


# Performance measures for the SACRED team-centered approach to advanced gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative



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## Bibliography

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## ABSTRACT

The European Society of Gastrointestinal Endoscopy and United European Gastroenterology have defined performance measures for upper and lower gastrointestinal, pancreaticobiliary, and small-bowel endoscopy. Quality indicators to guide endoscopists in the growing field of advanced endoscopy are also underway. We propose that equal attention is given to developing the entire advanced endoscopy team and not the individual endoscopist alone. We suggest that the practice of teams intending to deliver high quality advanced endoscopy is underpinned by six crucial principles concerning: selection, acceptance, complications, reconnaissance, envelopment, and documentation (SACRED).

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## ABBREVIATIONS

<b>AE</b>	adverse event
<b>ASA</b>	American Society of Anesthesiologists
<b>EGD</b>	esophagogastroduodenoscopy
<b>EMR</b>	endoscopic mucosal resection
<b>ERCP</b>	endoscopic retrograde cholangiopancreatography
<b>ESD</b>	endoscopic submucosal dissection
<b>ESGE</b>	European Society of Gastrointestinal Endoscopy
<b>GI</b>	gastrointestinal
<b>GRADE</b>	Grading of Recommendation Assessment, Development and Evaluation
<b>MDT</b>	multidisciplinary team
<b>OR</b>	odds ratio
<b>PICOS</b>	population/patient, intervention, comparison, outcome, study design
<b>QIC</b>	Quality Improvement Committee
<b>SACRED</b>	selection, acceptance, complications, reconnaissance, envelopment, and documentation
<b>SMSA</b>	size, morphology, site, and access
<b>UEG</b>	United European Gastroenterology
<b>WHO</b>	World Health Organization

## SOURCE AND SCOPE

This is an official position statement of the European Society of Gastrointestinal Endoscopy (ESGE). It provides Recommendations aimed at developing the characteristics we consider important to any endoscopy team performing advanced procedures. These Recommendations are based on a consensus among endoscopists considered to be experts in advanced gastrointestinal endoscopy and endoscopy service development.

## 1 Introduction

Diagnostic endoscopy is well established with defined standards of practice [1–6]. In 2015, the European Society of Gastrointestinal Endoscopy (ESGE) and United European Gastroenterology (UEG) identified the quality of endoscopy as a major priority. This led to the commissioning of the ESGE Quality Improvement Committee (QIC) to develop performance measures for the domains of upper gastrointestinal (GI), lower GI, pancreaticobiliary, and small-bowel endoscopy, and for the endoscopy service [7]. Meanwhile, advanced therapeutic endoscopy is constantly evolving, with new techniques frequently emerging and progressively becoming more complex [8–10]. The development of quality indicators for advanced endoscopy is now also underway [11, 12]; however, there is a need to look beyond just the technical skills required of individual advanced endoscopists.

When delivering high quality endoscopy, the importance of nontechnical skills should be emphasized [13]. Good communication and decision-making skills are just as essential as the mechanical dexterity required for endoscopy. Moreover, training of the whole endoscopy team is as important as that for the individual endoscopist [14]. Advanced therapy is associated with a higher risk of adverse events (AEs) [15, 16]. Effective teamworking is crucial in high risk trades, as is evident in the aviation industry [17, 18], and is not a foreign concept to endoscopy services [19, 20]. Yet the notion of defining the model qualities of an endoscopy team has remained unexplored. In a burgeoning era of advanced therapeutics, ensuring that teams are equipped with the necessary repertoire of skills is more relevant than ever. In this Position Statement, we describe practical guidelines for building a team capable of mastering the challenges of advanced endoscopy. This process dedicates attention to six domains: selection, acceptance, complications, reconnaissance, envelopment, and documentation (SACRED).

## 2 Methods

The multistep process involved in developing performance measures has previously been described [7]. The advanced endoscopy team working group was formed in May 2021 following initial meetings. A comprehensive literature search on the topic of advanced endoscopy teams was performed but yielded no evidence. Statements were therefore constructed using the PICOS (Population/Patient, Intervention, Comparison, Outcome, Study design) framework [6]. A systematic search was performed for literature on team-working in endoscopy and other team-orientated procedures and occupations. When statements were being formulated, articles were graded for evidence levels and recommendation strengths using the Grading of Recommendation Assessment, Development and Evaluation (GRADE) system [21].

Members of the working group provided comments on proposed statements during an initial videoconference. The Delphi method was used to negotiate agreements on the position statements [7]. All members were informed of the methodology. Statements were adjusted and/or excluded during iterative Delphi rounds by working group members; adjustments made in each round were documented. A cutoff for accepting statements as the consensus was set at reaching 80% agreement (summative of “strongly agree” and “agree”). A total of three Delphi rounds was set a priori as the maximum opportunity to come to an agreement on a statement. The final consensus statements described below refer to 80% agreements that were already achieved by the second voting round of the Delphi process.

## 3 Performance measures for the advanced endoscopy team: the SACRED approach

### 3.1 Selection

#### RECOMMENDATION

**1** A formalized multidisciplinary team (MDT) approach is recommended. The MDT should agree on a list of advanced interventions requiring discussion. Level of agreement 90%, very low quality evidence.

Advanced endoscopy inevitably carries a higher risk for AEs compared with diagnostic procedures [16]. Appropriate patient selection is one way of curtailing this risk [22]. Previous studies suggest that a multidisciplinary team (MDT) approach to advanced endoscopy is beneficial. In a prospective cohort study of 1909 patients undergoing endoscopic retrograde cholangiopancreatography (ERCP) for benign hepatobiliary disease, prior MDT discussion of cases improved safety and decreased overall AEs compared with controls (6.9% vs. 12.0%;  $P < 0.001$ ) [23]. A lower rate of severe AEs was also observed with preprocedural MDT discussion (0.4% vs. 2.5%;  $P = 0.04$ ).

