for independent practice' in all items within 2 DOPS on predefined cases, by two different assessors: one of whom is not based at their current endoscopy unit. (Weak recommendation, low-quality evidence)

Consensus: 89%

Summative assessment is part of the JAG certification process and ensures objective competence assessment prior to certification.⁴ Given the complexity of EUS and small number of agreed KPIs, to reduce bias we recommend that trainees should perform a total of 2 summative EUS DOPS and be rated as 'ready for independent practice' in all items by two separate assessors, of which one of these assessors should not be a current trainer

based at the trainee's unit. We recognise the relative paucity of endosonographers around the UK and Ireland so JAG will be working to compile a national list of assessors to facilitate this process.

The summative assessment cases should take place at an endoscopy unit chosen by the trainee (usually their current or recent training unit). At least one of the assessors should have attended an EUS TTT course.

Postcertification mentorship

Newly certified EUS practitioners should have a minimum period of mentorship lasting 1 year. (Strong recommendation, very low evidence)

Consensus: 89%

Performance of EUS continues to improve after certification during the early part of independent practice before aspirational standards may be reached, it follows therefore that there should be provision for mentorship and performance review for recently certified EUS practitioners.^{54–56}

Opportunities for continuing professional development should be encouraged including upskilling courses and visiting regional tertiary units. Both mentor and mentee should have time to invest in the relationship, ideally with protected time for regular meetings. Coaching and mentoring has been defined as 'learning relationships which help people to take charge of their own development, to release their potential and to achieve results which they value'.⁵⁷

Although a universal understanding of mentorship has been historically elusive, it is now increasingly recognised in healthcare.^{58–62} 'EUS mentorship' may be defined as the process by which an experienced colleague who performs high-quality EUS engages with a new colleague to foster their development and expertise in EUS. A period of at least 1 year is suggested to enable enough time to support and nurture a practitioner into one who can provide a high-quality EUS service.

A JAG/UKIEUS defined list of mentors who can be approached by a mentee is desirable. (Strong recommendation, low evidence)

Consensus: 95%

A JAG/UKIEUS list of mentors who have undertaken a mentorship qualification that can be approached by the mentee and their respective Trust is desirable. Mentors themselves should be expert in their field: consciously competent in EUS and in teaching EUS. Additional training may be required to develop specific mentorship expertise. It is strongly recommended mentors have completed the JAG EUS 'TTT' course.

EUS practitioners should perform 100 cases per year, of an adequate case mix including FNA/B. They should regularly review their performance via audit of KPI, presentation at morbidity and mortality (M&M) meetings, 360 assessments and via the annual appraisal system. (Strong recommendation, very low evidence)

Consensus: 95%

Clinicians who have recently certified in EUS should have the opportunity to practise in a wide range of subspecialty areas. Caseload selection through attendance at weekly MDT meetings is vital to this. All EUS cases should be logged to enable continuous audit of KPIs and to recognise post-EUS complications. In the medium-term some of this data will be captured through the National Endoscopy Database (NED) but clinicians should interrogate their EUS reporting tools to provide personal and unit results to be presented at regular audit meetings.

In single operator practices, EUS practitioners should have the opportunity to join local networks and if they do not exist, they should make efforts to form them. (Strong recommendation, very low evidence)

Consensus: 89%

Single-handed EUS practitioners should aim to join local networks to allow for coaching and help with service development and joint audit of results. If such networks do not exist, then the new EUS practitioner should make efforts to form them where possible.

Independent practice in therapeutic EUS will require specific training. (Strong recommendation, very low evidence)

Consensus: 100%

Therapeutic EUS procedures are complex with a significantly higher complication rate. Therefore, robust and safe patient pathways need to be established with MDT input and careful governance of outcomes. Although out of the scope of this document, before undertaking therapeutic EUS, clinicians should undergo a period of additional training (eg, via a preceptorship) with further mentorship to follow. It is desirable that endosonographers embarking on therapeutic EUS should have basic ERCP skills. Due to the rapidly expanding number of therapeutic EUS interventions available, the Delphi group felt that trying to outline a training and accreditation therapeutic pathway in addition to the diagnostic pathway was too broad a scope. However, we recognise the need for therapeutic accreditation and this will be the subject of a future Delphi process.

DISCUSSION

EUS is a technically demanding modality which involves a steep learning curve. While there is an increasing number of therapeutic procedures achievable with EUS guidance there is, prior to this, an imperative to ensure conscious competence in echoendoscope handling and accurate interpretation of ultrasound images. Moreover, during the procedure, the endosonographer must demonstrate good non-technical skills, perform tissue acquisition correctly, generate a report that answers the clinical question and always ensure patient safety.

Defining operator competency for EUS in comparison to, for example, ERCP or colonoscopy has been elusive. The latter studies have recognised quality performance indicators that can be assessed before, during and after the procedure while EUS historically does not. This partly relates to the varied remits of EUS examination that can be undertaken, a lack of consensus on judging competency of ultrasound imaging for trainee gastroenterologists, and a focus on FNA/B sampling adequacy and diagnostic rates that can only be evaluated retrospectively.^{14 41}

This Delphi group has assessed a comprehensive number of published scientific papers to address key questions of diagnostic EUS training reaching consensus on defining competence, the pathway to achieve this and its assessment to allow trainees to credential for independent practice. Like ERCP, the group has also examined the rationale for mentoring newly qualified practitioners.⁵ To reflect current practice and most service providers there is an emphasis on linear echoendosonography.

