

Training pathway for small bowel capsule endoscopy in the UK

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ABSTRACT

The demand for small bowel (SB) capsule endoscopy (CE) is increasing in the UK. However, there remains a wide variation in the number of CE procedures performed in different centres. Across the UK there is a lack of a clear training pathway or certification process. A standardised national Joint Advisory Group (JAG) on Gastrointestinal Endoscopy approved a 1-year training and accreditation programme accessible to all professional groups that may wish to train in SB CE. Structured training is delivered using JAG-accredited CE courses and an electronic learning module. Prior to setting a knowledge-based assessment, a minimum of 50 SB CE cases are recommended to be read in tandem with a trainer at a local centre, with proficiency documented using Direct Observation of Procedural Skill (DOPS) assessments.

INTRODUCTION

Capsule endoscopy (CE) is the first-line endoscopic examination of the small bowel (SB). Where SB endoscopy is appropriate, the most common indications for SBCE are gastrointestinal (GI) bleeding after negative bidirectional endoscopy and suspected or established SB Crohn's disease.¹ It complements cross-sectional imaging and conventional endoscopy in the assessment of complications of coeliac disease, in the surveillance of SB polyposis syndromes and identification of SB tumours (eg, primary adenocarcinomas, GI stromal tumours and primary SB neuroendocrine tumours).² CE is well tolerated by patients, and although SB examinations confer a risk of capsule retention, the use of patency devices in advance of CE minimises this.³

The demand for CE services in the UK has increased threefold from 4 to 13 per 100 000 population between 2007 and 2015.⁴ A survey in 2012 suggested that UK gastroenterologists felt that SBCE was underused, and despite being

available in-house at 45% of centres, it was estimated that at least 45 procedures per 100 000 population in the UK were required. Among trainees, 74% were interested in training in CE, although only 16% had been on a formal training course.⁵ At the same time there was a 45-fold variation in the number of procedures performed per head of population in the UK.⁴ Finally, the impact of COVID-19 on conventional endoscopy services and training has further fuelled an interest in CE training.⁶ These issues may therefore be addressed in part by formalising training and accreditation programmes in CE.

Training pathway

In the UK, the Joint Advisory Group on Gastrointestinal Endoscopy provides a structured framework for training and accreditation for conventional flexible GI endoscopy. One of the core objectives of the JAG is to agree on, and set acceptable standards for, competence in endoscopic procedures, where possible using an evidence-based approach to develop training and accreditation processes. SBCE courses have existed for many years in the UK; however, the widespread availability of and increase in demand for SBCE have mandated the need for a formal training pathway and accreditation process.

To certify competent practice, measurable competency indicators and outcomes needed to be defined and assessment processes developed. The development of the national JAG-approved SBCE training curriculum is described henceforth.

Overview

A curriculum is used to define essential and recommended knowledge, skills and behaviours and to provide a framework for progression at each stage in training. Standardisation of training pathways allows a closer understanding of the



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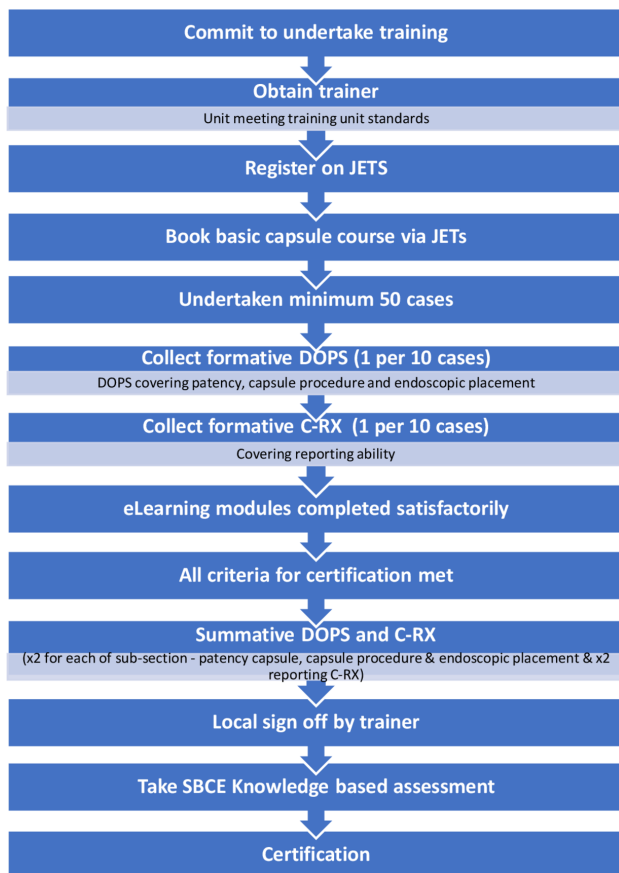