In a small cohort study, Vaughan-Shaw et al. retrospectively compared the management pathways of patients with a final diagnosis of early rectal cancer (pT1). Patients referred to a single regional center for management of potential early rectal cancer and uncertain rectal neoplasms were analyzed. There were 24 patients who underwent specialist MDT discussion and they were compared with 19 who did not [24]. The MDT consisted of two consultant surgeons with an interest in significant rectal neoplasms and transanal endoscopic microsurgery, two interventional gastroenterology colonoscopists, a specialist GI pathologist, two radiologists with a specialist interest in rectal cancer imaging, a clinical oncologist, and cancer nurse specialists. In patients not discussed at the specialist MDT meeting, 53% underwent primary resection without any prior attempt at local excision (conventional peranal excision or transanal endoscopic microsurgery), 80% of whom had a T1 N0 cancer. By contrast, only 8% of patients discussed at the specialist MDT meeting underwent primary resection (of which 50% were for a T1 N0 cancer), while 67% underwent local excision as definitive treatment. The authors concluded that specialist MDT discussion was associated with more accurate preoperative staging of early rectal cancers. It also increased the use of local excision, with a reduction in margin positivity, if performed. Other studies similarly suggest that input from an MDT improves outcomes for patients with colorectal cancer [25,26].

A formalized MDT approach to advanced endoscopy is also likely to be beneficial [27]; however, the criteria for patients warranting MDT discussion will not be universal to all centers. The definition of advanced endoscopy is ever changing with the technological developments. Therefore, prerequisites for MDT discussion should evolve concomitantly. Several other considerations may also influence the shortlist of patients re-

quiring MDT input. The anticipated technical complexity of a procedure may be sufficient to necessitate referral to the MDT. The interpretation of complexity may be subject to local experience for a specific intervention: centers with a high caseload volume need not discuss every case. Additionally, the availability and suitability of alternate treatment options is better debated at the MDT level. This would include discussion of comorbidities and physiological fitness to determine fitness for the proposed advanced procedure versus alternatives. The definition of procedures being advanced and requiring MDT discussion should be decided locally a priori, allowing adjustment for the available skillset and resources.

The core members of the MDT should, by definition, be multidisciplinary and may include surgeons, physicians, radiologists, and nurse specialists. Consideration should also be given to MDTs that are already established locally. Cases may be better discussed as part of an existing MDT (e.g. cancer and benign upper GI MDTs) rather than by a separate advanced endoscopy MDT. Standalone advanced endoscopy MDTs could be locoregional, for example a complex colorectal polyp MDT, recruiting core members with specific expertise in the area.

A decision should be made by the MDT as to whether advanced endoscopy is warranted and on the proposed mode of intervention, should alternatives exist. An example would be a discussion of the merits of removing a large flat colonic polyp in a young patient with multiple co-morbidities. If proceeding with intervention, discussion of whether to approach with endoscopic mucosal resection (EMR), endoscopic submucosal dissection (ESD), or surgical resection should occur.

#### RECOMMENDATION

**2** The patient should be assessed from an anesthetic perspective (not necessarily by an anesthesiologist) with a documented American Society of Anesthesiologists (ASA) grading. Level of agreement 100%, very low quality evidence.

Patients undergoing advanced interventional endoscopy should be assessed for their fitness [23,28–30], consented for the higher risk compared with routine endoscopy, and provided with alternatives if available [31]. The latter would include the option of active monitoring without intervention. In the UK, guidance for the delivery of safe and quality assured upper GI endoscopy recommends thorough assessments of patients' health status (including ASA class) before the procedure [22]. While this practice is not supported by high quality evidence, the available literature would emphasize the importance of assessing ASA status (as an indicator of physiological fitness) in GI endoscopy.

In a retrospective cohort analysis of 1 590 648 endoscopic procedures (34.2% esophagogastroduodenoscopy [EGD], 60.3% colonoscopy, 4.4% flexible sigmoidoscopy, 1.2% ERCP) in 1 318 495 patients, Enestvedt et al. reported an increased risk of any AE with increasing ASA class within each procedure type [30]. For

EGD and colonoscopy, the risk of any AE for a patient with ASA class IV/V, compared with an ASA class I patient, was 12.02 times (95%CI 9.62–15.01) and 4.93 times (95%CI 3.66–66.3) higher, respectively. The risk of a serious AE (hospital admission, surgery, cardiopulmonary resuscitation, or emergency room referral) increased with increasing ASA class for EGD (odds ratio [OR] and 95%CI were: ASA class I, 1.0 as reference; II, 2.88 [1.43–5.80]; III, 7.16 [3.47–14.79]; IV/V, 32.18 [14.54–71.24]), and for colonoscopy (ASA class I, 1.0 as reference; II, 0.98 [0.68–1.43]; III, 1.67 [1.01–2.78]; IV/V, 9.68 [4.00–23.46]).

In a prospective cohort study, Burgess et al. examined 1039 patients undergoing wide-field EMR for sessile colonic polyps of 20 mm or larger [32]. Clinically significant postendoscopic bleeding was experienced by 62 patients. Of these, 27 underwent repeat colonoscopy (21 received endotherapy) and one patient underwent primary embolization to achieve hemostasis. Multivariate analysis demonstrated a higher risk of requiring intervention to achieve hemostasis (defined as endoscopic intervention, angiographic embolization, or surgery) in patients with ASA class II or above (OR 20.1 [95%CI 3 to >100];  $P < 0.001$ ).

The assessment of ASA status prior to advanced interventional endoscopy is therefore important to fully appreciate the risk involved. This is relevant irrespective of whether the patient undergoes advanced endoscopy under a general anesthetic or conscious sedation. While the Charlson co-morbidity index [33, 34] and clinical frailty scale [35] have also been used to assess risk within endoscopy, these are supported by only a few smaller studies. Further work is required to determine the optimal modality to assess fitness for advanced endoscopic procedures.

### 3.2 Acceptance

#### RECOMMENDATION

**3** It is crucial for the team to understand and accept that advanced interventions carry a higher risk for adverse events compared with routine endoscopy.

Level of agreement 100%, very low quality evidence.

Adjusting to the higher risk associated with interventional endoscopy may not come easily to everyone; specific personality traits may be better suited, as seen in surgery [36]. In a national prospective observational study, Rutter et al. studied patients over the age of 60 years undergoing bowel cancer screening colonoscopy [16]. They reported increased relative risks for bleeding and perforation by factors of 11.14 and 2.97, respectively, when polypectomy was performed compared with when no polypectomy was performed. Moreover, larger polyp size was a strong predictor of bleeding ( $P < 0.001$ ) and perforation ( $P < 0.002$ ). A meta-analysis comparing early gastric cancers resected by ESD (1495 cases) versus EMR (2053 cases) also demonstrated higher perforation rates with the former (OR 4.67 [95%CI 2.77–7.87]).