The CREDES framework is a tool that has been published for assessing the quality of Delphi processes with a focus on four aspects: rationale, planning and design, study conduct and reporting.⁵⁴ By most of the 16 criteria outlined in this framework, our methodology was robust but there were

a few potential limitations. The size of the Delphi group (n=19) could leave our conclusions open to potential bias. However, the number of practising endosonographers in the UK is low (the last recorded estimate was 95 in 2011)¹ and thus we believe the group is reflective of current practitioners of EUS in the UK and Ireland. We recognise that bias may be evident in statements receiving strong recommendations with weak evidence but again there is a paucity of high-quality research in the field, with a significant proportion of studies the product of one group.^{10 11 13 41 55} As such, we have allowed discordantly high strength recommendations when the group determined a statement was integral to training or certification. While this leaves recommendations open to criticism it is our expectation that by setting these standards, high-quality research can be undertaken in the future to corroborate or refute our recommendations. A further limitation is that stability of responses was not measured between rounds potentially masking bias as statements were accepted a priori after the first round of voting once they crossed the 80% threshold. Finally, given the group of invited participants were from the UK and Ireland results may not be relevant to other international centres of EUS training.

While the Delphi group advocates a period of attendance at ultrasound and cross-sectional abdominal and thoracic imaging lists in addition to a period of 'hands off' observation there is currently no evidence base on which to base a recommendation. However, given the vast majority of practising endosonographers in the UK will be gastroenterologists it was felt a period of familiarisation with imaging modalities was important. While we have recommended at least 250 'hands on' procedures be performed prior to an assessment of competency, based on the best available evidence,⁴¹ we recognise there is a spectrum of ability with different case numbers required to reach independent practice. Following the publication of this pathway, the opportunities presented by the mandated use of the JETS to record procedures represent an exciting research opportunity to prospectively track learning curves at a national level.

The ASGE set out their core curriculum for EUS training in 2020⁶³ although through expert consensus rather than a formal Delphi process. In it, they outline a broad brush approach to the structure of EUS training and the principles of what competence looks like but stop short of prescriptive KPIs. ESGE published their combined EUS and ERCP curriculum in 2021.¹⁴ Given the limited literature on the issue, they have understandably alighted on similar KPIs for competence as our own Delphi process (procedure volume of >250 cases (75 FNA/FNBs), satisfactory visualisation of key anatomical landmarks in ≥90% of cases, and an FNA/FNB accuracy rate of ≥85%). They outline endosonographers 'should undergo formal summative assessment prior to completion of independent practice' without specifying what this entails. The strength of our study over both the ASGE and ESGE documents is to have produced an exhaustive training and assessment structure with auditable KPIs. Trainees and trainers alike will be able to use this framework to design their training experiences and standardise credentialing of new endosonographers on a national scale.

We propose a syllabus divided into three domains: (1) 'early novice' (0–75 cases), (2) 'intermediate' (76–150 cases) and (3) 'advanced' (151–250 cases). The syllabus (see online supplemental file 3) highlights defined categories to allow trainers and trainees to focus on learning milestones. The categories comprise: background knowledge, scope handling,

use of the ultrasound console, the study of EUS anatomy for normal and pathological lesions, the interpretation of ultrasound images and tissue acquisition. These culminate in the 'complete EUS procedure'. In advanced training, the focus increases on ENTs.

There are no published studies on the best way to teach the interpretation of real time continuous imaging in EUS. Trainers focus primarily on teaching specific anatomical landmarks or 'stations'. In online supplemental files, the stations are discussed in detail. For each station, there is a summary list of key images recommended for the trainee to develop competency in recognising. Domains 1 and 2 focus primarily on a structured approach to anatomy teaching; domain 3 (advanced) focuses on the ability to interpret real-time continuous imaging: that is, being able to 'follow the anatomy'. The Delphi group recommends all EUS procedures provide captured images to be stored on a PACS system; EUS is an imaging modality and as such should be in line with all imaging modalities. We envisage recordings of small video loops on PACS to become routinely available for the respective MDTs.

Historically, EUS training programmes have relied on set procedure numbers to attain competence.^{1 2 64} Wani *et al* have advocated for standardisation of assessment to individualise the number of procedures required for training.^{10 55} Although the widespread practice of trainers is to focus on procedure volume,⁵⁵ the direction of travel is towards competency-based training. Competency based fellowships have been shown to result in trainees meeting quality indicators through their first year of independent practice. A 2016 systematic review of structured assessment of EUS competencies identified technical skills including pancreatic solid mass T-staging, EUS-guided FNA (EUS-FNA) procedure time, number of EUS FNA passes and puncture precision for EUS that could form the basis of competency based accreditation.⁶⁵ An endoscopy trainers' course, such as the JAG 'TTT' in EUS, can highlight the importance of the EUS curriculum, improve the different techniques of performance enhancing feedback and teach how to make objective and measurable assessments of trainees.⁶⁶

Following the GMC commissioned 'Shape of Training' review the training of UK physicians is undergoing considerable change due to the implementation of shorter training times in gastroenterology from 5 to 4 years which also impacts training in endoscopy(68). Competency in specialties such as ERCP and EUS therefore may require post-CCT fellowships.

There are opportunities for future research using the competency framework outlined in this document. The JETS ePortfolio has been instrumental in driving quality standardisation across the UK in endoscopic practice for OGD, flexible sigmoidoscopy and colonoscopy. At the time of writing, JAG is engaging with stakeholders in the development of a robust JETS ePortfolio for EUS and the KPIs agreed by this working group will inform the accreditation through the upcoming JETS update. An EUS DOPS for assessment of competence has been proposed as part of this Delphi process. Performing a prospective study of the use of national JETS data learning curves to more accurately assess how trainees achieve EUS competency in the UK will further our knowledge. An appreciation of key interventions to 'accelerate' trainees up the learning curve including 'early novice'-stage exposure to diagnostic abdominal ultrasound lists, the use of intensive fellowships, simulation and virtual reality will be important.

CONCLUSIONS

This document attempts to be specific in the training requirements desired for service providers to undertake high-quality EUS examinations. This will enable training bodies to ensure adequate provision of high-quality, focused training (most likely through post certification EUS fellowships), using the competency and training framework outlined in this document. Additionally, the training of mentors to support newly qualified service providers in their early career of EUS practice should be formalised. This will ultimately result in a high-quality service for patients.