Figure 1 Capsule endoscopy training and certification pathway.

factors affecting the learning curves of the trainees. There are a number of facets unique to training in CE that warrant discussion. In contrast to conventional fibre-optic endoscopy, image interpretation is much the primary skill and is performed separately from the CE procedure itself. Interpretation of capsule videos requires a skill set based on observation and recognition of findings and an understanding of their significance in the context of the indication for CE.⁷ The scope of training will therefore vary between individuals based on their experience in endoscopy and their professional background, and there may be a wide variation in progress through competency levels on the learning curve and when training waypoints are reached between individual trainees. Overall, it is recommended that this hands-on training (both in performing the procedure and operation of CE software) and more intensive mentored CE reading and reporting will take place over a year.

Core curriculum

JAG certification standards have been developed such that outcomes of training should be linked to both the mastery of a technical skill and advising on further management based on CE findings. The core curriculum for CE provides information to the trainee and trainers about areas of practice which are considered essential to the understanding of the indications for

the test, recognising possible complications, patient-specific factors and complimentary or alternative approaches (eg, SB radiology). The core curriculum focuses on background knowledge required to provide informed consent, support clinical decision-making, accurate reporting and appropriate aftercare advice (eg, the need for further device-assisted enteroscopy or imaging). The two main processes in CE involve setting up the equipment and the capsule procedure itself, followed by interpretation of the videos and writing the report which guides the referrer on future management of any findings seen. Additionally, it may also involve administration of a luminal patency capsule (PillCam Patency, Medtronic) in advance of the CE and endoscopic placement of the capsule in some instances. Each of these elements are included in the curriculum and are assessed by the training pathway. Although upper GI endoscopy experience is desirable, it is not a prerequisite to training in SBCE as competency can be achieved in the absence of previous endoscopy experience.⁸

The proposed SBCE curriculum is detailed elsewhere.⁹ Such a structured SBCE curriculum could be included in the core UK gastroenterology curriculum; however, with specialty gastroenterology training being reviewed in the UK as part of the Shape of Training review,¹⁰ training in SBCE is likely to remain optional and may in the future fall into the GMC plans for credentialing or become part of a larger subspecialty in the management of SB pathology. The training programme is equally applicable to all advanced clinical practitioners within a regulated healthcare profession. The structured training elements which accompany the curriculum are the completion of an electronic learning module and attendance at a CE course. Achieving proficiency and demonstrating competency will then be met by local training guided by Direct Observation of Procedural Skill (DOPS) assessments and delivered in centres with appropriate experience and expertise. A summary of the CE training and certification pathway is illustrated in [figure 1](#).

E-learning module

The interpretation of SBCE is performed by reviewing images after the procedure, as opposed to the live image interpretation of conventional endoscopy. Training and assessment can be performed by using videos (whole videos or video segments, and showing normal mucosa and pathology) from a purpose made library. Such computer-aided training modules have been shown to improve lesion recognition, irrespective of level of experience, among both gastroenterology trainees and medical students.¹¹ As a primer to SBCE, four modules have been developed in conjunction with NHS e-learning for health to introduce trainees to the technical aspects of CE (two modules), standardised images of relevant normal variants (one module) and pathological findings (one module).¹² These modules

Table 1 Learning outcomes for capsule endoscopy courses

Learning outcome	Content	Trainee group
Technology Knowledge and competent handling of the video capsule system, software functionality and accessories	Technical specifications, performance characteristics of system components: Video capsules Sensor array/wearable antennas, data recorder, real-time viewing, workstation and software and network application Patency capsule and scanner	1. VC endoscopist 2. Nursing staff performing procedure
Assessment and consent Appropriately assess, select and consent patients for procedure, identify risk, recognise and manage special needs	Indications, fields of application and alternatives Absolute and relative contraindications Capsule retention and risk reduction strategies Special needs requiring modification of the procedure including the critically ill, swallowing disorders and impaired gastrointestinal motility Endoscopic placement Consent issues	1. VC endoscopist
Procedure Understand requirements for preparation and perform procedure (video capsule and patency)	Patient preparation: Dietary/fasting, bowel purgatives, prokinetics, antifoaming agent Management of comorbidity Video capsule procedure, video download Patency capsule procedure Complications Patient discharge	1. VC endoscopist 2. Nursing staff performing procedure
(Pre) Reading Navigate software to read videos, recognise a normal study, highlight pathology and save	Software functionality Practical methods of reading and image analysis Anatomical landmarks, variants of normal	1. VC endoscopist 2. Reader extender
Diagnosis and reporting	Interprets normal and abnormal findings. Accurately documents findings including clinical relevance with integration of findings into management plans Reports components in VCE standard terminology Recommendation to direct patient management	1. VC endoscopist 2. Reader extender

