Performance measures for colonoscopy in inflammatory bowel disease patients: European Society of Gastrointestinal Endoscopy (ESGE) Quality Improvement Initiative

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ABSTRACT

The European Society of Gastrointestinal Endoscopy (ESGE) presents a short list of performance measures for colonoscopy in inflammatory bowel disease (IBD) patients. Current performance measures for colonoscopy mainly focus on detecting (pre)malignant lesions. However, these performance measures are not relevant for all colonoscopy indications in IBD patients. Therefore, our aim was to provide endoscopy services across Europe and other interested countries with a tool for quality monitoring and improvement in IBD colonoscopy. Eight key performance measures and one minor performance measure were recommended for measurement and evaluation in daily endoscopy practice.

ABBREVIATIONS

BBPS	Boston Bowel Preparation Scale
ESGE	European Society of Gastrointestinal Endoscopy
GI	gastrointestinal
GRADE	Grading of Recommendations Assessment, Development and Evaluation
IBD	inflammatory bowel disease
MES	Mayo Endoscopic Score
PICO	population/patient, intervention/indicator, comparator/control, outcome
SES-CD	Simple Endoscopic Score for Crohn's Disease
UC	ulcerative colitis
UCEIS	Ulcerative Colitis Endoscopic Index of Severity
UEG	United European Gastroenterology

Introduction

The European Society of Gastrointestinal Endoscopy (ESGE) and United European Gastroenterology (UEG) have identified monitoring and evaluation of the quality of endoscopy as a major priority [1]. To this aim, the ESGE and UEG have developed several performance measures for different types and aspects of gastrointestinal (GI) endoscopy over the past few years [2–6]. Current performance measures for colonoscopy have mainly focused on optimal detection of (pre)malignant lesions [4]. However, the detection of (pre)malignant lesions is not the primary aim in colonoscopies performed in patients with a clinical suspicion of inflammatory bowel disease (IBD), nor when assessing endoscopic disease activity in known IBD patients. To date, no endoscopy performance measures have been identified for IBD patients. Furthermore, the current performance measures for colonoscopy do not include surveillance of longstanding IBD patients. Although several recommendations have been published for surveillance colonoscopy in IBD patients [7–9], these recommendations are numerous and not consistently measurable in community endoscopy practices.

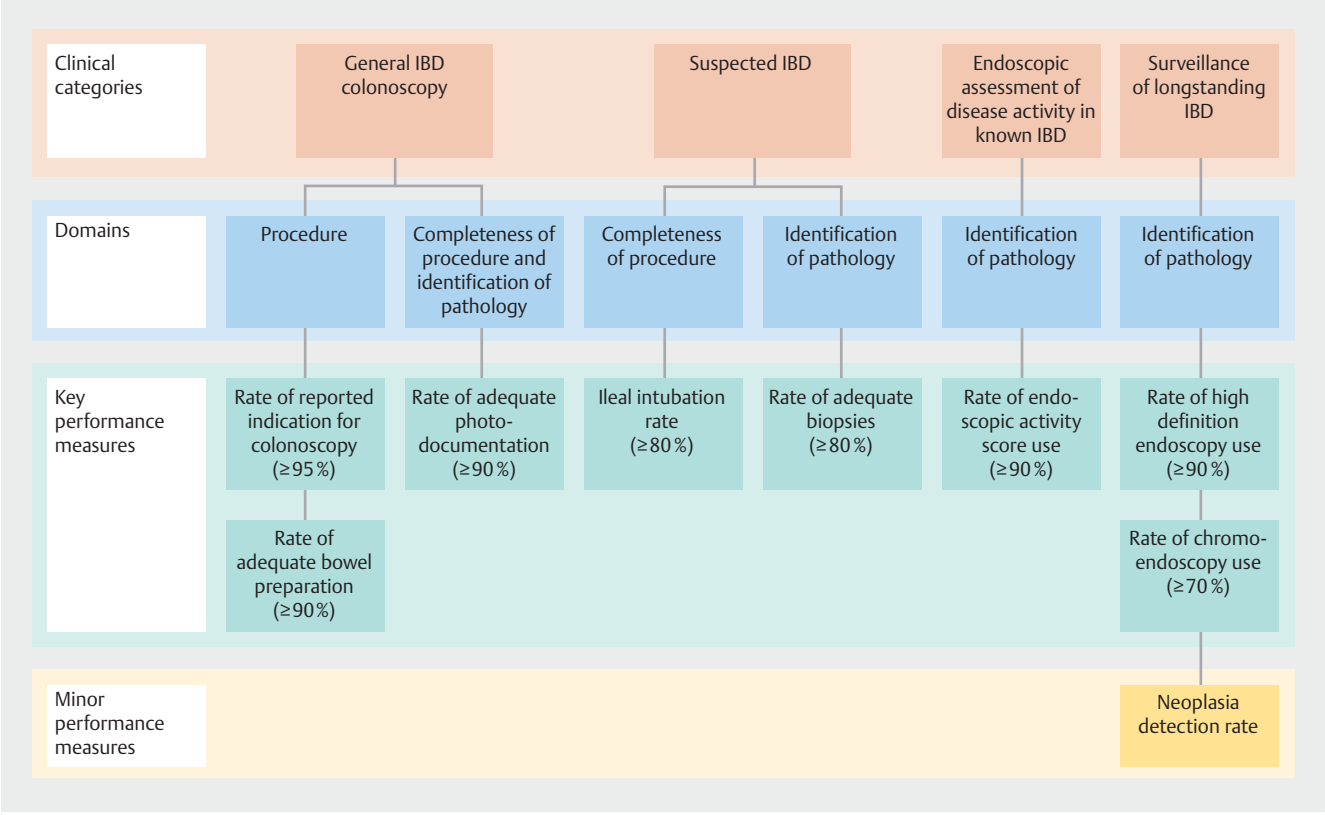
The aim of the IBD taskforce within the colonoscopy working group of the ESGE Quality Improvement Committee was to identify performance measures for colonoscopy in IBD patients that are widely applicable to endoscopy services throughout Europe and other interested countries. These performance measures would ideally meet the following criteria: have a proven impact on clinical outcomes; be well-defined, reliable, simple, and user-friendly; provide an opportunity for improvement; and be widely applicable to all levels of endoscopy services.

