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Unifying terminology, reporting, and bowel preparation standards in colon capsule endoscopy: Nyborg Consensus

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ABSTRACT

Background and study aims Colon capsule endoscopy (CCE) is becoming increasingly popular in Europe. However, development of quality assurance and standardized terminology has not kept pace with clinical integration of this technology. As a result, there are significant variations in reporting standards, highlighting the need for a standardized terminology and framework. We used the RAND process to achieve a consensus of experts to determine the terminology in CCE, bowel cleansing assessment, and quality assurance reporting and future research priorities.

Methods A panel comprising 14 European CCE experts evaluated 45 statements during the international REFLECT symposium (Nyborg, Denmark) through three survey rounds and face-to-face and virtual discussions in the initial two rounds. Participants anonymously rated statement appropriateness.

Results Twenty-eight consensus statements were developed. Eight statements focus on consistent terminology for confirming CCE-detected polypoid and inflammatory colonic lesions with colonoscopy. To ensure standardization and quality assurance, 13 mandatory fields were recommended for inclusion in a CCE report. Three endorsed reporting methodologies were suggested, emphasizing prompt notification for suspected malignant findings, recommending a generic disclaimer regarding stomach and small bowel visualization intentions, and establishing reporting timelines at an interdepartmental level based on urgency. Four bowel preparation scale-related statements led to the recommendation to adoptithe Colon Capsule CLEansing Assessment and Reporting (CC-CLEAR) scale as the preferred scale.

Conclusions This study established a framework for terminology, reporting, and assessment of bowel cleansing for CCE. Future research should focus on optimizing bowel preparation regimens and exploring artificial intelligence applications in CCE.

Introduction

Colon capsule endoscopy (CCE) has become more popular in Europe since the COVID-19 pandemic, specifically in Scotland, England, and Denmark [1, 2, 3]. However, the rapid global integration of technology has outpaced establishment of quality assurance and standardized terminology. It is vital to use precise and consistent terminology in CCE, especially for endoscopists performing follow-up procedures after significant findings are identified by CCE. Although colonoscopy and CCE reporting share similarities, pathologies examined through these modalities can exhibit subtle or significantly different appearances. Therefore, classifications or descriptions designed for use during colonoscopy should be used with caution in CCE to avoid miscommunication and unnecessary patient anxiety.

The increasing volume of CCE reports has revealed significant variations in bowel cleansing assessment and reporting standards, highlighting the need for a standardized framework or guidance. Although there is a lack of comprehensive literature describing reporting standards or quality measures, establishing benchmarks for the quality of CCE procedures remains crucial. To address this need, a working group of CCE experts at The futuRE oF MinimalLy InvasivE GI & Capsule diagnosTic (REFLECT) symposium (Nyborg, Denmark) used the RAND process to identify and describe CCE terminology, bowel cleansing assessment, quality assurance in CCE reporting, and future research priorities through consensus among experts. The RAND process aims to improve endoscopist comprehension of CCE reports, positively impacting clinical outcomes at all levels of endoscopic practice.