The modern approach to managing AEs involves vigilance, early recognition, and engagement of proactive endoscopic techniques to address untoward events [37]. However, the team also need to accept that advanced endoscopic procedures are associated with a higher rate of AEs compared with routine endoscopy, even in expert hands.

#### RECOMMENDATION

**4** A no-blame culture is essential for the wellbeing of the team. This is imperative when using critical incident reporting systems.

Level of agreement 100%, very low quality evidence.

Endoscopists and their teams are imperfect. The current working climate increasingly embraces a blame-free culture [18] and encourages learning from error analysis exercises [20]. Systems employed to address underperformance can be used to isolate and improve weaknesses. Techniques include informal reflection, coaching, and formal retraining programs to tackle both technical and nontechnical deficiencies [38]. In a study of 249 healthcare providers, the fear of being blamed for an error was significantly higher than the fear of the associated punishment for the error [39]. Whether healthcare providers feel as if they are being personally blamed for errors can also affect the level of trust within an organization. A trusting organizational culture is positively associated with supervisors and executive teams adopting a no-blame and systems review approach to managing errors, compared with holding individuals solely responsible [40]. Acceptance of higher risk and a no-blame culture are two factors that may promote wellbeing and longevity in advanced endoscopy. This mindset should be present in the endoscopy room and when AEs are reviewed on a systemic level.

The release of the landmark report *To Err is Human* by the Institute of Medicine in 1999 was met by a dramatic push to minimize patient harm from healthcare [41]. International Recommendations for critical incident reporting systems are now available and positively encourage reporting and learning from serious events [42]. A study of 2028 patient safety incidents occurring in 20 hospitals across the Netherlands reported different incident types (relating to collaboration vs. medication use) between different hospital departments (emergency medicine vs. internal medicine and general surgery) [43]. The authors suggest that unit-based incident analysis may provide more useful information to guide improvements. Advanced endoscopic interventions inherit niche AEs that may otherwise be rare, with their occurrence being unusual during diagnostic endoscopy. Advanced intervention-based incident analysis will therefore likely be of more benefit than general unit-based incident analysis.

**RECOMMENDATION**

**5** A preprocedural team brief should be performed prior to the patient entering the endoscopy room. This should include the equipment required, intended plan, anticipated adverse events, and associated management pathways.

Level of agreement 100%, very low quality evidence.

Communication is important to both the safety and effectiveness of clinical practice. Studies on communication remain scarce, even in the realm of surgery, where there is a complex flow of interprofessional working. In a prospective observational study, Lingard et al. examined the communication exchanges during general and vascular surgery [44]. A total of 421 communication exchanges were reported between 94 team members during 48 procedures. Of these exchanges, 30.6% were reported as failures in communication relating to: poor timing of information exchange (45.7%), missing or inaccurate information (35.7%), unresolved issues (24%), and key team members being excluded (20.9%). Over a third of these communication failures resulted in visible consequences of inefficiency and wasted resources, team tension, or procedural error.

Wheelock et al. examined the effects of distractions on the surgical team within the operating room [45]. Operation-irrelevant conversations initiated by surgeons correlated negatively with their teamworking abilities (including communication, coordination, and leadership skills;  $P < 0.05$  for all parameters). Nurses' scores in teamwork were lower and stress levels higher with equipment-related distractions ( $P < 0.05$ ). The advanced endoscopist could prime the team by commencing good communication flow through a comprehensive team brief just before the arrival of the patient and prior to distractions when the procedure starts.

**RECOMMENDATION**

**6** A post-procedural team debrief is helpful, particularly in the event of a significant adverse event.

Level of agreement 100%, very low quality evidence.

The aspiring and practicing advanced endoscopy team should accept the inevitability of AEs. They will therefore need to possess an appropriate repertoire of technical and emotional coping strategies [46]. Studies suggest that significant AEs are associated with poorer mental health and burnout [47], as well as long-lasting emotional effects and an impact on clinical practice [48].

Debriefing could be a useful tool to cope with AEs. Team debriefing in surgery has been shown to improve technical performance [49] and reduce AEs [50]. In a study of 24 surgical trainees, laparoscopic jejunojejunal anastomoses were performed under supervision and videotaped. Half of the trainees underwent video debriefing. AEs from technical errors were less frequent in the debriefed group ( $P = 0.006$ ). In the emer-

gency department, "hot" debriefing immediately following a cardiac arrest has been shown to help clinical practice and support the psychological wellbeing of staff [51]. Team debriefing is likely to lend itself to advanced endoscopy, but future studies are required.

**3.3 Complications****RECOMMENDATION**

**7** Appropriate and established pathways to deal with recognized adverse events for a particular advanced procedure should be in place.

Level of agreement 100%, low quality evidence.

If the team mindset is underpinned by the principle that AEs are an eventuality, then complications should not be met with a negative connotation. Pathways to admit patients to the ward and access to emergency radiological and surgical support should be clearly established [12]. If these safety measures are not in place on the day of the procedure, members of the team should challenge the justification for proceeding.

Governing bodies acknowledge the need for written multidisciplinary pathways to manage iatrogenic perforations caused by endoscopy [52, 53]. There is a varied nature and level of risk with different advanced interventions. This implies that management pathways for specific AEs should be appropriately nuanced to the individual advanced intervention. For example, esophageal perforation from EMR requires immediate access to upper GI surgical review and support.

**RECOMMENDATION**

**8** Regular morbidity and mortality conferences should be in place and multidisciplinary in nature.

Level of agreement 100%, very low quality evidence.

The sequence of events leading up to AEs after advanced intervention should be reviewed formally. This process should be performed on a regular basis. Ma et al. reported significant morbidity and mortality (25.3% and 0.8%, respectively) associated with surgical removal of nonmalignant colorectal polyps [54]. However, in this retrospective cohort study, matched comparisons were not made with endoscopic removal of nonmalignant polyps. In a prospective survey-based study of surgical faculties across the USA, 546 interviewees found morbidity and mortality conferences of good educational value and effective in reducing future errors [55]. Advanced endoscopy may benefit from regular mortality and morbidity reviews, as part of a wider effort to audit performance. Furthermore, a multidisciplinary approach would provide more valuable insight and reflection from the perspective of the endoscopist, the in-room assisting team, and affiliated GI medical and surgical team members knowledgeable in the intervention.