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Supplementary file 1: Authorship

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Specialty

Position: Consultant clinician unless otherwise stated. GI: Gastroenterology.

Stakeholder bodies:

- ¹UKIEUS: United Kingdom and Ireland Endoscopic Ultrasound Society
²AUGIS: Association of Upper Gastrointestinal Surgery of Great Britain and Ireland
³BSG: British Society of Gastroenterology
⁴BSGAR: British Society of Gastrointestinal and Abdominal Radiology
⁵JAG QAT: Joint Accreditation Group - Quality Assurance in Training
⁶JAG: Joint Accreditation Group
⁷PSGBI: Pancreatic Society of Great Britain and Ireland

Supplementary File 2: Key Anatomical Landmarks (Stations)

Thoracic stations: The Posterior Mediastinum

Important for chest disease, mediastinal mass on cross sectional imaging, UGI referrals such as mediastinal / duplication cyst, lesions intrinsic to the oesophageal wall and UGI cancer staging.

Cricopharynx 15-18cm then cervical oesophagus 18-25cm

- Azygous
- Superior vena cava
- Great vessels above arch of the aorta

Mid thoracic oesophagus 25-32cm

- Arch of the aorta, eg upper border 23cm, lower border 25cm
- Aorta ascending & descending
- Aortopulmonary (AP) window, station 4L on lung cancer staging
- Left atrium 30cm and pulmonary veins
- Trachea bifurcation
- Sub carinal (SC) space 29cm, station 7

Lower thoracic 32-38cm

Cardiac chambers

- Left atrium level, right outflow tract
- Mitral valve, left ventricle
- Aortic root, pulmonary outflow tract
- Right atrium, tricuspid valve, right pulmonary artery
- Vena cava

Oesophagus

- 4 wall layer structure (serosa absent)

Abdominal oesophagus lies approximately from 38–40cm

Key landmarks for EUS clinicians and photo documentation from the following

- **Aortic arch, descending aorta**
- **AP window**
- **Bifurcation of the Trachea**
- **Sub Carinal space**
- **Lymph node stations**
- **4x Wall layer structure of the oesophagus**
- **Right atrium and inferior vena cava & superior vena cava,**
- **Left atrium and aortic valve, aortic root**

Video

<https://www.sciencedirect.com/science/article/pii/S2212097113700268>

Abdominal Stations (Gastric): Station 1 Cardia

Station 1: Cardia (fundus of the stomach/OG Junction) Liver to Midline

“Base Station” 40cm at the GOJ to 41cm 1cm beyond

- Left lobe of the liver
- IVC / Right atrium
- Intra hepatic portion of the IVC
- Confluence of the hepatic veins into IVC (Common variability of right hepatic vein)
- Caudate process

Clockwise rotation at this juncture brings the echoendoscope onto the aorta/crus *however* forward progression by 2-3mm following the intra hepatic IVC brings the echoendoscope to the liver hilum.

Liver hilum

- (Right) Hepatic artery in cross section
- Portal Vein Confluence
- Common Hepatic Duct (CHD) – bile duct
- Intra hepatic left and right bile ducts and Intra hepatic portal venous branches

Clockwise rotation at this juncture brings the echoendoscope onto the aorta/crus and the following:

- Descending aorta & crus of the diaphragm
- Origin of coeliac artery in longitudinal view
- Origin of SMA in longitudinal view
- Left renal vein in cross section
- Coeliac ganglia

Progression of the echoendoscope by 3-5mm following the course of the coeliac artery (40.5-41cm):

- Mid Body of the Pancreas parenchyma
- Main Pancreatic Duct (MPD)
 - Rotation anticlockwise brings the echoendoscope back towards liver hilum or...
 - Rotation clockwise brings the echoendoscope toward the L adrenal (next page)
- Adjacent mesenteric vessels
 - Splenic artery (courses in and out of view around pancreas)
 - Splenic Vein (unlike SA, usually has a straight course) and superior mesenteric vein

Anticlockwise torque

- Portal venous confluence
- SMA
- MPD as it courses into the pancreatic neck (genu) then head / ampulla
- CHD as it courses deeper towards the head of pancreas and the ampulla
- Confluence of the SMV and SV into the Portal Vein
- Pulling back onto the portal vein by 3-6mm: brings echoendoscope back to the...
- Left lobe of the liver

Key landmarks for EUS clinicians and photo documentation

- **L lobe liver, Intra hepatic portion of the IVC and hepatic veins**
- **Liver hilum with PV confluence, hepatic artery (in cross section) and common hepatic duct**
- **Aorta / Crus and Origins of the coeliac and superior mesenteric arteries**
- **Pancreas parenchyma and MPD**
- **Confluence of SMV & SV to PV as it courses to the liver hilum**

Station 1 (continued): Cardia (fundus of the stomach/OG Junction) Midline to Spleen

“Base Station”: 40cm at the GOJ to 41cm 1cm beyond. Find the following:

- Left lobe of the liver, Intra hepatic portion of the IVC
- Liver hilum, then clockwise torque to...
- Aorta / origins of CA and SMA

Rotate echoendoscope clockwise by 5-10 degrees

- Left Adrenal Gland

Inferiorly (push in) and brief clockwise torque

- Left Kidney
- Renal hilum

Superiorly (withdraw and “tip up”) with additional clockwise torque

- Spleen
- Splenic hilum
- Tail of pancreas
- MPD

Anticlockwise torque to follow pancreas tail, to distal and mid body

- Body of pancreas parenchyma
- MPD
- Splenic artery and Splenic Vein
- Pancreatic genu
- Santorini duct
- MPD entering into the papilla with the CBD