This paper reports the consensus-based list of key performance measures for colonoscopy in IBD patients and describes the methodological process applied in the development of these measures. Performance measures are divided into key performance measures and minor performance measures.

Methodology

The multistep procedure to develop performance measures has been previously described [1]. In short, a modified Delphi consensus process was used to develop performance measures for colonoscopy in IBD patients. These performance measures were categorized into performance measures for three clinical settings: clinical suspicion of IBD, endoscopic assessment of disease activity in known IBD patients, and surveillance. Clinical suspicion of IBD can be defined as: either a clinical suspicion of IBD prior to colonoscopy (i. e. symptoms of diarrhea, iron deficiency anemia, or raised biomarkers), which may be confirmed by endoscopic signs of inflammation; or the finding of signs suggestive of IBD during a colonoscopy initially performed for a different indication, which then raises the suspicion of IBD. Surveillance colonoscopy is recommended in longstanding IBD patients (8 years after disease onset) [10]. In each clinical category, performance measures were defined for the following three quality domains: preprocedure, completeness of the procedure, and identification of pathology. One or two performance measures were defined per domain.

To identify performance measures for IBD colonoscopy, every working group member was invited to introduce potential performance measures. All of these performance measures



▶ **Fig. 1** The clinical categories, domains, and performance measures chosen by the expert working group for colonoscopy in patients with inflammatory bowel disease (IBD).

were discussed during a first videoconference in March 2021 and prioritized by all working group members (see Supporting information, available online). With this prioritization in mind, subworking groups for each clinical category (clinical suspicion of IBD; endoscopic assessment of disease activity; surveillance) structured the relevant performance measures using the PICO framework (where P stands for Population/Patient, I for Intervention/Indicator, C for Comparator/Control, and O for Outcome) to perform searches for available evidence to support these performance measures.

The clinical statements and performance measures derived from the PICOs were adapted or omitted during iterative rounds of comments and suggestions from the working group members during the Delphi process. This process began with a consensus meeting in June 2021, where the results of the literature searches were presented by each working group. Between July and September 2021, three online voting rounds were organized. After each voting round, a videoconference was scheduled with all working group members to discuss the comments received. A summary of the discussion during these videoconferences was added as supporting text to the next round of the Delphi process. The results of the iterative rounds of the Delphi process can be reviewed in the Supporting information.

In total, working group members participated in three voting rounds to agree on, or rescind, the definitions of statements and performance measures. A statement was accepted if at least 80 % agreement was reached after a minimum of two voting rounds. Statements not reaching agreement were extensively discussed during the online meetings based on the comments made during the previous voting round. This discussion led to modified statements that were tested in a subsequent voting round. Statements were discarded if agreement was not reached (< 80 %) after three voting rounds. The agreement given for the different statements in this paper refers to the last voting round in the Delphi process.