Methods

Modified Delphi process

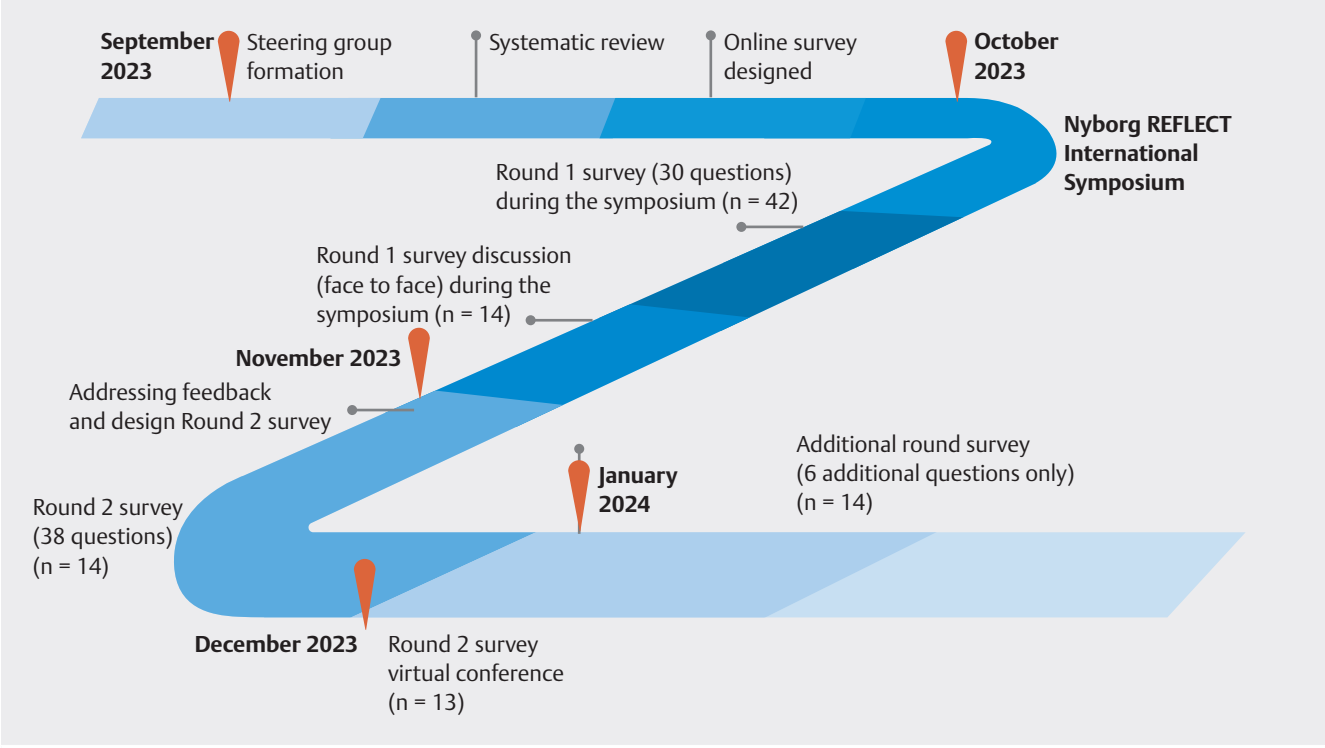
The RAND/UCLA (University of California, Los Angeles, United States) appropriateness method (RAM) integrates expert opinions with the best available evidence to assess the appropriateness of specific practices [4]. It is essential in areas of uncertainty and insufficient clinical evidence. Differing from the Delphi model, it does not prioritize imposing consensus but focuses on agreement and disagreement as primary results of the method. The process includes a systematic review to gather relevant literature, providing essential insights for the questionnaire design. Achieving consensus entails two rounds of the survey and subsequent meetings to formulate findings and collaborative recommendations.

Systematic literature search

A systematic literature review was conducted on October 1, 2023 in the EMBASE, MEDLINE OVID, COCHRANE, and PUBMED CENTRAL databases. The search string and the PRISMA flow diagrams (▶ **Fig. 1**) are listed in the appendix. IL carried out the title, abstract, and full-text review. The steering group (IL, BSO, RPA, and AK) convened, discussed, and formulated the initial questionnaire based on the currently available evidence.

Expert panel selection

European Experts specializing in CCE, known for their contributions as authors of published articles and active practice of CCE, were invited to the “REFLECT” symposium (Nyborg, Denmark) [5]. A total of 42 experts were invited during the symposium, with 23 participating in the Round 1 survey. Subsequently, 14 experts actively participated in Round 2, additional surveys, and in-person and virtual discussions. Panel details, including



▶ **Fig. 1** The consensus development timeline and process.

the number of CE publications and total lifetime CCE reading, are summarized in Supplementary Table 3 in the appendix. Three members of the steering committee were granted voting rights as part of the panel.

Conduct of surveys

A total of three rounds of surveys were conducted. The initial survey encompassed four sections: terminology, future CCE indications, bowel preparation, and future research priorities. Following feedback from the in-person discussion at the Nyborg Symposium, a CCE report quality assurance section was incorporated. The future indication and research sections were combined in the second survey. The second survey ensued, and its outcome was further discussed during a virtual teleconference. Recognizing the importance of incorporating feedback on six additional aspects, an additional short survey was conducted. The outcomes of the surveys were summarized to yield the final consensus. Statements with high levels of agreement were formulated into declaratory recommendations (**Supplementary Table 1** in the appendix).

Consensus development process

The consensus development process is outlined in ▶ **Fig. 1**. Invited experts were given at least 2 weeks to complete the survey. The face-to-face RAND panel workshop, guided by the steering group, took place on October 13, 2023 at the end of the Nyborg REFLECT symposium [5] and a subsequent virtual teleconference on December 19, 2023 via Microsoft Teams (Microsoft, United States). It is crucial to emphasize that the goal of this discussion was not to coerce the panel into reaching a consensus, but rather, to create opportunities for understanding and collaborative discussion on defining recommendations in these aspects of CCE.