Continue

Anticlockwise torque

- Portal venous confluence
- SMA
- MPD as it courses into the pancreatic neck (genu) then head / ampulla
- CHD as it courses deeper towards the head of pancreas and the ampulla
- Confluence of the SMV and SV into the Portal Vein
- Pulling back onto the portal vein by 3-6mm: brings echoendoscope back to the...
- Left lobe of the liver

Key landmarks for EUS clinicians and photo documentation

- **Pancreas parenchyma & MPD**
- **Spleen and splenic hilum**
- **Left adrenal**
- **Left kidney and renal hilum**
- **Splenic artery and splenic vein**
- **Aorta / Crus and Origins of the coeliac and superior mesenteric arteries**
- **Confluence of SMV & SV to PV as it courses to the liver hilum**
- **Liver hilum with PV confluence, hepatic artery (in cross section) and common hepatic duct**

Abdominal Stations (Gastric): Stations Body & Antrum

Insertion of the echoendoscope towards but not intubating the pyloric canal

Scope is in a “long” position

- Gall Bladder and Wall layer structure
- Lower 1/3 of the bile duct (Common Bile Duct)
- Portal Venous Confluence
- IVC
- Body of Pancreas
- Common hepatic artery

Gastric wall

- 5x layered structure

Lymph node stations

- Hepatic / porta hepatis
- Left gastric
- Gastrohepatic ligament
- More superiorly: splenic, coeliac

From D1 bulb: the echoendoscope slips back into the stomach.

Scope is in a “short position”

Similar anatomical findings

Key landmarks for EUS clinicians and photo documentation

- **Gall Bladder**
- **Gastric wall layer structure**
- **Pancreas parenchyma & MPD**
- **Portal vein & PV confluence (SMV & SV)**
- **IVC**
- **Location of lymph node stations**
- **Liver hilum with PV confluence, hepatic artery (in cross section) and common hepatic duct**

[https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4613806/#:~:text=Examination%20of%20the%20CBD%20is,%3B%20and%20\(5\)%20antrum.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4613806/#:~:text=Examination%20of%20the%20CBD%20is,%3B%20and%20(5)%20antrum.)

Sharma M, Pathak A, Shoukat A et al. Imaging of the common bile duct by linear endoscopic ultrasound. *World J Gastrointest Endosc* 2015 Oct 25; 7(15): 1170-1180

Abdominal Stations (Duodenum): Station 3 Duodenal Bulb

“Base position”

Intubate D1/Bulb

- Gall Bladder
- Cystic duct

Insert scope further

- Common Bile Duct (CBD) – mid duct
- Pancreas Duct
- Pancreas parenchyma
- Portal Vein

From base position: Torque clockwise

- Scope veers inferiorly and right of midline towards D2
- Trace the lower 1/3 of the CBD
- CBD and MPD converge towards the major papilla
- Confluence of the SV and SMV into the PV
- Head of pancreas
- Intra-duodenal part of the CBD within the papilla itself
- Ampulla (from D1)
- Uncinate process (from D1)

From base position: Torque anticlockwise

- Cystic duct and its insertion point into the CBD
- GB
- The upper 1/3 of the common hepatic bile duct (above the cystic duct insertion point)
- Liver hilum
- PV confluence enters liver parenchyma at the liver hilum
- Hepatic artery in cross section
- Division of the CHD into the Right and Left hepatic ducts

Key landmarks for EUS clinicians

- **Common hepatic and common bile duct**
- **GB and cystic duct including insertion point into CBD**
- **Portal vein confluence and feeding veins: SMV & SV**
- **Pancreas parenchyma & MPD**
- **Confluence of SMV & SV to PV as it courses to the liver hilum**
- **Liver hilum with PV confluence, hepatic artery (in cross section) and common hepatic duct**

Abdominal Stations (Duodenum): Station 4 D2 & D3

“Base position” D3

- Bifurcation of the Aorta and common iliacs
- Abdominal Aorta
- IVC and portal vein
- Para aortic lymph node stations
- Inferior pole of right kidney

Slow withdrawal back into D2

From D3 into D2

- Uncinate process of the pancreas
- Accessory pancreatic duct
- MPD as it enters the papilla
- CBD as it enters the papilla
- Ampulla
- Right kidney
- IVC
- Duodenal wall layer structure

Further withdrawal

- Trace CBD up towards CHD
- Division of the CHD into the right and left hepatic ducts
- PV confluence
- Trace MPD into the pancreatic neck (genu)
- Liver hilum

Key landmarks for EUS clinicians

- Aorta
- IVC
- Uncinate process
- MPD and CBD coursing into the major papilla
- Common bile duct traced into the common hepatic
- Liver hilum
- Portal vein confluence and feeding veins: SMV & SV
- Pancreas parenchyma
- MPD can be traced into the pancreatic neck (genu)

Syllabus for Training in EUS: Domains 1 - 3

Domain 1 Novice Phase of Training 0 – 75 cases: Aims of Training

At induction, *if available*:

- Attend ultrasound and CT lists with HPB/GI/thoracic radiologist
- “Hands off” scope: 50 recommended but 100 is advantageous
- Begin regular attendance at HPB / GI MDT

Background knowledge of EUS

Appreciation of indications, reviewing imaging, preparation and equipment checks prior to each procedure (echoendoscope, ultrasound console, monitoring & sedation planning, anticoagulation)

- Contemporary knowledge of local and national guidelines, GMC guidance on consent
- Assessment of “personalized risk” for each patient & potential for adverse events
- Limitations of EUS in comparison to other imaging modalities
- 1x DOPS / 10 cases min for “Hands on” EUS procedures: minimum 7-8 in Novice Phase