The performance measures are shown below the relevant clinical category and quality domain. Each box describes a different performance measure, the level of agreement during the modified Delphi process, and the grading of the available evidence, which was determined according to the Grading of Recommendations Assessment, Development and Evaluation [GRADE] system [11]. Instructions on how these performance measures should be measured and calculated, including standards for evaluation, are listed in each box.

The minimum number needed to assess whether the threshold for a certain performance measure has been reached can be calculated by estimating the 95 % CIs around the predefined threshold for different sample sizes. For practical reasons and to simplify implementation and auditing, the working group suggests that at least 100 consecutive procedures (or all, if < 100 have been performed) should be measured to assess a performance measure. Ideally, continuous monitor-

ing of performance should be integrated as part of regular performance management.

All performance measures should be assessed at an individual level; however, in situations where this is not feasible, an assessment of performance measures should at least be applied at service level.

Performance measures for colonoscopy in IBD patients

The input from the working group members and the evidence derived from the literature search resulted in a total of 16 statements and 11 potential performance measures that were considered relevant for IBD colonoscopies (see Supporting information). The working group members considered several other performance measures, such as measures on patient tolerance, sedation, standard terminology, and complications; however, the working group members agreed that these performance measures were not essential to assure high quality colonoscopy explicitly for IBD patients. Therefore, general colonoscopy recommendations and standards for these measures should be considered for IBD colonoscopy [4].

The statements and performance measures were categorized into three clinical categories and six domains. To minimize overlap between the different categories, some statements and potential performance measures were combined into a "general IBD colonoscopy" category after the first voting round. After three voting rounds, a total of 15 statements, eight key performance measures, and one minor performance measure were accepted (▶ **Fig. 1**). The process of the development of these statements and performance measures can be reviewed in the Supporting information. The performance measures are presented below using the descriptive framework proposed by the Quality Improvement Committee and a short summary of the available literature [1]. The performance measures are listed according to the clinical categories and domains to which they were attributed.

1 General IBD colonoscopy: preprocedure

Key performance measure	Rate of reported indication for colonoscopy
Description	Percentage of colonoscopies explicitly including the indication for the procedure
Clinical category	General IBD colonoscopy
Domain	Preprocedure
Category	Process
Rationale	Colonoscopies with an appropriate indication are associated with higher diagnostic yield for relevant lesions than colonoscopies without an appropriate indication
Construct	**Denominator**: All colonoscopies performed in IBD patients **Numerator**: Procedures in the denominator that explicitly include the indication in the endoscopy report
Standards	Minimum standard: ≥ 95 % Target standard: ≥ 98 %
Consensus agreement	100 %
PICO	1.5 and 2.3 (see Supporting information)
Evidence grading	Moderate

The acceptance of this performance measure is based on agreement with the following statement:

- For colonoscopies performed in IBD patients, the endoscopy report should explicitly include the indication for the procedure: i. e. clinical suspicion of IBD, endoscopic assessment of disease activity, or surveillance. Agreement: 100 %

Inappropriate referral for colonoscopy might lead to the misuse of limited endoscopic resources, an increase in potential harm to patients from unnecessary invasive procedures, and an increase in healthcare costs. In general, colonoscopies with an appropriate indication are associated with significantly higher diagnostic yields for relevant lesions than colonoscopies without an appropriate indication [4]. There is also literature that supports these findings specifically for IBD colonoscopies. The diagnostic yield for IBD-related lesions is significantly higher in colonoscopies with an appropriate indication compared with colonoscopies without an appropriate indication [12, 13]. The proposed minimum standard rate for reporting of the indication for colonoscopy (≥ 95 %) was set because this is a prerequisite for the monitoring and evaluation of explicit performance measures in each clinical category for IBD patients.

Key performance measure	Rate of adequate bowel preparation
Description	The percentage of patients with an adequately prepared bowel
Clinical category	General IBD colonoscopy
Domain	Preprocedure
Category	Process
Rationale	The quality of bowel preparation affects the efficacy of colonoscopy
Construct	**Denominator**: All colonoscopies performed in IBD patients **Numerator**: Patients in the denominator with adequate bowel preparation (assessed with a validated scale)
Standards	Minimum standard: ≥ 90 % Target standard: none set
Consensus agreement	95 %
PICO	1.6, 2.4, and 3.1 (see Supporting information)
Evidence grading	Moderate

The acceptance of this performance measure is based on agreement with the following statements:

- For colonoscopies performed in IBD patients, the endoscopy report should include the adequacy of bowel preparation using a validated score. Agreement: 100 %
- Adequate bowel preparation should be obtained in 90 % of the colonoscopies performed in IBD patients. Agreement: 95 %

Inadequate bowel preparation has a detrimental effect on all quality aspects of colonoscopy [14]. Adequate bowel preparation in IBD patients is essential for disease assessment and for the detection of dysplasia during colonoscopy [14]. A successful surveillance colonoscopy requires adequate bowel preparation to detect any nonpolypoid flat lesions hidden by debris and stool [15]. A recent study has shown that inadequate bowel preparation and active colonic inflammation were the most frequent factors resulting in unsuccessful chromoendoscopy in surveillance colonoscopies in IBD patients [16].