While each expert is aware of the identity of other panel members, the responses of individual panellists remain confidential, except for the collective response from the preceding round. Individual responses are only disclosed if panellists voluntarily share their input during the discussions. To address concerns about expert bias, pseudonyms were also assigned to each expert as an option, allowing the experts to contribute anonymously, which only applies to the teleconference.

Statistical analysis statements

Each item was rated on a scale from 1 to 9, reflecting its appropriateness based on the current evidence and clinical practices. Considering diverse practices, panellists were instructed to evaluate terminology and CCE reporting practices with a global applicability perspective. The rating categories included "appropriate," "uncertain," and "inappropriate," determined based on the median score and the disagreement index. Items with a median panel rating of 1–3 without disagreement were classified as inappropriate, those with a rating of 4–6 or any median score with disagreement were classified as uncertain, and those with a 7–9 without disagreement were deemed appropriate.

$$Disagreement\ Index\ (DI) = \frac{70th - 30th\ centile}{2.35 + (1.5 \times \mathrm{abs}\left(5 - \frac{70\mathrm{th} - 30\mathrm{th\ centile}}{2}\right))}$$

Disagreement Index (DI)	Panel median score								
	1	2	3	4	5	6	7	8	9
	Lower third (1–3)			Middle third (4–6)			Top third (7–9)		
<1 (agreement)	Inappropriate			Uncertain			Appropriate		
>1 (disagreement)									

▶ **Fig. 2** Summary of RAND/UCLA appropriateness scale [4].

The level of disagreement was calculated based on the disagreement index (DI) calculation provided above. If the DIs is ≥ 1, this indicates uncertainty in the item. Conversely, a DI < 1 signifies the panel achieved agreement with the calculated Panel Median Score (▶ **Fig. 2**). The DI score is determined based only on the responses from the final round after the panel discussion.

Results

Systematic review

A total of 667 references were identified, and 28 references were included, including 11 additional hand-search guidelines and publications. (**Supplementary Fig. 1** and **Supplementary Table 2** in the appendix).

Nyborg consensus statements

Forty-four statements were included in the final survey and the 28 recommendations are summarized in ▶ **Table 1**. The study process is also summarized in ▶ **Fig. 1**. Statements for which no consensus was reached are listed in ▶ **Table 2**. Future research questions in CCE are summarized in ▶ **Table 3**. The concise summary of the recommendations is presented in ▶ **Table 4**. Result tables are included in the **Supplementary Table 1** in the appendix.

General concepts of CCE terminology

Given the absence of an established standard terminology for CCE, a consensus was reached on the importance of maintaining consistent terminology between CCE and colonoscopy [2]. This implies aligning CCE terminology with the minimal standard terminology (MST) of the World Endoscopy Organisation (WEO) used in colonoscopy [6]. This alignment also describes inflammatory bowel disease features, including ulcers, loss of vascular pattern, etc.

The panel also agreed that the Paris classification system should be used for polyp morphological characterization, even when the polyp is unclear or partially visible in CCE. [7] However, consideration must be given to the limitation regarding potential variation in the appearance of flat polyps [8]. In instances where most of the polyp is not visualized in the video, documenting insufficient information for morphology assessment is crucial, especially when there is uncertainty of malignancy in the unseen part of the polyp. In addition, diminutive polyps should still have their morphology noted.

Regarding pit pattern assessment, consensus was achieved on using the KUDO/NICE/JNET classification [6, 7]. The challenges mainly lie in obtaining high-quality polyp images in CCE, even with a high-resolution camera. In cases of uncertainty, recording the inability to assess the pit pattern is recommended. Despite the variability in flexure assessment, agreed-upon landmarks include the first cecal image, hepatic flexure, splenic flexure, and last rectal image. Timestamps for both hepatic and splenic flexure landmarks should be recorded when the capsule exits the flexures and enters the next (caudal) colonic segments.

CCE reporting quality assurance.

To address significant variations in CCE reporting practices, the panel unanimously endorsed incorporating mandatory fields as part of the quality assurance process. The essential fields encompass details such as bowel preparation regimen, the booster regimen, visibility of the anal cushion, capsule excretion, overall capsule transit time, colonic capsule transit time, adverse events, the size estimate of all the polyps with corresponding timestamps, presence of signal interference, procedure completion, the adequate visualization of the cecum, and additional landmarks such as triradiate fold, cecal pole, and appendix.