Scope Handling

- Introduction to oblique viewing linear echoendoscope (radial EUS is optional)
- Agreed Language of Training in Endoscopic Ultrasound within the training unit
 - STOP
 - Pull back (withdraw) and Push in (insert)
 - Blow (insufflate) and Suck (deflate)
 - Clockwise torque and Anti-clockwise torque
 - Tip Up (big wheel down) and Tip down (big wheel up)
 - Tip right (small wheel clockwise torque) and Tip Left (small wheel anti clockwise)
 - Slow down/slowly
- Importance of small movements
- Introduction to ergonomics
 - room set up, table height, console position to the bed, optimal upright posture
 - free umbilical console & endoscopic cables
 - scope positions, scope handling
 - creating good habits at start of training (eg left-hand dominance)
- Intubation of cricopharynx, GOJ, cardia, pylorus, D1/bulb, D2/D3
- Introduction to problem solving when an image cannot be achieved despite following the instructed movements
- Importance of avoiding insufflation, attention on U/S screen rather than Endoscope LCD

Ultrasound Console

Introduction to ultrasound and physics of ultrasound

Introduction to ultrasound console or machine: ultrasound knobology

- Depth penetration
- Zoom
- Transducer Frequency
- Brightness
 - Overall gain control
 - Time Gain Compensation
- Focal Zones
- Dynamic range, Tissue Harmonic imaging
- Basic functions: Freeze and annotation functions, video loop function

Document up to 2 static images per procedure & Introduction to annotation functions

“The Influence of Ultrasound Equipment Knobology in Abdominal Sonography”

<https://www.intechopen.com/chapters/65515>

Lexicon of Ultrasound Imaging with some examples:

Introduction to the descriptors or language/lexicon of ultrasound reporting. Examples:

Artefact: low attenuation, distal enhancement, attenuating, distal acoustic shadowing, dirty shadowing, edge shadowing, ringdown

Echogenicity: anechoic, hypoechoic, low level internal echoes, isoechoic, echogenic, hyperechoic, highly echogenic

Location: superficial/deep, inferior/superior, lateral/medial, anterior/posterior

Structure: size, shape, contour

Proximity: abutting, close proximity to, adjacent to, separate from, scattered

Borders: well or poorly defined, distinct, indistinct, subtle

Contour: smooth, irregular, lobulated, microlobulated

Masses: round/spherical, irregular, lobulated, polypoid, crescent shaped, invading

Mass size: atrophic, small, normal size, enlarged, hypertrophied, large, organomegaly, swollen, bulky

Degrees of severity: trivial, negligible, mild, moderate, severe

Solid: homogeneous/heterogeneous, uniformly echogenic, hypo/hyper echoic, smooth, heterogeneous, coarse echotexture, internal nodularity, patchy echotexture, calcified/calcification

Ducts: prominent, dilated, ectatic, tortuous, transition points

Fluid: free fluid, fluid level, loculated fluid, fluid collections, walled-off, clear, turbid

Cysts: unilocular, multilocular, septated, multiseptated, thick/thin, papillary projection

Vascularity: avascular, low vascularity (hypovascular, hypoperfused). Isovascular, hypervascular, highly vascular. Perfusion pattern: uniform, non-uniform, regional hypoperfusion

Effects on surrounding structures: separate, displacing, indenting, compressing, distorting, protruding, communicating, herniating, invaginating, crossing tissue planes, surrounding, encasing, extending from,

Anatomy encountered at EUS: Introduction to key EUS imaging stations

- Posterior Mediastinum
- Abdominal structures in Stations 1 – IV
 - Station 1: Cardia/OG junction: *Liver to Midline* and separately *Midline to Spleen*
 - Station 2: Antrum
 - Station 3: Pyloric canal, D1 / Duodenal bulb
 - Station 4: D2 and D3

Introduction to normal anatomy and to certain structures

- Mediastinum: aorta, oesophageal wall, lymph node stations, cardiac chambers, GOJ
- Abdominal: L lobe liver & hilum, IVC,
- Biliary tree: intra hepatic ducts, common hepatic, cystic duct with GB, common bile duct
- Aorta & origins of CA & SMA, SMV & SV with PV confluence
- Pancreas, main pancreatic duct
- Gastrointestinal wall layer structure
- Spleen, Left and Right kidney, L adrenal

Introduction to pathology

- Mass lesions, benign and malignant tumours, Cystic lesions
- Abnormalities of gastrointestinal wall, GISTs, Leiomyomas
- Vascular abnormalities
- Common bile duct stones, CBD wall thickening
- GB wall abnormalities, GB stones, sludge, microlithiasis
- Appreciation of expected duct calibres, abnormal calibres and transition points

Interpretation of ultrasound Images

- Introduction to use of Ultrasound and Radiological language
- Build up experience of “normal” for multiple structures
- Appreciation of imaging characteristics for:
 - Air
 - Cyst
 - Solid
 - Fluid

The EUS Procedure

- An appreciation of the workflow of running an EUS list
- Introduction to certain aspects of Endoscopic Non-Technical Skills (ENTS)
- Introduction to report writing

Domain 2 Intermediate Phase of Training 76 – 150 case: Aims of Training

Background knowledge of EUS

- Knowledgeable and Competent in pre-procedure preparation: indications etc
 - Ability to distil referrals to ascertain the key clinical question(s)
- Familiarity with assessing previous imaging (U/S, CT, MR, ERCP, EUS etc) and reports
- Knowledgeable on assessment of role of antibiotics
- Proficiency in use of Ultrasound Lexicon and Scope Training Language
- 1x DOPS per 10 cases; minimum 15c total uploaded to JETS around case number 150

Introduction to Remit of the Procedure

- EUS is performed for different indications
- The measurement of Key Performance Indicators (KPIs) is dependent on selecting, and successfully fulfilling, each remit.