The quality of bowel preparation should be assessed with a validated scale, as has also been recommended by the ESGE for general colonoscopy [4]. Three scales have been comprehensively validated: the Boston Bowel Preparation Scale (BBPS), the Ottawa Scale, and the Aronchick Scale. Adequate bowel preparation may be defined as: BBPS ≥ 6; Ottawa Scale ≤ 7; or Aronchick Scale excellent, good, or fair [4].

The proposed minimum standard of adequate bowel preparation for colonoscopy in IBD patients (≥ 90 %) was adopted from the ESGE guideline on performance measures for lower GI endoscopy [4], as no evidence was found to support adjusted standards for the subpopulation of IBD patients. Few data explored an association between IBD disease activity and the quality of bowel preparation. Hence, there is no definitive proof that patients with IBD have an increased likelihood of inadequate bowel preparation. In a retrospective analysis of 348 colonoscopies from 169 consecutively enrolled IBD patients, no differences were found in the quality of bowel preparation between patients with active disease and those with mucosal healing, suggesting that the efficacy of bowel preparation is not influenced by disease inflammation [17].

2 General IBD colonoscopy: completeness of procedure and identification of pathology

Key performance measure	Rate of adequate photodocumentation
Description	The percentage of patients with adequate photodocumentation
Clinical category	General IBD colonoscopy
Domain	Completeness of procedure and identification of pathology
Category	Process
Rationale	It is recommended that adequate photodocumentation be included in the endoscopy report to enable quality control
Construct	**Denominator**: All colonoscopies performed in patients with endoscopic suspicion of IBD, for endoscopic assessment of disease activity in IBD patients, and for surveillance colonoscopies in longstanding IBD patients **Numerator**: Procedures in the denominator with adequate photodocumentation
Standards	Minimum standard: ≥ 90 % Target standard: ≥ 95 %
Consensus agreement	100 %
PICO	1.3 and 2.7 (see Supporting information)
Evidence grading	Very low

The acceptance of this performance measure is based on agreement with the following statements:

- When colonoscopies are performed because of endoscopic suspicion of IBD or for endoscopic assessment of disease activity in IBD patients, at least one image should be recorded per segment. Agreement: 89 %
- For surveillance colonoscopies in longstanding IBD patients, at least one annotated image should be recorded for every lesion biopsied or resected. Agreement: 95 %

Photodocumentation of endoscopic landmarks or lesions during colonoscopy is embedded in several quality recommendations for GI endoscopy [4, 5]. It allows continuous monitoring

for quality purposes and it should be considered to be as important as text descriptions for endoscopic findings [18]. Despite the lack of supporting evidence, the working group members agreed that photodocumentation supports quality control in colonoscopy in IBD patients. Photodocumentation of each inspected segment (i. e. ileum, cecum, ascending, transverse, descending, and sigmoid colon, and rectum) could support optimal diagnosis, assessment of disease activity, and the assessment of future changes in IBD patients, as low interobserver agreement exists regarding endoscopic assessment of disease activity [19, 20].

Annotated photodocumentation of every lesion (biopsied or resected) facilitates accurate interpretation, assists with onward referral, and enables direct comparison if subsequent follow-up procedures are required. The working group members agreed on the definition of annotation, meaning anything that indicates where the picture is taken. Annotation should be interpreted in its most simple form, for example it could be written on the pictures or simply described in the endoscopy report. A minimum standard of 90 % is recommended for adequate photodocumentation in colonoscopy in IBD patients.

When endoscopic software and endoscopy reporting systems support videodocumentation during colonoscopy, this might be superior to photodocumentation in certain situations [21]. However, videodocumentation is not yet widely available and not always easy to incorporate in the endoscopy report. Where videodocumentation is used, annotation by marking the colon segments is recommended to support the interpretation of the videos afterward.