Advisable fields, including a generic disclaimer, were also recommended. This emphasized that the CCE procedure is not intended to completely visualize the stomach and the small bowel, regardless of reported abnormalities, and the importance of establishing reporting timelines at the interdepartmental level based on the urgency of the indication for CCE. Furthermore, there was also consensus that it is the responsibility of the CCE reader to promptly notify the responsible clinician of any suspected malignant findings with the information recorded in the report.

Bowel preparation assessment

The Leighton-Rex scale and the Colon Capsule CLEansing Assessment and Reporting (CC-CLEAR) scale were considered easy to use [9]. The consensus was reached to have three separate bowel segments (right, transverse, and left colon) cleansing evaluated, but not five segments. Therefore, the panel advocated adopting the CC-CLEAR score, encompassing three segmental scores. An overall bowel cleansing evaluation for the entire examination was also agreed upon in addition to the segmental score.

▶ **Table 1** Nyborg Consensus Statement.

CCE Terminology and Classifications	1. Consistent terminology between CCE and colonoscopy should be maintained for the effective identification of specific findings by subsequent colonoscopists.
	2. Compared to colonoscopy, identical terminology in the CCE report should be employed for describing the severity and features of inflammatory bowel disease.
	3. Noting technical limitations and possible differences in flat polyp appearance, the Paris classification system should be used to characterize CCE-identified polyps whenever feasible.
	4. For unclear or partially captured polyps on CCE, its morphology should be commented on using Paris classification based on the available information.
	5. The morphology of diminutive polyps should be noted in the finding section of the report when reporting objective findings in CCE.
	6. It is imperative to document "insufficient information for morphology assessment" when the majority of the polyp is not visualized.
	7. KUDO/NICE/JNET classification should be used to describe the polyp pit pattern whenever feasible, provided the imaging quality permits accurate classification.
	8. In cases where the imaging quality is inadequate for pit pattern assessment, "Not feasible to assess pit pattern" should be recorded
Quality assurance in CCE reporting Mandatory fields	9. The bowel preparation regimen and the "booster" regimen should be included.
	10. When reporting CCE, the Adverse Events should be reported, and "None" should still be reported when there is no complication.
	11. In CCE, the overall and colonic capsule transit time should be reported.
	12. The CCE report must consistently include information about signal interference or interruptions.
	13. All CCE reports must include information indicating whether the capsule procedure was completed. Completion, in this context, encompasses the visualization of the anal cushion or capsule excretion.
	14. The visibility of the anal cushion should be reported.
	15. Information regarding whether the capsule was excreted or not should be reported
	16. The first cecal image, hepatic flexure, splenic flexure, and the last rectal image should be used as standard landmarks for capsule localization in the CCE video, recognizing the potential variability in assessing the flexures.
	17. The timestamp of the hepatic flexure and splenic flexure should be recorded at the moment when the capsule exits the flexures and enters the next colonic segment.
	18. In CCE reporting, a mandatory field should be included to indicate whether a clear visualization of the caecum is achieved
	19. When reporting CCE, any additional specific details, such as the visualization of the cecal triradiate fold, ileocecal (IC) valve and appendiceal orifice, should be explicitly mentioned in a separate section.
	20. When reporting any polyp in the CCE report, the corresponding timestamps should be included in the report's main body or attached as annotated images at the bottom.
	21. The size estimate of all polyps should be recorded formally in the CCE report.
Recommended reporting methodology	22. In the context of suspected malignant lesions, there is an imperative on the part of the CCE reader to flag up the finding urgently to the responsible clinician. This should be recorded in the CCE report.
	23. In the CCE report, it is advisable to incorporate a generic disclaimer emphasizing that the CCE procedure is not intended to completely visualize the stomach and the small bowel. This disclaimer should apply whether abnormalities in these areas are reported or not in the CCE final report.
	24. The agreement on reporting timelines must be established at the interdepartmental level and should be based on the urgency of the indication for CCE.
Bowel preparation	25. The Leighton-Rex scale is easy to use for evaluating bowel cleansing quality.
	26. The CC-CLEAR scale is easy to use for evaluating bowel cleansing quality.
	27. CCE reporting should contain an overall bowel cleansing quality evaluation for the entire examination (regardless of completion)
	28. CCE reporting should contain a bowel cleansing quality evaluation for three separate segments of the colon (right, transverse and left colon)

CC-CLEAR scales, Colon Capsule Cleansing Assessment and Report; CCE, colon capsule endoscopy; IC, ileocecal; NICE, narrow-band imaging international colorectal endoscopic; JNET, Japanese Narrow Band Imaging Expert Team.