### 3.4 Reconnaissance

#### RECOMMENDATION

**9** At the crucial point of endoscopic intervention, the endoscopist should fully engage the team, and this engagement should be reciprocated.

Level of agreement 100%, very low quality evidence.

Endoscopy rooms in contemporary times can be a convivial space, which may serve to enhance staff wellbeing, as well as alleviate the anxieties of patients [56]. However, during crucial periods of endoscopic intervention, the team needs to become more focused. In a study of 26 laparoscopic cholecystectomies and 22 carotid endarterectomies, the relationship between the nontechnical skills of individual team members (leadership and management, teamworking, problem-solving, decision-making, and situation awareness) and operative outcomes were compared [57]. The operating time decreased significantly with higher surgical leadership and management scores ( $P=0.046$ ). Errors in surgical technique were associated with less surgical situation awareness ( $P<0.001$ ). Other procedural problems were associated with the leadership and management skills of nurses ( $P=0.03$ ).

Advanced endoscopic intervention would also benefit from endoscopists demonstrating strong leadership skills and teamworking. One possible way to achieve this is for the endoscopist to adopt verbal conscious competence [58, 59]. Endoscopy trainers who display conscious competence (understanding what is required to perform a task and the ability to convey this to others) teach endoscopy effectively [59]. The concept of verbal conscious competence may be relevant to the advanced endoscopist.

The following would be an illustrative example for performing polypectomy by EMR. Before starting, the endoscopist describes their impression of whether the intended polypectomy is expected to be straightforward, moderately challenging, or difficult; this status is fluid and may change during therapy at which point the endoscopist should update the team. The planned technical approach is described, including where the needle will be injected for the mucosal lift, the intended effect, and positioning of the polyp post-lift, planned snare size, and electrical settings for cutting and/or coagulation; whether the snare is to be closed by the endoscopist or an assistant, and whether clipping is likely to be needed to close the post-polypectomy defect. The endoscopist continues to then verbally acknowledge the likelihood of AEs (e.g. bleeding, perforation, or incomplete resection), how any AE will be specifically dealt with (e.g. adrenaline, clipping, radiological scans and surgical consult, snare-tip soft coagulation, or argon plasma coagulation), and confirm with the team that all necessary equipment and personnel are available. A clear moment is identified at this point by the endoscopist encouraging team members to verbalize any questions or uncertainty. Once a team consensus is reached and readiness to start is confirmed the

endoscopist delivers a verbal cue that signals the start of therapy: “Let us begin.”

An observational study by Schraagen et al. evaluated different communication processes during 40 cases of pediatric cardiac surgery [60]. Surgeons were observed to display more explicit coordination behavior (exchange of situational awareness statements and resulting coordination actions), whereas anesthesiologists demonstrated more heedful inter-relating behaviors (monitoring other team members’ work, ensuring processes were running as expected, and providing corrective responses to nonroutine events). Use of explicit coordination behavior amongst anesthesiologists differed significantly between uncomplicated operations (mean of 12.88), and operations where minor and major AEs occurred (means of 21.55 and 16.4, respectively;  $P=0.01$ ). Most unexpected events occurring during surgery were noticed and dealt with through explicit coordination tactics. The group suggested that, for more difficult unexpected scenarios, heedful inter-relating communication may be required. The ideal communication process amongst the advanced endoscopy team requires further evaluation. Nonetheless, a system should be in place to bring the team together immediately before the act of intervention.

#### RECOMMENDATION

**10** The roles and responsibilities of the team should be reiterated just before the act of advanced intervention. This avoids ambiguity and allows the endoscopist to focus on their technique.

Level of agreement 100%, very low quality evidence.

The concept of cognitive overload refers to the situation in which the demands placed on an individual by mental work are greater than what their mental abilities can cope with [61]. In the context of teaching endoscopy, avoiding cognitive overload of the trainee may improve learning. Sewell et al. interviewed 22 experienced endoscopy trainers and identified three tactics for reducing overload of the working memory of learners: matching intrinsic load (performing essential components of a task) to the learner’s ability, minimizing extraneous load (mental effort towards distracting stimuli), and optimizing germane load (promoting formation and refinement of learning) [62]. Wheelock et al. reported distractions being evident in 98% of observed general surgery and vascular surgery cases [45]. The advanced endoscopist could benefit from avoiding cognitive overload. Reconfirming team roles just before the act of therapy would allow the endoscopist to then purely focus on the technical demands of the advanced intervention.

### 3.5 Envelopment

#### RECOMMENDATION

**11** It is suggested that the endoscopy report is provided to the patient. This should detail appropriate points of contact should adverse events occur, which could be local or at the interventional center.

Level of agreement 100%, very low quality evidence.

Suboptimal handover of patients during transfer of care can lead to AEs [63]. Furthermore, a standardized handover process may reduce preventable medical errors [64]. Herrigel et al. identified highly variable levels of clinical information being provided to tertiary centers during patient transfer [65]. Receiving teams were updated about the clinical status of patients prior to transfer over a widely variable timeframe (from 2 to 24 hours). A copy of the endoscopy report would act as a real-time update to a patient's "medical passport" that they carry with them. This would detail the intervention performed, points of contact for managing foreseeable AEs, and the emergency contact details for the advanced endoscopy team responsible. This would be beneficial when current systems are still unable to seamlessly share clinical information universally across different hospitals.

In some cases, it may be difficult to include all post-procedure instructions within the body of an endoscopy report. A detailed procedure-specific patient information leaflet at discharge may equally be helpful.

#### RECOMMENDATION

**12** It is suggested that the endoscopy report and contact details for the interventional endoscopist are relayed to the referring clinician without delay.

Level of agreement 100%, very low quality evidence.

Clinical documentation accompanying interhospital transfer of patients is highly variable [65]. Harl et al. reported that the diagnosis was not documented in the transfer notes of 9.7% of patients in an emergency department accepting patients for emergency surgical consultation [66]. In fact, referring documents arrived after the patient's arrival in 12.4% of cases. In 32.7%, the referring hospital physicians had to be consulted for further clinical clarification. Similarly, another group found that objective clinical information (including a discharge summary and the latest blood and radiology results) was available for the handover process in only 29% of interhospital transfers to tertiary hospitals. We would recommend that careful and timely communication with referring clinicians is essential in order to optimize the management of shared-care patients undergoing advanced endoscopic procedures.