3 Clinical suspicion of IBD: completeness of procedure

Key performance measure	Ileal intubation rate
Description	The percentage of colonoscopies reaching the terminal ileum
Clinical category	Clinical suspicion of IBD
Domain	Completeness of procedure
Category	Process
Rationale	Complete visualization of the colon and ileal intubation are prerequisites for an adequate inspection of the mucosa of the colon and terminal ileum
Construct	**Denominator:** All colonoscopies in suspected IBD patients **Numerator:** Procedures in the denominator that report reaching the ileum
Standards	Minimum standard: ≥ 80 % Target standard: ≥ 90 %
Consensus agreement	95 %
PICO	1.1 (see Supporting information)
Evidence grading	Low

The acceptance of this performance measure is based on agreement with the following statement:

- The terminal ileum should be reached in colonoscopies in patients with suspected IBD. Agreement: 95 %

Ileal intubation is essential for identifying ileal Crohn's disease [22]. Most studies support that ileoscopy increases the diagnostic yield when evaluating suspected IBD [23–26]. Reported rates for ileal intubation in colonoscopies in patients with diarrhea have varied widely from 46 % to 96 % [24–26]. There is a scarcity of data regarding the preferred depth of ileal intubation and patient discomfort with ileal intubation in correlation with the sedation used. Furthermore, the existing guidelines do not comment on this subject [27, 28]. Despite the absence of concrete supporting evidence, the members of this working group recommend that endoscopists should aim to achieve terminal ileal intubation in suspected IBD patients (minimum standard: ≥ 80 %; target standard ≥ 90 %).

4 Clinical suspicion of IBD: identification of pathology

Key performance measure	Rate of adequate biopsies
Description	The percentage of colonoscopies with adequate biopsies
Clinical categories	Clinical suspicion of IBD
Domain	Identification of pathology
Category	Process
Rationale	Adequate biopsies are essential for correct diagnosis in patients with suspected IBD
Construct	**Denominator**: All colonoscopies in patients with suspected IBD **Numerator**: Procedures in the denominator with adequate biopsies
Standards	Minimum standard: ≥ 80 % Target standard: ≥ 85 %
Consensus agreement	89 %
PICO	1.2 (see Supporting information)
Evidence grading	Moderate

The acceptance of this performance measure is based on agreement with the following statements:

- Adequate biopsies should be taken in patients with a clinical suspicion of IBD, as these are essential for correct diagnosis. Agreement: 89 %
- Adequate biopsies in patients with endoscopic suspicion of IBD should include two biopsies from each of the ileum, cecum, ascending colon, transverse colon, descending colon,

sigmoid, and rectum, including affected and macroscopically normal (if present) mucosa. Agreement: 95 %
- Adequate biopsies in patients with clinically suspected IBD and endoscopically normal mucosa should include at least two biopsies from the terminal ileum in a separate vial. Agreement: 84 %
- Adequate biopsies in patients with suspected Crohn's disease should include biopsies taken from the largest ulcers. Agreement: 95 %

For the clinical category "Endoscopic assessment of disease activity in known IBD," the working group members reached consensus on the following statement:
- Adequate biopsies to assess disease activity in ulcerative colitis (UC) patients with endoscopic inflammation, should include at least two biopsies from the most affected area. Agreement: 100 %

According to clinical practice, evidence from the literature, and statements in relevant guidelines, ileocolonoscopy with histology is the fundamental basis for diagnosing IBD [27–29]. Histology plays a pivotal role in the differentiation between Crohn's disease and UC. Within this context, the distribution and extent of histological pathology can further aid in the differential diagnosis of IBD. This requires a sufficient number of biopsies that are collected separately from the ileum, all colonic segments, and the rectum, as well from endoscopically affected areas and macroscopically normal areas [30]. Providing the pathologist with endoscopic and clinical information further aids in establishing a diagnosis [30]. Biopsies are also crucial for differentiating IBD from other diseases, such as intestinal tuberculosis, amebiasis, amyloidosis, and strongyloidiasis [31–35].

The added value of terminal ileal biopsies in patients with clinically suspected IBD and endoscopically normal mucosa was supported by the literature [36]. Baker et al. reported, in a retrospective analysis, that histological inflammation in biopsies of endoscopically normal terminal ileum was significantly associated with the development of Crohn's disease during a mean follow-up of 6 years compared with the finding of normal histology. Furthermore, no real disadvantages for biopsies in the terminal ileum exist when there is a clinical suspicion of IBD. Therefore, terminal ileal biopsies were recommended to histologically confirm a normal ileum and prevent a patient undergoing a second colonoscopy to exclude IBD in the future.

In active Crohn's disease, histological disease activity scores, proinflammatory gene expression levels, and numbers of myeloperoxidase-positive cells were significantly higher in biopsies from the ulcer edge in the colon and ileum, with decreasing gradients observed with distance from the ulcer edge [37].