Scope Handling

- Knowledgeable on troubleshooting the echoendoscope where problems occur:
 - Electrical connections
 - Valves
 - Air/Water and CO²
 - Optional: use of the balloon if required
- Adept at with intubation of cricopharynx, GOJ, cardia, pylorus, D1 bulb, D2/D3
- Increasing appreciation of scope handling required to achieve imaging for each station
 - Mediastinum
 - Abdominal Stations I – IV: awareness of the different planes the echoendoscope can adopt within each station
- Ability to manoeuvre scope to optimise images (eg “tip up” to improve coupling)
- Introduction to scope positioning to evaluate sub epithelial lesions in the following:
 - Oesophagus
 - Stomach
 - Pyloric canal and D1 bulb
 - D2 / D3
- Awareness of strategies to hold scope in the correct position for FNA
- Importance of left-hand dominance
- Proficient at avoiding air insufflation and performing small fine movements

Ultrasound Console

Continuing appreciation of ultrasound parameters

- Transducer Frequency, Depth of penetration, Zoom
- Focal Zone, Gain, Time Gain Compensation (TGC), Tissue Harmonic Imaging
- Freeze & Loop function, distance measurement, Store function & transfer to PACS

Increasing knowledge for optimising an image

Capturing and annotation of images: ability to capture 2 to 5 images *with* annotation

Anatomy encountered at EUS

Introduction to normal anatomy and to certain structures

- Increased recognition of anatomical structure: demonstrated to teacher by pointing
- Wall layer structure of the Gastrointestinal tract (and differences within the oesophagus)
- Increased understanding of vasculature in:
 - Mediastinum and Abdomen eg around pancreas, liver hilum, D2
- Increased exposure to studies examining each station

Increasing awareness of techniques to evaluate

- Whole organ
- Pancreas: uncinata, head and neck, body and tail
- Hepatobiliary tree
- Complexity of the mesenteric vessels

Introduction to pathology

Detection of fluid: Ascites, Pleural effusion, Pancreatic fluid collections

Introduction to tumour staging: Oesophagus, Pancreas, Lymph node assessment, examining for metastatic disease

Characterisation of a tumour: size, shape, echogenicity, vascular Involvement, TNM staging

Evaluation of cysts

Interpretation of ultrasound Images

- Introduction and appreciation of ultrasound artefact
- Introduction to image optimisation
- Use of Doppler to assess vascular structure
- *Optional and where available*: introduction to contrast

Fine Needle Aspiration (FNA/FNB)

- Introduction to tissue acquisition, FNA/FNAB needle
- Appropriate areas to biopsy
- Different types of needle
- Techniques of FNA & Different suction techniques
- Awareness of the importance of a secure stable position of scope prior to acquisition

The EUS Procedure

- Introduction to report writing. Example:
 - BACKGROUND: imaging results and indication for EUS, Risks
 - REMIT: Type of study
 - FINDINGS: key findings including unexpected ones
 - INTERVENTION: tissue acquisition: needle type, where/how/number of passes, judgement on adequacy for assessment
 - CONCLUSIONS: correlation (or variance) with previous imaging. Findings relevant to clinical care. Assessment of diagnosis and possible differential.
 - RECOMMENDATIONS: further studies or imaging, review in relevant MDT
 - POST PROCEDURAL CARE: recommencement of anticoagulation date/time
- Introduction to certain aspects of Endoscopic Non-Technical Skills (ENTS)

Domain 3 Advanced Phase of training 151 – 250: Aims of Training

Background knowledge of EUS

- Competent in pre procedural work up per case
- Demonstrates regular attendance at HPB / UGI MDT
- Ability to troubleshoot the scope set up

Scope Handling

- Ability to handle the echoendoscope, intubate and navigate in all stations
- Can manoeuvre echo endoscope to optimise an image; (aspiration: left hand dominant)
- Competent in placement of echoendoscope to “follow anatomical structures” consistently
- Consistently controls scope position to record finding and undertake biopsy

Ultrasound Console

- Can troubleshoot and optimise an ultrasound imaging consistently
- Records 7x key annotated static images relevant to each procedure remit

Anatomy encountered at EUS

Normal

- Can appreciate normal and its variants, consistently finds anatomical landmarks
- Proficiency in identifying key structures at each of the stations
- Ability to record challenging anatomical landmarks such as:
 - Mediastinum: AP Window, above aortic arch
 - Station 1: Spleen, splenic hilum, left renal vein, PV confluence, liver hilum
 - Station 2: GB fundus
 - Station 3: Cystic duct, trace bile duct from papilla to hilum and back
 - Station 4: Bifurcation of the aorta, major papilla, Pancreas Divisum

Trainee now moves from appreciation of “static” anatomical stations to manoeuvring the echoendoscope allowing continuous real time ultrasound when examine whole organs, tracing whole vessels & ductal systems and evaluating pathological lesions. The trainee becomes competent in real time U/S with the ability to “Follow the Anatomy”

- Evaluate a whole organ
- Follow vascular or ductal structures along their respective course such as:
 - Descending aorta after the arch
 - Course of the SMA after the origin from aorta
 - Course of the hepatic artery to the liver hilum
 - Trace the bile duct completely from ampulla to liver hilum
 - Trace main pancreatic duct continuously from tail to papilla
- Knowledgeable in appreciation of an incomplete exam, and recognises structures to be avoided during tissue acquisition

Pathology

Ability to detect and assess pathological lesions

- Stage cancer (TNM): an appreciation of staging facilitates and consolidates knowledge of anatomical landmarks, pathological lesion assessment & anatomical variants
 - Oesophageal and oesophagogastric cancer
 - Pancreatic cancer
 - Biliary
- Ability to discern small pathological lesions
 - Small pancreatic cyst and tumours of 3-5mm
 - Trace of ascites
 - Sub centimetre pathological lymph nodes
 - Characterise and describe pancreatic lesions: NETs, Cysts, IPMN

Interpretation of ultrasound Images

Proficiency in identifying, and documenting in descriptive ultrasound language, studies of different organs