#### RECOMMENDATION

**13** There should be a prearranged alternative plan of action should the intended procedure fail, or adverse events occur. This may be delivered locally or at the interventional center.

Level of agreement 100%, very low quality evidence.

In some instances, the procedure being undertaken may be in a regional (tertiary) or national (quaternary) center. The team performing the index advanced procedure may be best suited to deal with any AEs. Subspecialization within endoscopy implies that not all endoscopy teams have the same proficiencies [20,67]. In a retrospective study of 542 colorectal lesions requiring endoscopic resection at a tertiary center, a previous failed attempt at resection was negatively associated with subsequent en bloc resection [68]. The team performing the index endoscopy would already have experience, planned strategies, and the team-based skills [19] necessary to deal with potential AEs or failed procedures [31].

The interventional endoscopy team should therefore envelop the responsibility of the entire patient pathway. This would start with the pre-assessment and counselling of the patient, include delivery of high quality endoscopic intervention, and finally offer prompt management of AEs should they occur. If the intended endoscopic procedure is unsuccessful, the endoscopy team should facilitate further subsequent management. Some patients and referring clinicians may prefer the interventional endoscopy team to provide continuity of care. Advanced endoscopy teams may have previous experience in managing similar endoscopic AEs or failures if undertaking high case volumes [68]. However, local services may be effective and more appropriate in some cases. As an illustration: if a patient develops symptoms of a delayed perforation following ESD, local assessment and surgical management is more appropriate than returning to a tertiary center that is geographically far away.

The principle of envelopment therefore refers to the responsibility of the advanced endoscopy team to plan the management of all outcomes. For each case, there should be prior agreement as to whether AEs and failed procedures would be dealt with locally or at the interventional center.

### 3.6 Documentation

#### RECOMMENDATION

**14** The MDT discussion and outcome should be recorded prior to discussion with the patient and updated afterwards with the patient's final treatment decision.

Level of agreement 100%, low quality evidence.

The documentation process of a patient's journey should start as early as the initial MDT discussion seeking out the appropriate therapeutic strategy [24]. Anticoagulant and antiplatelet medications are commonly prescribed for various indi-

cations, including ischemic heart disease, cerebrovascular disease, previous thromboembolic disease, and prothrombotic conditions [69, 70]. The periprocedural management of such medications should be made explicit during the MDT discussion and documentation process. International guidance is available with protocols that address the multitude of commercially available anticoagulants and antiplatelets with respect to the intended therapeutic intervention [71–73]. Standard operating procedures often reflect national guidelines and, if already locally established, further MDT discussion is not necessary. Where evidence is equivocal, such as the role of prophylactic hemostatic clips following colorectal polypectomy [74], local policies should be agreed upon beforehand.

#### RECOMMENDATION

**15** Discussions with patients about the procedure should be documented, including the benefits, risks (adverse events), alternatives, and if nothing was done. Level of agreement 100%, very low quality evidence.

A higher ASA status is associated with more frequent AEs during both EGD and colonoscopy [30], as well as advanced procedures, such as wide-field EMR [32]. National guidelines in the UK recommend that, when obtaining consent for endoscopic resection of large nonpedunculated colorectal polyps, the full list of management options (including endoscopic therapy, surgery, and conservative management) be discussed with the patient [27]. This is applicable to all proposed advanced endoscopic interventions and should be clearly documented in the clinical notes.

#### RECOMMENDATION

**16** On the day of the procedure, a World Health Organization abbreviated/adapted checklist should be documented prior to the procedure. Level of agreement 100%, very low quality evidence.

Human factors remain a significant cause of medical errors [18]. Implementation of the World Health Organization (WHO) surgical safety checklist is commonplace and may improve procedural outcomes and reduce errors [75, 76], although the jury is still out. Tailored checklists are also recommended [22, 77, 78] to reduce human errors in endoscopic practice and improve patient safety. Dubois et al. demonstrated that a pre-endoscopy checklist improved accurate patient identification by physicians (from 0% at baseline to 87%;  $P < 0.001$ ) [79]. Kherad et al. reported that implementation of a precolonoscopy checklist improved team and patient perception of teamwork and team communication, although complication rates did not change [77].

Advanced endoscopy is similar to surgery in terms of its technical complexity and invasiveness. This implies a higher risk for AEs associated with therapeutic interventions [80].

Most generic endoscopy checklists would not adequately address the idiosyncrasies of advanced procedures, and checklists need to be nuanced. Prompts for the risk assessment of endotherapy in patients who are on anticoagulation or antiplatelet medication [81], the performance of advanced equipment checks by competent staff [22], and clear documentation of emergency contact details on the report are a few examples, but this is by no means an exhaustive list. Individualization of checklists is needed to adapt to the growing range of niche advanced procedures.

## 4 Conclusion

In the presence of a well-trained team, advanced endoscopy can appear seemingly effortless, akin to the perfect coordination observed at a Formula 1 racing pitstop [82]. When disorganized however, the outcome could be harmful. The epitome of a model advanced endoscopy team is therefore more than just the physical gathering of experts.

Team training is well recognized in the field of surgery [83] and is equally important in the realm of endoscopy, where education in human factors and simulation training may be of benefit [14, 19, 20, 84]. One of the downstream effects of complying with the European Working Time Directive is the increase in team composition changes. Fixed surgical teams operating in the same operating room have been shown to reduce procedural and turnover time durations, and improve teamwork and safety awareness. [85, 86]. The technical nature and environment of advanced endoscopy is synonymous to that of surgical operations. Advanced endoscopy staff may benefit from undergoing training together as a unit. Studies are needed to further explore the role of fixed teams and formal team training in advanced endoscopy. Advanced endoscopists should also have access to fellow peer support, whether this be in the form of peer coaching [87] within the same organization or “buddying-up” with advanced endoscopists at other centers [88].

The advanced endoscopy team belongs to a wider service that provides access to therapeutic intervention. The quality indicators of an ideal advanced endoscopy service have not been defined but deserve attention, particularly with the growing number of therapies being delivered at endoscopy [16]. The complexity of performing a polypectomy can be graded using the parameters of size, morphology, site, and access (SMSA) [89]. Moreover, SMSA grading can be used to determine the time required to perform an advanced polypectomy [90]. Time allocations on an advanced therapeutic endoscopy list should therefore be modified from the standard routine endoscopy list. Adjustments to equipment and environment are also needed to accommodate team members from other specialties, such as anesthesiologists providing propofol-assisted endoscopy [91] and interventional radiologists facilitating rendezvous ERCP procedures.