In an endoscopically completely normal colon, biopsies are also important to rule out microscopic colitis. Here, ESGE recommends two biopsies from the left colon and two biopsies from the right colon, placed in separate containers and labelled as such [30]. This is supported by the finding of lymphocytic and collagenous colitis presenting histologically as pancolitis, excluding the rectum [38].

The recently published ESGE guideline on tissue sampling in the lower GI tract recommends biopsies in UC patients to evaluate disease activity [30]. A minimum of two biopsies from the worst affected area or the most representative area of mucosal healing, preferably at the edge of any ulcers was recommended. The worst affected area might include an ulcerated anastomosis, where biopsies might differentiate between an IBD-associated ulcer or an ischemic lesion. Histological assessment of biopsies can be used to assess disease activity, the presence of cytomegalovirus, or histological healing, and to optimize therapy by either escalation or exit strategies, predict long-term adverse outcome, and manage patients to achieve treatment targets [30].

Although data on actual adequate biopsies rates are lacking, based on available evidence and expert opinion, a minimum standard of ≥ 80 % was considered appropriate by the working group members.

5 Endoscopic assessment of disease activity in known IBD: identification of pathology

Key performance measure	Rate of endoscopic activity score use
Description	The percentage of colonoscopies using endoscopic activity scores for assessment of ulcerative colitis activity
Clinical category	Endoscopic assessment of disease activity in known IBD
Domain	Endoscopic assessment of disease activity
Category	Process
Rationale	The use of endoscopic activity scores for the assessment of disease activity in ulcerative colitis is recommended for evaluation of prognosis and efficacy of medical therapy
Construct	**Denominator:** All colonoscopies performed to assess disease activity in ulcerative colitis patients **Numerator:** Procedures in the denominator that explicitly include the activity score in the endoscopy report
Standards	Minimum standard: ≥ 90 % Target standard: ≥ 95 %
Consensus agreement	100 %
PICO	2.1 and 2.5 (see Supporting information)
Evidence grading	Moderate

The acceptance of this performance measure is based on agreement with the following statement:
- An endoscopic activity score should be used for the assessment of disease activity in ulcerative colitis, the endoscopy report should explicitly include the score used. Agreement: 100 %

Accurate assessment of disease activity and disease extent in patients with IBD is of paramount importance for planning and tailoring treatment strategies [39]. The use of endoscopic disease activity indices to evaluate the prognosis and efficacy of medical treatment in UC patients has been recommended by international guidelines [39]. There are insufficient data to set the minimum and target standards reliably, but the proposed values for the use of an endoscopic activity score for the assessment of disease activity in UC patients of ≥ 90 % and ≥ 95 %, respectively, seem achievable.

Nineteen different endoscopic scoring indices have been partially validated [40]. Among these, the most commonly used are the Mayo Endoscopic score (MES) and the Ulcerative Colitis Endoscopic Index of Severity (UCEIS). Both have been validated for reliability, construct validity, and responsiveness [19, 41–44]. The operating properties of both scores are comparable. However, because the MES is easier to use, it remains the outcome of choice for clinical trials and daily practice [43]. Electronic chromoendoscopy-based scores, such as the Paddington International Virtual Chromoendoscopy Score (PICaSSO), require more real-life, treatment-related studies for their full establishment in both daily practice and clinical trials [45].

Endoscopic activity scores for Crohn's disease are more complex to use; hence their broad implementation into routine clinical practice might be difficult [39]. Therefore, the working group members agreed not to include activity scores for Crohn's disease in the performance measure and statements. Nevertheless, whenever feasible, the working group members recommend using the Simple Endoscopic Score for Crohn's Disease (SES-CD) to assess disease activity in Crohn's disease [46].

6 Surveillance: identification of pathology

Key performance measure	Rate of high definition endoscopy use
Description	Percentage of colonoscopies using high definition endoscopy
Clinical category	Surveillance
Domain	Identification of pathology
Category	Process
Rationale	High definition endoscopy improves the visualization of the mucosa
Construct	**Denominator:** All surveillance colonoscopies in IBD patients **Numerator:** Colonoscopies in the denominator using high definition endoscopy
Standards	Minimum standard: ≥ 90 % Target standard: ≥ 95 %
Consensus agreement	100 %
PICO	3.2 (see Supporting information)
Evidence grading	Moderate

The acceptance of this performance measure is based on agreement with the following statement:

- High definition endoscopy should be used for surveillance in longstanding colitis. Agreement: 100 %

Patients with longstanding IBD are at increased risk of developing colorectal cancer, with an estimated risk of approximately 18 % after 30 years with the diagnosis [47, 48]. Consequently, patients are recommended to undergo screening colonoscopy with the aim of detecting premalignant dysplastic lesions [8, 28] The use of high definition endoscopy is strongly recommended in current guidelines for surveillance in longstanding IBD patients [8, 27–29]. High definition endoscopy significantly improves the detection of dysplastic lesions in surveillance colonoscopy in IBD patients compared with standard definition endoscopy [49]. The improved visualization of the mucosa enables detection of most dysplastic lesions [50, 51]. This improved visualization, combined with a lack of adverse effects when using high definition endoscopy, resulted in a proposed minimum standard of ≥ 90 % and target standard of ≥ 95 % for the use of high definition endoscopy in longstanding IBD patients.