- Pancreas
 - Evaluation of normal pancreas
 - Autoimmune disease eg IgG4 related disease involving the pancreas
 - Stigmata of chronic pancreatitis
 - Phases of pancreatitis: inflammatory changes to walled off pancreatic necrosis
 - Ductal calibre changes and transition points
- Extrahepatic bile duct and ampulla and pathology
- GB and abnormalities of structure, presence of pathology
- L lobe liver, intra hepatic bile ducts
- *Optional, where available: Contrast EUS*
 - Indications for routine clinical use:
 - Neuroendocrine tumours and other lesions not appreciated on cross sectional imaging
 - Indeterminate liver lesions in the liver eg haemangioma
 - Cystic lesions with large intra mural nodule

Morphology of lymph nodes

Fine Needle Aspiration (FNA/FNB)

- Competent in undertaking safe tissue acquisition
- Techniques eg fanning
- Awareness of different types of needle suction:
 - vacuum, low suction, water suction, slow pull technique of stylet, no suction
- Excellent knowledge when *not* to biopsy key structures to avoid doing harm
- Familiarity and confident at tissue bx of sub epithelial lesions when required
- Understanding of differences in tissue preparation of slides for cytology, and preparation for tissue for cytocheck, immunohistochemistry, histology and molecular biology such as flow cytometry
- Ability to prepare slides and preparations for cytocheck and histopathology
- Knowledge of strengths and weaknesses of needle types E.G.
- FNA for solid pancreatic lesions
- FNB for some of the following
 - Lymph nodes
 - Autoimmune pancreatic pathology: IgG4 related disease
 - Sarcoma
 - Lymphoma

The EUS Procedure

- Adequate knowledge in discerning normal findings from pathology
- Consistent in optimising images: scope handling and via ultrasound console
- Ability to carry out an EUS procedure in a suitable time frame whilst also taking charge of the room, communicates with all team members and the patient, demonstrating leadership and ability to make clear decisions
- Competent in Endoscopic Non-Technical Skills
- Consistently creates a structured EUS report
- Documents procedure remit
- Consistently addresses the clinical question (not all questions can be adequately answered)
- Good communication with relevant stakeholders: referring clinicians, MDTs etc

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**Formative DOPS:
Endoscopic Ultrasound (EUS)**

Date of Procedure			
Trainee name		Membership no (eg GMC/NMC)	
Trainer name		Membership no (eg GMC/NMC)	
Outline of case			
Category	Gastrointestinal	HPB	Other: eg Mediastinal
<i>Please tick appropriate box</i>			
Difficulty of case	Easy	Moderate	Complicated
<i>Please tick appropriate box</i>			

Level of supervision	Maximal supervision	Significant supervision	Minimal Supervision	Competent for independent practise	Not Applicable
Complete DOPS form by ticking the appropriate level of supervision required for each item below. Constructive feedback is key to this tool assisting in skill development.	Supervisor undertakes the majority of the tasks/decisions & delivers constant verbal prompts	Trainee undertakes tasks requiring frequent supervisor input & verbal prompts	Trainee undertakes tasks requiring occasional supervisor input & verbal prompts	No supervision required	
Pre-Procedure					
Indication					
Personalised Risk					
Review imaging					
Preparation					
Confirms Consent					
Equipment check					
Sedation					
Monitoring					
Comments					
Endoscopic Skills					
Intubation - cricopharynx - oesophagus - duodenum					
Endoscopy Visualization					
Scope Handling					
Comments					
Endoscopic Ultrasound Imaging and Interpretation					
Ultrasound Proficiency					
Image Acquisition					
Document all key images					
Interpretation					
Tissue Acquisition					
Target Selection					
Sampling Technique					
Complications					
Recognition and management of complications					
Post-Procedure					
Report Writing					
Management Plan					

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**Formative DOPS:
Endoscopic Ultrasound (EUS)**

Level of supervision	Maximal supervision	Significant supervision	Minimal Supervision	Competent for independent practise	Not Applicable
ENTS (Endoscopic Non-Technical Skills)					
Communication and Teamwork					
Situation Awareness					
Leadership					
Judgement and Decision Making					
Comments					
Learning Objectives for the next case					
The objective should be added to the trainee's personal development plan (PDP) once DOPS is submitted					
1.					
2.					
3.					
Overall Degree of Supervision required	Maximal supervision Supervisor undertakes the majority of the tasks/decisions & delivers constant verbal prompts	Significant supervision Trainee undertakes tasks requiring frequent supervisor input & verbal prompts	Minimal Supervision Trainee undertakes tasks requiring occasional supervisor input & verbal prompts	Competent for independent practise No supervision required	
<i>Please tick appropriate box</i>					

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Formative DOPS:
Endoscopic Ultrasound (EUS)