VC, video capsule; VCE, video capsule endoscopy.

are mapped to the curriculum and it is proposed that these modules be completed during training in CE prior to certification.

CE courses

Structured courses that include at least 6 hours of hands-on training in reading and interpreting CE cases have been used successfully in Europe.¹³ The learning objectives of a JAG-approved CE course are illustrated in [table 1](#).¹⁴ Delegates are exposed to didactic training about the procedure and use of equipment, the evidence behind the indications, contraindications and complications of CE and adjuncts such as patency capsules and capsule delivery devices. During the hands-on sessions, delegates review a series of capsule videos guided by an expert. Each case is focused on a specific lesson in capsule video interpretation, from use of software to the identification of landmarks, normal variants, benign and pathological findings. Importantly, how these findings contribute to aftercare decisions are emphasised, for example, the further need for device-assisted enteroscopy (DAE) to investigate pathology or abdominal radiography in cases of incomplete SB examinations. The benefit of such an approach is that each successive case that follows allows new knowledge to be acquired while reinforcing earlier lessons fundamental to accurate interpretation. As a significant proportion of capsule examinations do not yield significant findings, a large repository of select short capsule videos means different examples of normal variants, common and less common pathologies such

as SB diverticula and tumours will be studied during the hands-on sessions.

The aim of these courses is to enable delegates to recognise a wide range of SB pathologies while improving uniformity in interpretation and reporting of SB pathology in line with capsule endoscopy standard terminology.¹⁵ These courses have been shown to improve delegates' diagnostic skills. Ten short CE videos were used to test the performance of delegates of 17 European courses in the identification of pathology pre course and post course.¹⁶ Baseline scores were higher among those with previous experience in capsule and flexible endoscopy. However, improvements in delegates' ability to classify the types and relevance of SB findings were found irrespective of baseline experience.

Local training

In the training pathway, e-learning and structured capsule courses are mandatory adjuncts to local training. A trainee with the desire to pursue CE should be supported by a training unit with a CE service that meets certain criteria; it should comprise of a minimum of two consultant gastroenterologists reporting CE and an endoscopist able to deploy a capsule endoscope using a conventional endoscope when this is necessary. It is essential that the service be supported by allied healthcare professional experienced in performing patency capsule and CE procedures. The service should perform a minimum of 100 SB capsule endoscopies per annum and have on site DAE or close links to centres

with an established referral pathway. Training should cover SB anatomy and physiology, indications for and risk of CE, patient assessment and selection and alternative investigations. Hands-on training alongside a CE expert, with double reading, is the mainstay of learning to interpret capsule videos. Trainers read the same videos in tandem although not necessarily simultaneously with the trainee and feedback is given to the trainee on the accuracy of reading and reporting. The trainee will require access to CE reading and reporting software, the JAG endoscopy training system portfolio and thus CE DOPS forms. Trainers should be reading capsules routinely, have a lifetime experience of more than 200 procedures and have a portfolio demonstrating training competence and continuing professional development in CE. Where individual units are unable to meet these requirements, collaborations between neighbouring centres may be established to provide training opportunities.

Competency assessment

Unlike conventional endoscopy, CE relies on visual interpretation of images alone, rather than operator manipulation of an endoscope and so there are no key performance indicators for CE analogous to caecal or duodenal intubation. Furthermore, there is a wide variability in the learning curve between trainees in CE, in particular with interpretation of capsule videos.^{11 17–19}

Rajan *et al* reported on structured training and assessment of GI fellows who had completed a 24-month fellowship at the Mayo Clinic in the USA, but had no experience in CE.¹⁸ Participants underwent a structured training programme in CE, involving didactic teaching and a variable number of supervised capsule reading, following which they undertook a Capsule Competency Test (CapCT). The CapCT tests trainee's knowledge of SBCE (indications, contraindications and possible complications), ability to identify, interpret and document findings. This was achieved using a combination of multiple choice questions, assessments on eight video clips and review of a full CE case with complete procedural reporting. The CapCT scores of the trainees, who had between 5 and 35 supervised reads with expert endoscopists, showed no difference between trainee and staff grade capsule endoscopists after 20 supervised reads. It should be pointed out however, this learning curve represents a cohort of trainees in the advance stages of their gastroenterology training having performed a significant number of gastroscopies, colonoscopies and push enteroscopies. No association between CapCT scores and number of endoscopic procedures performed were seen.