▶ **Table 2** Nyborg Consensus Statements for which no consensus was reached.

CCE Terminology	1. When reporting CCE, judgment about the significance of the disease identified, such as describing polyps as diminutive or insignificant, should be reserved for the summary section of the CCE report.
Quality assurance in CCE reporting	2. The CCE report should contain information regarding the use of a patency capsule or not.
Bowel preparation	3. Bowel cleansing can be considered adequate only when there is no risk of any pathology being o-bscured.
	4. Bowel cleansing can be considered adequate only when there is no risk of polyps > 5 mm in size being obscured. (consensus reached initially but omitted after the teleconferencing discussion)
	5. Bowel cleansing can be considered adequate only when there is no risk of polyps > 9 mm in size being obscured.
	6. CCE reporting should contain a bowel cleansing quality evaluation for five separate segments of the colon (cecum, ascending colon, transverse colon, left colon and rectum)
Future research question	7. Is the utilization of flexures as landmarks a viable approach?
	8. Is using CCE and subsequent flexible sigmoidoscopy to obtain left-sided biopsies adequate to investigate patients with diarrhea?

CCE, colon capsule endoscopy.

▶ **Table 3** Prioritized future research questions.

	Rank in priority	Median score
1. What is the optimal bowel preparation regimen for CCE?	**1**	**9**
2. Will the implementation of artificial intelligence (AI) significantly impact the pathway, considering that the primary challenge lies in acquiring the recordings rather than finding CCE readers?	**2**	**7.5**
3. Does combining CCE with triage markers enhance diagnostic yield?	**3**	**7**
4. Is CCE sufficiently reliable for predicting the pathology of colonic polyps?	**4**	**7**
5. What is the optimal FIT cut-off that allows the highest sensitivity for pathology detection in those with lower GI symptoms using CCE?	**5**	**7**
6. Can CCE be used as an alternative to colonoscopy to investigate colorectal cancer in high-risk groups, defined by first-degree relatives with colorectal cancer (CRC) or a personal history of CRC or inflammatory bowel disease (IBD)?	**6**	**8**
7. What sort of classification (e. g. IBD/diverticular disease) systems are useful in colonic capsule endoscopy?	**7**	**7**
8. Can CCE accurately assess patients with haematochezia?	**8**	**7**
AI implementation research questions		**Rank in priority**
9. How might the implementation of AI in polyp detection impact the CCE pathways?		**1**
10. How might the implementation of AI in bowel cleansing assessment impact the CCE pathways?		**2**
11. How might the implementation of AI in flexure localization impact the CCE pathways?		**3**

AI, artificial intelligence; CCE, colon capsule endoscopy; CRC, colorectal cancer; FIT, fecal immunochemical test; IBD, inflammatory bowel disease.

Uncertain statements

Considerable uncertainty surrounded the usage of the term "diminutive polyps," which inherently implies insignificance and small size (< 6 mm). However, it is worth noting that this term is not formally defined within the Paris classification and has predominantly been utilized in the summary section of the report to indicate polyps deemed insignificant. The panel did not reach a consensus on whether it is appropriate to employ the term "diminutive" to describe polyps, even within the summary section of the report. Consequently, no definitive conclusion could be drawn regarding use of this term.

Similarly, uncertainty was expressed regarding reporting utilization of a patency capsule. The relevance of employing a patency capsule in this low-risk patient cohort was deemed uncertain due to its infrequent requirement. However, the relevance of patency capsules may become more evident in their application as panenteric capsules.

To further understand the qualitative bowel cleansing assessment of the experts, various thresholds for bowel cleansing

▶ **Table 4** Concise summary of Nyborg Consensus Statement.