DOPS form guidance and descriptors

Pre-Procedure	
Indication	<ul style="list-style-type: none"> - Has read and evaluated referral - Assess relevant documentation and results of tests - Understands clinical question and role of EUS in management of patient
Personalised Risk	<ul style="list-style-type: none"> - Assesses co-morbidity including drug history - Assesses any procedure related risks relevant to patient - Takes appropriate action to minimise any risks
Review Imaging	<ul style="list-style-type: none"> - Evaluation of previous imaging - Demonstrates understanding of relevant anatomy and features of pathology related to clinical condition on pre-procedural imaging - Can correlate imaging with necessary EUS technique to successfully evaluate those abnormalities
Preparation	<ul style="list-style-type: none"> - Ensures all appropriate pre-procedure checks are performed as per local policies - Ensures that all assisting staff are fully apprised of the current case - Ensures all medications & accessories likely to be required for this case are available
Confirms Consent	<p>Candidate has knowledge of the most up-to-date national guidance on consent</p> <ul style="list-style-type: none"> - Early in training the consent process should be witnessed by the trainer, once competent it is acceptable for the trainee to confirm that valid consent has been gained by another trained member of staff - During the summative DOPS the process of obtaining consent should be witnessed and assessed - Complete and full explanation of the procedure including proportionate risks and consequences without any significant omissions and individualised to the patient - Avoids the use of jargon - Does not raise any concerns unduly <ul style="list-style-type: none"> • Gives an opportunity for patient to ask questions by adopting appropriate verbal and non-verbal behaviours • Seeks out what matters to patients in order to share relevant information on the benefits and harms of proposed options and reasonable alternatives including the option to take no action • Develops rapport with the patient - Respects the patient's own views, concerns and perceptions
Equipment check	<ul style="list-style-type: none"> - Ensures the available scope is appropriate for the current patient and indication - Ensures the endoscope is functioning normally before attempting insertion
Monitoring	<ul style="list-style-type: none"> - Ensures appropriate monitoring of oxygen saturation and vital signs pre-procedure - Ensures appropriate action taken if readings are sub-optimal - Demonstrates awareness of clinical monitoring throughout procedure
Sedation	<ul style="list-style-type: none"> - When indicated inserts and secures IV access and uses appropriate topical anaesthesia - Uses sedation and/or analgesic doses in keeping with current guidelines and in the context of the physiology of the patient - Drug doses checked and confirmed with the assisting staff
Endoscopic Skills	
Intubation	Demonstrates safe & effective intubation of: Cricopharynx, GOJ, Pylorus, D1/bulb, D2/D3
Endoscopy Visualization	Rudimentary appreciation & documentation of mucosal pathology noted visually
Scope Handling	<p>Consistently positions echoendoscope to achieve stability in all stations including</p> <ul style="list-style-type: none"> - ability to manoeuvre scope and tip position to improve & optimise imaging - knowledgeable in specific movements to "follow anatomical structures"
Endoscopic Ultrasound Imaging and Interpretation	
Ultrasound Proficiency	U/S knowledge, recognition of ultrasound artefact, knobology, Image optimisation,
Target Acquisition	<ul style="list-style-type: none"> - Can obtain and record clear, accurate images of all relevant anatomy and pathology - Demonstrates knowledge and necessary skills to utilise scope and ultrasound equipment to produce diagnostic images
Document all key images	<p>Document and annotate accurately all required key images for the given imaging remit</p> <ul style="list-style-type: none"> - Anatomical landmarks for normal anatomy and their variants - Record pathology including key images to highlight diagnosis and staging etc
Interpretation	<ul style="list-style-type: none"> - Understands normal & abnormal findings, correlates with clinical problem to aid diagnosis - Incorporate ultrasound findings into medical decision making and clinical practice

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**Formative DOPS:
Endoscopic Ultrasound (EUS)**

Tissue Acquisition	
Target Selection	<ul style="list-style-type: none"> - Appropriate selection of FNA/Core biopsy technique - Demonstrates understanding of different tissue / fluid required depending on anticipated pathology - Shows ability to select safe and achievable target
Sampling Technique	<ul style="list-style-type: none"> - Selects appropriate FNA/core biopsy needle to obtain tissue/fluid - Demonstrates ability to maintain safe, stable position during sampling - Shows ability to maintain needle visualisation at all times - Demonstrates understanding and necessary skills for distribution of acquired sample for effective cytology/pathology preparation - Demonstrates necessary communication/liaison with pathology colleagues to ensure effective reporting of samples
Complications	
Recognition	<ul style="list-style-type: none"> - Understanding of potential complications and demonstration of knowledge about likely symptoms in immediate post procedure time, short term and long term. - To include those related to general endoscopy and those specific to EUS and EUS guided interventions
Management	<ul style="list-style-type: none"> - Demonstration of ability to set in motion necessary actions in case of immediate, short term and long-term complications including: <ul style="list-style-type: none"> • communication with patients and staff • stratification of risk and appropriate therapies
Post-Procedure	
Report writing - <i>Content</i> - <i>Clarity</i> - <i>Conclusion & Answering the clinical question</i>	Structured endoscopy report: <ul style="list-style-type: none"> - Background, Risks, Remit - Findings <ul style="list-style-type: none"> • Adequate record of definitive findings • Clear and concise use of relevant EUS terminology - Intervention: - Conclusions: Correlation with previous imaging <ul style="list-style-type: none"> • Record of conclusion of findings and relevance to clinical care • Clear thought to diagnosis / differential diagnosis Recommendations: Post procedural Instructions: including anticoagulation re-commencement etc
Management plan	- Adequate communication with clinical staff, patient & relatives
ENTS (Endoscopic Non-Technical Skills)	
Communication and Teamwork	<ul style="list-style-type: none"> - Ensures that the patient is at the centre of the procedure, emphasising safety and comfort - Maintains clear communication with assisting staff - Gives and receives knowledge and information in a clear and timely fashion - Ensures that both the team and the endoscopist are working together, using the same core information and understand the 'big picture' of the case - Clear communication of results and management plan with patient and/or carers
Situation Awareness	<ul style="list-style-type: none"> - Ensure procedure is carried out with full respect for privacy and dignity - Maintains continuous evaluation of the patient's condition - Ensures lack of distractions and maintains concentration, particularly during difficult situations - Intra-procedural changes to scope set-up monitored and rechecked
Leadership	<ul style="list-style-type: none"> - Provides emotional and cognitive support to team members by tailoring leadership and teaching style appropriately - Supports safety and quality by adhering to current protocols and codes of clinical practice - Adopts a calm and controlled demeanour when under pressure, utilising all resources to maintain control of the situation and taking responsibility for patient outcome
Judgement and Decision Making	<ul style="list-style-type: none"> - Considers options and possible courses of action to solve an issue or problem, including assessment of risk and benefit - Communicates decisions and actions to team members prior to implementation - Reviews outcomes of procedure or options for dealing with problems - Reflects on issues and institutes changes to improve practice

Option for Summative Assessment

Summative Assessment			
Assessor Name (1)		GMC no	
Assessor Signature			
Assessor Name (1)		GMC no	
Assessor Signature			