In addition to performing CE procedures, specialist nurses acting as physician extenders also have a role in the reading and interpretation of capsule videos.^{20 21} Using a standardised pro forma of findings and feedback from physician reviewers, nurses with 3 days of training in prereading capsule procedures had

consistent agreement with physician reviewers after an initial 80 procedures.¹⁷ Therefore, the move towards competency being based on assessment of proficiency rather than experience based on number of videos read/procedures performed has been adopted in CE. Endoscopy experience may be beneficial in helping trainees initially interpret CE more accurately but not necessary for achieving CE competence.^{8 16 22} A recent European Society of Gastrointestinal Endoscopy position statement on SBCE training recommend a minimum number of 30 procedures are reviewed under supervision before assessment of competency.²³ Given the paucity of evidence, especially among physician extenders, the JAG recommend that a minimum of 50 CE procedures are undertaken prior to assessment of competence.

During the training programme, assessment of progress is achieved using DOPS tools. The DOPS is an established and validated tool to assess competence and is based on the degree of supervision required in different domains relevant to the endoscopic modality.²⁴ The purpose of formative DOPS is to document changes in proficiency over the course of training. Two types of DOPS tools have been designed for CE: Capsule procedure DOPS and capsule reporting DOPS (C-RX). The capsule procedure DOPS covers procedural aspects including equipment use, performing patency procedures and scans, the capsule procedure and endoscopic placement. Endoscopic placement of capsule endoscopes is an optional competency in only those trainees with suitable upper GI endoscopy experience. The C-RX DOPS assesses capsule video reading, interpretation and reporting performed during tandem reading of videos by trainer and trainee. It is recommended that the respective formative DOPS are completed for every 10 procedures performed or reported. Competency and suitability for certification is considered when the most recent two DOPS of each type scores competent for independent practice and C-RX demonstrate parity between trainee and trainer.

Competency certification

The proposed certification pathway involves satisfactory completion of e-learning modules, attendance at a JAG-accredited CE course and completion of at least five formative capsule DOPS and five C-RX DOPS, followed by two summative capsule DOPS and CR-X assessments prior to local sign off by a trainer (figure 1). Following this, a knowledge-based assessment examination should be passed prior to certification of competence in SBCE. This examination is scenario based with images in a single best answer format and includes questions on identification of pathology, reporting significance of findings and immediate management, indications and procedural risk.

SUMMARY

This is an overview of SBCE training in the UK which presently is expected to take a year, but may take longer. Training is accessible to any clinical practitioner of a range of healthcare professionals, assuring training to a particular standard while being flexible towards the professional background and prior experience in endoscopy of the learner. Nonetheless, it has a shorter training period than conventional endoscopy and the roles of non-invasive diagnostic endoscopy are likely to increase in the future.

The training pathway includes an electronic e-learning module and a structured capsule course with at least 6 hours of hands-on teaching. The mainstay of learning SBCE is tandem reviews of capsule videos by trainee and trainer with provision of focused feedback from trainer to trainee, this is recommended to occur in a local unit that has the expertise to deliver training. Certification of proficiency can be obtained after attendance of a CE course, completion of an e-learning module, a prerequisite number of DOPs assessments and a knowledge-based assessment examination.