CCE terminology and classifications	1. Consistent terminology between CCE and colonoscopy should be maintained, including in the description of inflammatory bowel disease severity and features.
	2. Noting technical limitations and variations in flat polyp appearance, the Paris classification should be used to characterize CCE-identified polyps whenever feasible, including for unclear or partially captured polyps based on available information.
	3. The morphology of diminutive polyps should be included in the findings section of the CCE report. If most of the polyp is not visualized, it is essential to document "insufficient information for morphology assessment."
Quality assurance in CCE reporting Mandatory fields	4. All CCE reports must indicate whether the capsule procedure was completed, defined by the visualization of the anal cushion or capsule excretion. The visibility of the anal cushion and whether the capsule was excreted should be documented.
	5. The first cecal image, hepatic flexure, splenic flexure, and last rectal image should be standard landmarks for capsule localization in the CCE video, with timestamps recorded as the capsule exits the flexures and enters the next colonic segment.
	6. CCE reports should include a mandatory field indicating whether clear visualization of the cecum is achieved. Additional details, such as the cecal triradiate fold, ileocecal valve, and appendiceal orifice, should be explicitly mentioned in a separate section.
Recommended reporting methodology	7. In the context of suspected malignant lesions, there is an imperative on the part of the CCE reader to flag up the finding urgently to the responsible clinician. This should be recorded in the CCE report.
	8. In the CCE report, it is advisable to incorporate a generic disclaimer emphasizing that the CCE procedure is not intended to completely visualize the stomach and the small bowel. This disclaimer should apply whether abnormalities in these areas are reported or not in the CCE final report.
	9. The agreement on reporting timelines must be established at the interdepartmental level and should be based on the urgency of the indication for CCE.
Bowel preparation	10. Both the Leighton-Rex and CC-CLEAR scales are easy to use for assessing bowel cleansing quality. CCE reports should include both overall (entire examination) and segmental evaluations (right, transverse, and left colon

CCE, colon capsule endoscopy.

adequacy were explored, incorporating levels such as adequacy without risk of missing polyp size > 9 mm, size > 5 mm, or no risk of missing any pathology altogether. Although an agreement was reached, indicating that the threshold of no risk in missing polyp size > 5 mm should be considered adequate, this criterion was recognized as not the most robust due to the inherent subjectivity of readers and the inaccuracy in the polyp sizing tool [10]. Furthermore, although adequacy of bowel preparation impacts accuracy of lesion detection, it is important to differentiate these concepts clearly. Despite reaching an agreement on this statement, the quantitative definition of adequate bowel preparation falls beyond the scope of this paper. Consequently, to maintain clarity, this statement was intentionally omitted from the final consensus statements.

Discussion

CCE terminology

Although CCE and colonoscopy are endoscopic examinations, they are very different in terms of device specifications and procedure delivery. To improve treatment outcomes, it is essential to unify the terminology so that CCE findings can be matched with those of a subsequent colonoscopy. This will facilitate clear communication between the CCE reader and the endoscopist, streamline report generation, simplify education and training, and enable the integration of CCE into electronic medical records and large national databases [7, 8]. According to this consensus, it is important to maintain consistent terminology in both polypoid pathologies and inflammatory bowel diseases.

Polyp classification for morphology and pit pattern

In terms of adopting the Paris classification for polyp morphology in CCE, the consensus emphasized the practicality of employing the same principle and language (as that used in colonoscopy). Caution should be exercised in serrated (flat) polyps, as their appearance may vary between CCE and colonoscopy. Such lesions may appear more polypoidal on CCE due to absence of air insufflation during the procedure, making the Paris classification imperfect for CCE but sufficiently effective for matching polyps between the two modalities [11].

An essential aspect of evaluating polyps involves assessing pit pattern. Extensive application of the KUDO/NICE/JNET classification in colonoscopy was acknowledged, leading to a consensus that this classification should be employed whenever feasible, accepting the CCE image quality as a predominant limiting factor [12, 13, 14]. Despite the high-resolution camera, several other factors continue to affect image quality in CCE, including capsule speed, capsule type, bowel cleansing quality, distance of the polyp from the camera, and camera angle. Un-

like colonoscopy, CCE lacks control over all these factors, and notably, there is no equivalent narrow band imaging (NBI) technology in CCE. These pose additional challenges for pit pattern assessment. Subsequently, it was agreed that the option of "Not feasible to assess pit pattern" should be permitted when imaging quality is inadequate. As CCE technology continues to advance, the panel acknowledged the potential future integration of these classifications.