The rapidly growing list of endoscopic therapeutic possibilities reflects the evolution in technical ability but also complexity. The practical challenges of advanced endoscopy are approaching those of surgery. Outcomes are therefore not determined by the skills of the endoscopist alone, but by the



effectiveness of the team. The historical approach to experiential and often ad hoc endoscopic training is outdated. The SACRED philosophy we describe is one that introduces the next level of training for advanced endoscopy. The advice we provide is not intended to be prescriptive. We hope to encourage readers, if not already doing so, to shift their attention away from solely developing the endoscopist. Our approach encompasses the fundamental elements we feel are necessary to create a unified crew who, with these principles enshrined, are highly capable and able to excel in this exciting field of gastroenterology.

## Disclaimer

The legal disclaimer for ESGE guidelines [92] applies to this Position Statement.

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## Endorsements

This ESGE position statement has been endorsed by the British Society of Gastroenterology (BSG).

## Competing interests

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## References

- [1] Valori R, Cortas G, de Lange T et al. Performance measures for endoscopy services: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative. *Endoscopy* 2018; 50: 1186–1204
- [2] Kaminski MF, Thomas-Gibson S, Bugajski M et al. Performance measures for lower gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative. *Endoscopy* 2017; 49: 378–397
- [3] Bisschops R, Areia M, Coron E et al. Performance measures for upper gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative. *Endoscopy* 2016; 48: 843–864
- [4] Domagk D, Oppong KW, Aabakken L et al. Performance measures for ERCP and endoscopic ultrasound: a European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative. *Endoscopy* 2018; 50: 1116–1127
- [5] Park WG, Shaheen NJ, Cohen J et al. Quality indicators for EGD. *Gastrointest Endosc* 2015; 81: 17–30
- [6] Rees CJ, Thomas Gibson S, Rutter MD et al. UK key performance indicators and quality assurance standards for colonoscopy. *Gut* 2016; 65: 1923–1929
- [7] Rutter MD, Senore C, Bisschops R et al. The European Society of Gastrointestinal Endoscopy Quality Improvement Initiative: developing performance measures. *Endoscopy* 2016; 48: 81–89
- [8] Klein A, Nayyar D, Bahin FF et al. Endoscopic mucosal resection of large and giant lateral spreading lesions of the duodenum: success, adverse events, and long-term outcomes. *Gastrointest Endosc* 2016; 84: 688–696
- [9] Tutticci N, Klein A, Sonson R et al. Endoscopic resection of subtotal or completely circumferential laterally spreading colonic adenomas: technique, caveats, and outcomes. *Endoscopy* 2016; 48: 465–471
- [10] Stanciu C, Sfarti C, Chiriac S et al. A half century of endoscopic retrograde colangiopancreatography: reflections of the past, present and future. *J Gastrointestin Liver Dis* 2018; 27: 357–360
- [11] Bisschops R, Dekker E, East JE et al. Correction: European Society of Gastrointestinal Endoscopy (ESGE) curricula development for post-graduate training in advanced endoscopic procedures: rationale and methodology. *Endoscopy* 2019; 51: C6
- [12] Pimentel-Nunes P, Pioche M, Albéniz E et al. Curriculum for endoscopic submucosal dissection training in Europe: European Society of Gastrointestinal Endoscopy (ESGE) Position Statement. *Endoscopy* 2019; 51: 980–992
- [13] Patel K, Pinto A, Faiz O et al. Factors defining expertise in screening colonoscopy. *Endosc Int Open* 2017; 5: E931–E938
- [14] Matharoo M, Haycock A, Sevdalis N et al. Endoscopic non-technical skills team training: the next step in quality assurance of endoscopy training. *World J Gastroenterol* 2014; 20: 17507–17515
- [15] Lian J, Chen S, Zhang Y et al. A meta-analysis of endoscopic submucosal dissection and EMR for early gastric cancer. *Gastrointest Endosc* 2012; 76: 763–770
- [16] Rutter MD, Nickerson C, Rees CJ et al. Risk factors for adverse events related to polypectomy in the English Bowel Cancer Screening Programme. *Endoscopy* 2014; 46: 90–97
- [17] McCune K. Reducing error, improving safety. Doctors could certainly take lessons from aviation. *BMJ* 2000; 321: 506
- [18] Kapur N, Parand A, Soukup T et al. Aviation and healthcare: a comparative review with implications for patient safety. *JRSM Open* 2016; 7: 2054270415616548
- [19] Haycock A, Matharoo MK, Thomas-Gibson S. Effective teamworking in gastroenterology. *Frontline Gastroenterol* 2012; 3: 86–89
- [20] Matharoo M, Thomas-Gibson S. Safe endoscopy. *Frontline Gastroenterol* 2017; 8: 86–89
- [21] Guyatt GH, Oxman AD, Vist GE et al. GRADE: an emerging consensus on rating quality of evidence and strength of Recommendations. *BMJ* 2008; 336: 924–926
- [22] Dunkley I, Griffiths H, Follows R et al. UK consensus on non-medical staffing required to deliver safe, quality-assured care for adult patients undergoing gastrointestinal endoscopy. *Frontline Gastroenterol* 2019; 10: 24–34