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REFERENCES

- Dionisio PM, Gurudu SR, Leighton JA, *et al.* Capsule endoscopy has a significantly higher diagnostic yield in patients with suspected and established small-bowel Crohn's disease: a meta-analysis. *Am J Gastroenterol* 2010;105:1240–8. quiz 9.
- Pennazio M, Spada C, Eliakim R, *et al.* Small-Bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of gastrointestinal endoscopy (ESGE) clinical guideline. *Endoscopy* 2015;47:352–86.
- Wang Y-C, Pan J, Liu Y-W, *et al.* Adverse events of video capsule endoscopy over the past two decades: a systematic review and proportion meta-analysis. *BMC Gastroenterol* 2020;20:364.
- Public Health England. Atlas of variation: diagnostics, 2017. Available: <https://fingertips.phe.org.uk/profile/atlas-of-variation/> [Accessed 18/11/2020].
- McAlindon ME, Parker CE, Hendy P, *et al.* Provision of service and training for small bowel endoscopy in the UK. *Frontline Gastroenterol* 2012;3:98–103.
- Conley TE, Fiske J, Townsend T, *et al.* COVID-19 and the challenges faced by gastroenterology trainees: time for capsule endoscopy training? *Frontline Gastroenterol* 2021;22:flgastro-2020-101704.
- Rondonotti E, Pennazio M, Toth E, *et al.* How to read small bowel capsule endoscopy: a practical guide for everyday use. *Endosc Int Open* 2020;8:E1220–4.
- Alakkari A, El-Sherif O, Dobson M, *et al.* Is focused training adequate or is prior endoscopy experience needed for reliable capsule endoscopy reporting? *Journal of Gastroenterology and Hepatology Research* 2013.
- Joint Advisory Group for GI Endoscopy. JAG certification capsule endoscopy (small bowel), 2020. Available: [https://www.thejag.org.uk/CMS/UploadedDocuments/Scheme/Scheme5/Capsule endoscopy certification criteria and process 1.1.pdf](https://www.thejag.org.uk/CMS/UploadedDocuments/Scheme/Scheme5/Capsule%20endoscopy%20certification%20criteria%20and%20process%201.1.pdf)
- Clough J, FitzPatrick M, Harvey P, *et al.* Shape of training review: an impact assessment for UK gastroenterology trainees. *Frontline Gastroenterol* 2019;10:356–63.
- Postgate A, Haycock A, Thomas-Gibson S, *et al.* Computer-Aided learning in capsule endoscopy leads to improvement in lesion recognition ability. *Gastrointest Endosc* 2009;70:310–6.
- e-Learning for Health. Capsule endoscopy. Available: <https://www.e-lfh.org.uk/programmes/endoscopy/> [Accessed 18/11/2020].
- Fernandez-Urien I, Panter S, Carretero C, *et al.* International core curriculum for capsule endoscopy training courses. *Endosc Int Open* 2017;5:E526–38.
- Davidson C, Sidhu R. Education and Training in Video Capsule Endoscopy. In: Keuchal M, Hagemuller F, Tajiri H, eds. *Video capsule endoscopy*. Berlin, Heidelberg: Springer, 2014.
- Korman LY, Delvaux M, Gay G, *et al.* Capsule endoscopy structured terminology (CEST): proposal of a standardized and structured terminology for reporting capsule endoscopy procedures. *Endoscopy* 2005;37:951–9.
- Albert JG, Humbla O, McAlindon ME, *et al.* A simple evaluation tool (ET-CET) indicates increase of diagnostic skills from small bowel capsule endoscopy training courses: a prospective observational European multicenter study. *Medicine* 2015;94:e1941.
- Postgate A, Haycock A, Fitzpatrick A, *et al.* How should we train capsule endoscopy? A pilot study of performance changes during a structured capsule endoscopy training program. *Dig Dis Sci* 2009;54:1672–9.
- Rajan E, Iyer PG, Oxentenko AS, *et al.* Training in small-bowel capsule endoscopy: assessing and defining competency. *Gastrointest Endosc* 2013;78:617–22.
- Brock AS, Freeman J, Roberts J, *et al.* A resource-efficient tool for training novices in wireless capsule endoscopy. *Gastroenterol Nurs* 2012;35:317–21.
- Yung DE, Fernandez-Urien I, Douglas S, *et al.* Systematic review and meta-analysis of the performance of nurses in small bowel capsule endoscopy reading. *United European Gastroenterol J* 2017;5:1061–72.
- Rondonotti E, Spada C, Adler S, *et al.* Small-Bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of gastrointestinal endoscopy (ESGE) technical review. *Endoscopy* 2018;50:423–46.
- Sidhu R, Sakellariou P, McAlindon ME, *et al.* Is formal training necessary for capsule endoscopy? the largest gastroenterology trainee study with controls. *Dig Liver Dis* 2008;40:298–302.
- Sidhu R, Chetcuti Zammit S, Baltes P, *et al.* Curriculum for small-bowel capsule endoscopy and device-assisted enteroscopy training in Europe: European Society of gastrointestinal endoscopy (ESGE) position statement. *Endoscopy* 2020;52:669–86.
- Siau K, Dunckley P, Valori R, *et al.* Changes in scoring of direct observation of procedural skills (DOPS) forms and the impact on competence assessment. *Endoscopy* 2018;50:770–8.