During the panel discussion, a notable concern revolved around partially visible polyps, especially when it is difficult to assess their morphology and pit pattern due to limited views. This issue was previously highlighted by Igawa et al. [8] when studying CCE in identifying laterally spreading tumors (LST). The study reported potential inaccuracies in polyp margin interpretation when an LST extends beyond a single image. There are also additional challenges, including interpretation difficulties through multiple images, presence of mucosal cap, stool residue, and the bubble. The consensus aligns with prioritizing detection over precise diagnosis in CCE, advocating for describing morphology whenever feasible. Importantly, it was also agreed to document "insufficient information for morphology assessment" when most of the polyp is not visualized, or there is uncertainty about the potential malignancy in the unseen part of the polyp.

CCE landmarks

Regarding landmarks for capsule localization, consensus supports using the first cecal image, hepatic flexure, splenic flexure, and the last rectal image as standard landmarks. However, the accuracy of the flexure remains controversial, as this was demonstrated by Schelde-Olesen et al. [9], with only 29% and 22% agreement between observers in the hepatic and splenic flexures. Despite this uncertainty, these flexures remain necessary for the decision on further procedures, such as flexible sigmoidoscopy or colonoscopy. Furthermore, absence of standardization in defining flexure in CCE also contributed to interobserver variability. As a result, consensus was reached to define the flexures at the timestamp when the capsule exits the flexures and enters the next colonic segment. This standardization will improve reproducibility of flexure landmarking, thereby enhancing localization and matching of polyps in subsequent colonoscopies.

In CCE reporting, it is crucial to define the complete procedure, characterized by visualizing the anal cushion or capsule excretion. This does not include whether all the colonic segments are adequately seen. Specific details, such as the visualization of the cecal triradiate fold, ileocecal valve and appendiceal orifice, should be explicitly mentioned in a separate section of the report.

CCE reporting assurance

It was also important to state that it is the responsibility of the CCE reader to promptly notify the responsible clinician of suspected malignant findings. Unlike colonoscopy practice, the report and diagnosis are not communicated to the patients immediately after the procedure. Considering the trend of the evolving CCE reporting pathway, it is essential to inform the responsible clinician urgently of the suspected malignant findings to enable prompt clinical decision-making within the entire clinical context. In addition, a generic disclaimer was also agreed upon to emphasize that the CCE procedure is not intended to completely visualize the esophagus, stomach, or small bowel, regardless of any reported abnormalities in these areas. However, an exception exists when CCE is used as a panenteric capsule by turning off the "sleep mode" because it can capture the entire small bowel length within that context [15].

Bowel preparation evaluation

In evaluating the bowel preparation scoring system, the panel acknowledged that the Leighton-Rex and CC-CLEAR scales are easy to use. However, the consensus favored the CC-CLEAR scale due to its perceived simplicity in assessing three bowel segments compared with five segments of the Leighton-Rex scale. Moreover, the quantitative nature of CC-CLEAR, in contrast to the qualitative aspect of Leighton-Rex, suggested potential superiority in terms of interobserver variability and correlation to clinical outcome [16, 17]. Subjectivity inherent in the qualitative assessment of Leighton-Rex scales was also considered a disadvantage.

Although the segmental scores were considered useful, an overall score for an entire examination retained its value, particularly given uncertainties around the flexure localization when defining the left and right colon. These factors directly influence the decision for subsequent colonoscopy over flexible sigmoidoscopy. Therefore, the panel recommends both (segmental and entire) scoring methods.

Time metrics for CCE reporting

The panellists also highlighted a crucial aspect of the CCE reporting process, emphasizing that CCE reporting needs to be conducted in real time, and there exists a delay between the procedure and reporting. There was concern about the potential implications of delayed curative treatment due to the delayed reports, prompting a search for a standardized benchmark and drawing insights from the radiology reporting experience, where despite decades of reporting experience, there is no national standard, at least in the UK, as a benchmark for reporting time, relying instead on variable local performance indicators (KPIs) [18]. Considering that, the panel agreement establishes reporting timelines based on the urgency of the indication. This decision-making process should occur at an interdepartmental level, considering different risk-stratifying strategies that might already be implemented locally for CCE patient selection, such as the utilization of faecal immunochemical tests (FIT).

Future research

The consensus also delved into the focus of future research in CCE. These research questions are detailed in ▶ **Table 2** and organized based on their priority rankings. Foremost among the future research questions is determination of the optimal bowel preparation regimen for CCE, given its direct impact on procedure completion rate, bowel cleansing quality, and, thereby, accuracy of the procedure. Despite ongoing research into novel

bowel preparation and booster regimens, they still need to catch up to ideal standards compared to conventional colonoscopy, as evidenced by recent findings from the Scotcap study [19].