Key performance measure	Rate of chromoendoscopy use
Description	Percentage of surveillance colonoscopies using dye-based or virtual chromoendoscopy combined with targeted biopsies in longstanding IBD patients
Clinical category	Surveillance
Domain	Identification of pathology
Category	Process
Rationale	The use of chromoendoscopy and targeted biopsies during surveillance colonoscopy in longstanding IBD patients improves the detection of dysplastic lesions
Construct	**Denominator**: All surveillance colonoscopies in longstanding IBD patients **Numerator**: Colonoscopies in the denominator using dye-based or virtual chromoendoscopy combined with targeted biopsies
Standards	Minimum standard: ≥ 70 % Target standard: none set
Consensus agreement	95 %
PICO	3.2 and 3.3 (see Supporting information)
Evidence grading	Moderate

The acceptance of this performance measure is based on agreement with the following statement:

- Dye-based or virtual chromoendoscopy in combination with targeted biopsies should be used in surveillance colonoscopy in longstanding IBD patients. Agreement: 95 %

The routine use of dye-based pancolonic chromoendoscopy or virtual chromoendoscopy with targeted biopsies for neoplasia surveillance in patients with longstanding colitis, in the situation of quiescent disease activity and adequate bowel preparation, has already been recommended by the ESGE Guideline on advanced imaging for detection and differentiation of colorectal neoplasia [52]. Virtual chromoendoscopy has emerged as an attractive alternative to overcome the laboriousness of dye-based chromoendoscopy. The current evidence showed no significant difference between the two techniques for dysplasia detection [53–55].

Numerous academic studies, predominantly at tertiary centers, have demonstrated the low yield of nontargeted biopsies for dysplasia detection [56–59]. In addition, nontargeted random biopsies cause a significant workload for both endoscopists and pathologists. The value of continuing four-quadrant biopsies, both in terms of effort and cost, has been questioned as their yield is so low compared with targeted approaches, on the basis of both dysplasia detected per patient and dysplasia detected per sample. However, the literature supports that, for certain high risk subsets of IBD patients (i. e. primary sclerosing cholangitis), four-quadrant or random biopsies may still have a role [60, 61]. Therefore, when using chromoendoscopy for IBD surveillance, the use of targeted biopsies only is recommended as an easily measurable quality indicator.

A minimum standard of ≥ 70 % may seem relatively low. However, it allows a different strategy to be followed in a selected number of colonoscopies. For example, in high risk patients with a family history of colonic neoplasia, a tubular-appearing colon, or primary sclerosing cholangitis, where endoscopists may opt to take random biopsies in addition to targeted biopsies, as suggested in the ESGE tissue sampling guideline for the lower GI tract [30].

Although no significant learning curve was observed for the use of chromoendoscopy [62], the working group members agreed that endoscopists should be adequately trained according to the recently published ESGE curriculum [63].

Minor performance measure	**Neoplasia detection rate**
Description	Percentage of colonoscopies with at least one neoplastic lesion detected during surveillance of longstanding colitis
Clinical category	Surveillance
Domain	Identification of pathology
Category	Process
Rationale	Neoplasia detection rate reflects adequate inspection of the bowel mucosa
Construct	**Denominator**: All surveillance colonoscopies in longstanding IBD patients **Numerator**: Colonoscopies in the denominator in which at least one neoplastic lesion was identified **Exclusions**: Patients with incomplete colonoscopy
Standards	Minimum standard: ≥ 8 % Target standard: none set
Consensus agreement	89 %
PICO	3.4 (see Supporting information)
Evidence grading	Low

The acceptance of this performance measure is based on agreement with the following statement:

- The detection rate of neoplastic lesions in surveillance colonoscopies in longstanding IBD patients should be more than 8 %. Agreement: 89 %

Current surveillance strategies in IBD patients aim to identify dysplasia and prevent progression to CRC. Interval cancers are significantly more frequent in IBD patients compared with non-IBD patients and are most likely due to undetected or incompletely resected dysplastic lesions [8, 64, 65]. While the correlation between the adenoma detection rate and the risk of developing interval cancers is solid in a screening population [66, 67], it is still debatable in IBD. Nevertheless, applying a neoplasia detection rate as a performance measure for surveillance colonoscopy in IBD patients seems reasonable.