- [23] Liao Z, Hu LH, Li ZS et al. Multidisciplinary team meeting before therapeutic ERCP: A prospective study with 1,909 cases. *J Interv Gastroenterol* 2011; 1: 64–69
- [24] Vaughan-Shaw PG, Wheeler JM, Borley NR. The impact of a dedicated multidisciplinary team on the management of early rectal cancer. *Colorectal Dis* 2015; 17: 704–709
- [25] Richardson B, Preskitt J, Lichliter W et al. The effect of multidisciplinary teams for rectal cancer on delivery of care and patient outcome: has the use of multidisciplinary teams for rectal cancer affected the utilization of available resources, proportion of patients meeting the standard of care, and does this translate into changes in patient outcome? *Am J Surg* 2016; 211: 46–52
- [26] Fehervari M, Hamrang-Yousefi S, Fadel MG et al. A systematic review of colorectal multidisciplinary team meetings: an international comparison. *BJS Open* 2021; 5: zrab044doi:10.1093/bjsopen/zrab044
- [27] Rutter MD, Chattree A, Barbour JA et al. British Society of Gastroenterology/Association of Coloproctologists of Great Britain and Ireland guidelines for the management of large non-pedunculated colorectal polyps. *Gut* 2015; 64: 1847–1873
- [28] van Hooft JE, van Halsema EE, Vanbiervliet G et al. Self-expandable metal stents for obstructing colonic and extracolonic cancer: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy* 2014; 46: 990–1053
- [29] Januszewicz W, Kaminski MF. Quality indicators in diagnostic upper gastrointestinal endoscopy. *Therap Adv Gastroenterol* 2020; 13: 1756284820916693
- [30] Enestvedt BK, Eisen GM, Holub J et al. Is the American Society of Anesthesiologists classification useful in risk stratification for endoscopic procedures? *Gastrointest Endosc* 2013; 77: 464–471
- [31] Klein A, Bourke MJ. How to perform high-quality endoscopic mucosal resection during colonoscopy. *Gastroenterology* 2017; 152: 466–471
- [32] Burgess NG, Williams SJ, Hourigan LF et al. A management algorithm based on delayed bleeding after wide-field endoscopic mucosal resection of large colonic lesions. *Clin Gastroenterol Hepatol* 2014; 12: 1525–1533
- [33] Kim S, Kim DH, Park SY et al. Association between Charlson comorbidity index and complications of endoscopic resection of gastric neoplasms in elderly patients. *BMC Gastroenterol* 2020; 20: 213
- [34] Taleban S, Toosizadeh N, Junna S et al. Frailty assessment predicts acute outcomes in patients undergoing screening colonoscopy. *Dig Dis Sci* 2018; 63: 3272–3280
- [35] Misawa N, Higurashi T, Tachikawa J et al. Clinical impact of evaluation of frailty in endoscopic submucosal dissection for early gastric cancer in elderly patients. *Geriatr Gerontol Int* 2020; 20: 461–466
- [36] Ying LD, Harrington A, Assi R et al. Measuring uncertainty intolerance in surgical residents using standardized assessments. *J Surg Res* 2020; 245: 145–152
- [37] Ponchon T, Bauerfeind P. Management of complications. *Endoscopy* 2019; 51: 1110–1112
- [38] Rees CJ, Thomas-Gibson S, Bourke MJ et al. Managing underperformance in endoscopy: a pragmatic approach. *Gastrointest Endosc* 2018; 88: 737–744.e1
- [39] Gorini A, Miglioretti M, Pravettoni G. A new perspective on blame culture: an experimental study. *J Eval Clin Pract* 2012; 18: 671–675
- [40] Pattison J, Kline T. Facilitating a just and trusting culture. *Int J Health Care Qual Assur* 2015; 28: 11–26
- [41] Kohn LT, Corrigan JM, Donaldson MS. Institute of Medicine. To err is human: building a safer health system. Washington DC: National Academy Press; 2000
- [42] Howell AM, Burns EM, Hull L et al. International Recommendations for national patient safety incident reporting systems: an expert Delphi consensus-building process. *BMJ Qual Saf* 2017; 26: 150–163
- [43] Wagner C, Merten H, Zwaan L et al. Unit-based incident reporting and root cause analysis: variation at three hospital unit types. *BMJ Open* 2016; 6: e011277
- [44] Lingard L, Espin S, Whyte S et al. Communication failures in the operating room: an observational classification of recurrent types and effects. *Qual Saf Health Care* 2004; 13: 330–334
- [45] Wheelock A, Suliman A, Wharton R et al. The impact of operating room distractions on stress, workload, and teamwork. *Ann Surg* 2015; 261: 1079–1084
- [46] Srinivasa S, Gurney J, Koea J. Potential consequences of patient complications for surgeon well-being: a systematic review. *JAMA Surg* 2019; 154: 451–457
- [47] Shanafelt TD, Balch CM, Bechamps G et al. Burnout and medical errors among American surgeons. *Ann Surg* 2010; 251: 995–1000
- [48] Pinto A, Faiz O, Bicknell C et al. Surgical complications and their implications for surgeons' well-being. *Br J Surg* 2013; 100: 1748–1755
- [49] Rogers DA, Regehr G, Howdieshell TR et al. The impact of external feedback on computer-assisted learning for surgical technical skill training. *Am J Surg* 2000; 179: 341–343
- [50] Hamad GG, Brown MT, Clavijo-Alvarez JA. Postoperative video debriefing reduces technical errors in laparoscopic surgery. *Am J Surg* 2007; 194: 110–114
- [51] Gilmartin S, Martin L, Kenny S et al. Promoting hot debriefing in an emergency department. *BMJ Open Qual* 2020; 9: e000913
- [52] de'Angelis N, Di Saverio S, Chiara O et al. 2017 WSES guidelines for the management of iatrogenic colonoscopy perforation. *World J Emerg Surg* 2018; 13: 5
- [53] Paspatis GA, Arvanitakis M, Dumonceau JM et al. Diagnosis and management of iatrogenic endoscopic perforations: European Society of Gastrointestinal Endoscopy (ESGE) Position Statement – Update 2020. *Endoscopy* 2020; 52: 792–810
- [54] Ma C, Teriaky A, Sheh S et al. Morbidity and mortality after surgery for nonmalignant colorectal polyps: a 10-year nationwide analysis. *Am J Gastroenterol* 2019; 114: 1802–1810
- [55] Gore DC. National survey of surgical morbidity and mortality conferences. *Am J Surg* 2006; 191: 708–714
- [56] Neilson LJ, Patterson J, von Wagner C et al. Patient experience of gastrointestinal endoscopy: informing the development of the Newcastle ENDOPREM™. *Frontline Gastroenterol* 2020; 11: 209–217
- [57] Catchpole K, Mishra A, Handa A et al. Teamwork and error in the operating room: analysis of skills and roles. *Ann Surg* 2008; 247: 699–706
- [58] Anderson JT. Optimizing ergonomics during endoscopy training. *Tech Gastrointest Endosc* 2019; 21: 143–149
- [59] Waschke KA, Anderson J, Valori RM et al. ASGE principles of endoscopic training. *Gastrointest Endosc* 2019; 90: 27–34
- [60] Schraagen JM. Dealing with unforeseen complexity in the OR: the role of heedful interrelating in medical teams. *Theor Issues Ergon Sci* 2011; 12: 256–272
- [61] Bailey J, Driver K, Wasson EJ et al. Cognitive overload-A medical student's perspective. *Med Educ* 2021; 55: 276
- [62] Sewell JL, Bowen JL, Cate OT et al. Learning challenges, teaching strategies, and cognitive load: insights from the experience of seasoned endoscopy teachers. *Acad Med* 2020; 95: 794–802
- [63] Raduma-Tomàs MA, Flin R, Yule S et al. Doctors' handovers in hospitals: a literature review. *BMJ Qual Saf* 2011; 20: 128–133
- [64] Starmer AJ, Spector ND, Srivastava R et al. Changes in medical errors after implementation of a handoff program. *NEJM* 2014; 371: 1803–1812
- [65] Herrigel DJ, Carroll M, Fanning C et al. Interhospital transfer handoff practices among US tertiary care centers: A descriptive survey. *J Hosp Med* 2016; 11: 413–417