The second priority in future research lies in implementing artificial intelligence (AI) in CCE. A recent systematic review on using AI in CCE revealed a sensitivity between 86.5% and 95.5% for bowel cleansing and 47.4% and 98.1% for polyps and colorectal neoplasia detection using a deep learning convoluted neural network (CNN) [20]. Given the highly specific nature of AI, this aspect underwent further ranking in the last round. Prioritization of AI implementation in CCE was allocated as follows: polyp detection, bowel cleansing assessment, flexures, and inflammatory bowel disease assessments. The emphasis on polyp detection reflects the substantial workload associated with this aspect of CCE and the possibility of significantly reducing reading time [21,22]. Furthermore, bowel preparation gained significant attention following polyp detection owing to optimism surrounding the potential of AI to mitigate subjectivity in bowel cleansing assessment and enhance interobserver consistency [23,24]. These advancements, coupled with the noninvasive nature of CCE and its capability for panenteric examination, offer promising prospects for improving the efficiency of CCE to potentially surpass colonoscopy in the future.

Patient involvement

Two participants who were not part of the clinical team provided feedback on the reporting framework from the patient perspective. This was conducted concurrently with the consensus process via a brief five-item questionnaire without any direct influence on the RAND process study design.

Their suggestions included a condensed and simplified summary of the study results, which would be helpful using plain language. This summary could be supported with visual aids, such as images, and clear explanations of the findings. Additionally, having a dedicated section that outlines the necessary follow-up investigations and provides an estimated timeframe might be useful. This will enable patients to plan their health management better in their day-to-day lives. Furthermore, participants expressed their thoughts on a need for direction to reliable resources, including relevant websites and online patient information, especially related to positive findings, to enhance their understanding and facilitate informed decision-making.

Limitations of this study

One of the potential limitations of this study is selection bias, because the panel was composed solely of experts in capsule endoscopy, predominantly CCE. Even though most of these experts are also proficient in colonoscopy, incorporating perspectives from non-CCE colonoscopists could have ensured that diverse viewpoints and aspects were thoroughly considered. Furthermore, the relatively large number of experts who did not respond to the initial invitation may have impacted the representativeness of the panel and potentially introduced bias.

Conclusions

This study provided a fundamental framework summarizing agreed-upon terminology, reporting structure and bowel cleansing assessment for CCE. It marks the commencement of efforts to standardize practices and establish benchmarks to uphold the standard of practice in a field that currently needs more robust evidence. Although this consensus is not exhaustive, it represents an essential initiative toward developing auditable key performance indicators in CCE and enhancing CCE reporting systems.

Availability of data and materials

The primary data are included in the supplementary material in the appendix, published in the online version of the journal.

Conflict of Interest

The futuRE oF MinimalLy InvasivE GI & Capsule diagnosTic (REFLECT) symposium at Nyborg Denmark was partly funded by Jinshan Ltd. Jacob Brodersen: Speaker and consultant fee Jansen-Cilag Benedicte Schelde-Olesen: received honoraria and participated as a member of an advisory board for Jinshan Ltd Emanuele Rondonotti: Medtronic Co, consultancy agreement and Fujifilm Co, speaker honoraria. Ervin Toth: Medtronic; Consultancy, lecture fees, AnX Robotics; Consultancy, research support, Jinshan; Consultancy, research support, lecture fees, Norgine; Consultancy, research support, Tillotts Pharma; Lecture fee Mark Mcalindon: Received research support from Ankon Ltd. Xavier Dray: Alfasigma, Bouchara Recordatim Fujifilm; Medtronic, Norgine, Snadoz. Lecture fees; Augmented Endoscopy, Co-founder and shareholder; Norgine and Provepharma, Consultancy. Anastasios Koulaouzidis: director and shareholder of AJM Medicaps, was a director of iCERV Ltd. and receives consultancy fees (Jinshan Ltd), received travel support (Jinshan, Aqquilant and DiagMed Healthcare Ltd.), research support (grant) from ESGE/Given Imaging Ltd. and (material) IntroMedic/SynMed, and lecture honoraria (Jinshan, Medtronic). He participated in Advisory board meetings for Tillots, ANKON, and Dr Falk Pharma UK, Norgine. Martin Keuchel: Medtronic: Lecture fees, consultancy; AnX Robotics: study support; Jinshan: lecture fees, study support; Capsovision: consultancy; Norgine: study support. The remaining authors have no conflicts of interest to declare

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