The neoplasia detection rate has already been incorporated into the ESGE curriculum for optical diagnosis [63]. In the literature, neoplasia detection rates vary between 10 % and 26 % in surveillance colonoscopies in longstanding IBD patients [53, 62, 68]. Current literature on neoplasia detection rates in longstanding IBD patients comes mainly from academic services and it can be assumed that there will likely be differences in the prevalence of dysplasia and treatment preferences between countries [69, 70]. Furthermore, owing to improved treatment of IBD, the prevalence of neoplasia might also fall and, with frequent surveillance, it seems unlikely that many dysplastic lesions will be found in longstanding IBD patients. Therefore, the working group members considered a minimum standard

of ≥ 8 % achievable for the neoplasia detection rate in surveillance colonoscopies in longstanding IBD patients. In addition, because of the uncertainty of the prevalence and incidence in a nontertiary setting, this quality indicator was qualified as a minor performance measure.

Conclusions

This paper describes the key performance measures for colonoscopy in IBD patients. These measures were supported by the available evidence where possible or based on an expert consensus between the working group members and were regarded as feasible to measure in endoscopy services throughout Europe and other interested countries. As there is limited evidence to support performance measures for all clinical categories for colonoscopy in IBD patients, most evidence was graded as moderate or low quality. This generated future research priorities, primarily to audit the proposed performance measures and to evaluate if these proposed measures do actually improve the care of IBD patients.

Similarly to the previously published ESGE quality improvement initiatives, the first step should be to implement these key performance measures for colonoscopy in IBD patients in endoscopy services throughout Europe and other interested countries. The ESGE recently published recommendations to overcome barriers in dissemination and implementation of quality measures for GI endoscopy [71]. The dissemination and implementation of performance measures are important to identify services and endoscopists with substandard levels of performance. Furthermore, the ESGE recommendations on endoscopy reporting systems will support endoscopy services to facilitate quality monitoring in daily practice [72]. Adequate quality monitoring will enable the principle of audit and feedback; this principle has been proven to improve the quality of care [73].

Financial or logistical issues may cause barriers for optimal implementation of quality control systems. However, in an era where hospital accreditation is becoming increasingly important, hospital administrations are expected to be more inclined to support the need for such developments. Furthermore, investments in hardware will support endoscopy services in broad quality assessment for all types of endoscopy. Moreover, we should overcome financial, individual, or logistical barriers to aim for the highest possible quality in our endoscopy services to ensure the best possible outcomes for our patients.

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Competing Interests

R. Bisschops has received research grants and speaker's fees from Fujifilm, Norgine, and Pentax; he has provided consultancy for Fujifilm, Norgine, and Pentax. E. Dekker has received a research grant and has endoscopic equipment on loan from Fujifilm; she has received speaker's fees from Olympus, GI Supply, Norgine, Ipsen, Paion, and Fujifilm; she has provided consultancy for Fujifilm, Olympus, GI Supply, Paion, and Ambu. J.E. East has received speaker's fees from Falk and Jenssen, has served on clinical advisory boards for Paion, and has served on the clinical advisory board and has share options in Satisfai Health. M. Iacucci has received research grants from Olympus, Pentax, and Fujifilm. M.F. Kaminski has equipment on loan from Fujifilm; he has received speaker's fees from Boston Scientific, Ipsen, and Recordati, and a research grant from Olympus; he has provided consultancy for Olympus and ERBE. J.G. Karstensen has received speaker's fees from Norgine and provided for consultancy from Ambu and SNIPR Biome. M. Keuchel has received speaker's fees from Medtronic and Olympus, and study support from AnXRobotics; he has provided consultancy for Medtronic. M. Pellisé has provided consultancy to Norgine Iberia, GI Supply, and Fujifilm; she has served on the editorial board of Thieme, has been the ESGE equity and diversity working group chair and a councillor for SEED, and is president elect of AEG; her department has received research support from Fujifilm and Casen Recordat. L. Peyrin-Biroulet has received personal fees from Abbvie, Janssen, Takeda, and Celltrion. None of the above conflicts of interest are of relevance to this manuscript. M. Bugajski, C. Carretero, G. Cortas, E.J. Despott, M. Löwenberg, A. Monged, A. Murino, K.J. Nass, O.M. Nardone, H. Neumann, M. Omar, and M.D. Rutter declare that they have no conflict of interest.

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