- [66] Harl FNR, Saucke MC, Greenberg CC et al. Assessing written communication during interhospital transfers of emergency general surgery patients. *J Surg Res* 2017; 214: 86–92
- [67] Anderson J. The future of gastroenterology training: instruction in technical skills. *Frontline Gastroenterol* 2012; 3: (Suppl. 01): i13–i18
- [68] Emmanuel A, Gulati S, Burt M et al. Outcomes of endoscopic resection of large colorectal lesions subjected to prior failed resection or substantial manipulation. *Int J Colorectal Dis* 2019; 34: 1033–1041
- [69] Chan FKL, Kyaw MH, Hsiang JC et al. Risk of postpolypectomy bleeding with uninterrupted clopidogrel therapy in an industry-independent, double-blind, randomized trial. *Gastroenterology* 2019; 156: 918–925.e1
- [70] Morillo CA, Banerjee A, Perel P et al. Atrial fibrillation: the current epidemic. *J Geriatr Cardiol* 2017; 14: 195–203
- [71] Veitch AM, Radaelli F, Alikhan R et al. Endoscopy in patients on antiplatelet or anticoagulant therapy: British Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guideline update. *Gut* 2021; 70: 1611–1628
- [72] Acosta RD, Abraham NS, Chandrasekhara V et al. The management of antithrombotic agents for patients undergoing GI endoscopy. *Gastrointest Endosc* 2016; 83: 3–16
- [73] Chan FKL, Goh KL, Reddy N et al. Management of patients on antithrombotic agents undergoing emergency and elective endoscopy: joint Asian Pacific Association of Gastroenterology (APAGE) and Asian Pacific Society for Digestive Endoscopy (APSDE) practice guidelines. *Gut* 2018; 67: 405–417
- [74] Abraham NS. Antiplatelets, anticoagulants, and colonoscopic polypectomy. *Gastrointest Endosc* 2020; 91: 257–265
- [75] Urbach DR, Dimick JB, Haynes AB et al. Is WHO's surgical safety checklist being hyped? *BMJ* 2019; 366: 14700
- [76] Bergs J, Hellings J, Cleemput I et al. Systematic review and meta-analysis of the effect of the World Health Organization surgical safety checklist on postoperative complications. *Br J Surg* 2014; 101: 150–158
- [77] Kherad O, Restellini S, Ménard C et al. Implementation of a checklist before colonoscopy: a quality improvement initiative. *Endoscopy* 2018; 50: 203–210
- [78] Matharoo M, Thomas-Gibson S, Haycock A et al. Implementation of an endoscopy safety checklist. *Frontline Gastroenterol* 2014; 5: 260–265
- [79] Dubois J, Schmidt PT, Creutzfeldt J et al. Person-centered endoscopy safety checklist: Development, implementation, and evaluation. *World J Gastroenterol* 2017; 23: 8605–8614
- [80] de Vries EN, Ramrattan MA, Smorenburg SM et al. The incidence and nature of in-hospital adverse events: a systematic review. *Qual Saf Health Care* 2008; 17: 216–223
- [81] Veitch AM, Vanbiervliet G, Gershlick AH et al. Endoscopy in patients on antiplatelet or anticoagulant therapy, including direct oral anticoagulants: British Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guidelines. *Endoscopy* 2016; 48: c1
- [82] Catchpole KR, de Leval MR, McEwan A et al. Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality. *Paediatr Anaesth* 2007; 17: 470–478
- [83] Moorthy K, Munz Y, Forrest D et al. Surgical crisis management skills training and assessment: a simulation[corrected]-based approach to enhancing operating room performance. *Ann Surg* 2006; 244: 139–147
- [84] Mahmood T, Scaffidi MA, Khan R et al. Virtual reality simulation in endoscopy training: Current evidence and future directions. *World J Gastroenterol* 2018; 24: 5439–5445
- [85] Stepaniak PS, Vrijland WW, de Quelerij M et al. Working with a fixed operating room team on consecutive similar cases and the effect on case duration and turnover time. *Arch Surg* 2010; 145: 1165–1170
- [86] Stepaniak PS, Heij C, Buise MP et al. Bariatric surgery with operating room teams that stayed fixed during the day: a multicenter study analyzing the effects on patient outcomes, teamwork and safety climate, and procedure duration. *Anesth Analg* 2012; 115: 1384–1392
- [87] Kumar NL, Housiaux A, Ryou M. How to continue learning after gastroenterology fellowship with a peer-coach. *Gastroenterology* 2020; 158: 812–815
- [88] Sidhu R, Chetcuti Zammit S, Baltas 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: 669–686
- [89] Gupta S, Miskovic D, Bhandari P et al. A novel method for determining the difficulty of colonoscopic polypectomy. *Frontline Gastroenterol* 2013; 4: 244–248
- [90] Kang H, Thoufeeq MH. Size of colorectal polyps determines time taken to remove them endoscopically. *Endosc Int Open* 2018; 6: E610–E615
- [91] Sidhu R, Turnbull D, Newton M et al. Deep sedation and anaesthesia in complex gastrointestinal endoscopy: a joint position statement endorsed by the British Society of Gastroenterology (BSG), Joint Advisory Group (JAG) and Royal College of Anaesthetists (RCOA). *Frontline Gastroenterol* 2019; 10: 141–147
- [92] Hassan C, Ponchon T, Bisschops R et al. European Society of Gastrointestinal Endoscopy (ESGE) Publications Policy – Update 2020. *Endoscopy* 2020; 52: 123–126