BMC Gastroenterology

STUDY PROTOCOL Open Access

The VISION-AI Trial: protocol for a pragmatic randomized controlled non-inferiority trial comparing artificial intelligence-guided colonoscopy to pancolonic chromoendoscopy for neoplasia detection in adults with colorectal inflammatory bowel disease

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Abstract

Background Current guidelines recommend pancolonic chromoendoscopy (pCE) over white light endoscopy (WLE) alone for colorectal neoplasia (CRN) detection in individuals with inflammatory bowel diseases (IBD). However, these techniques are poorly adopted due to technical and logistical limitations. Artificial intelligence–based computer-aided detection (CADe) is a promising new technology integrated into modern endoscopy platforms that has been shown to increase CRN detection in the non-IBD population. We aim to compare CADe-guided colonoscopy to chromoendoscopy in a randomized controlled trial (RCT) in individuals with IBD undergoing surveillance colonoscopy.

Methods This is a pragmatic, multicenter, parallel-group, open-label, non-inferiority RCT comparing CADe-guided colonoscopy (intervention) to pCE (virtual or dye spray) (standard of care). Consenting adults (≥ 18 years) with longstanding (≥ 8 years) IBD (or any duration with primary sclerosing cholangitis) involving ≥ 1/3 of the colorectum, in clinical remission and undergoing surveillance colonoscopy, will be included. Those who undergo a high-quality colonoscopy (adequate preparation, minimal inflammation, complete intubation) will be included in the primary analysis. Patients will be centrally randomized by permuted blocks, stratified by endoscopist. The anticipated CRN rate is 15% in both groups. To demonstrate non-inferiority with a 7.5% margin, at a one-sided alpha of 2.5% and 80% power, and allowing for a 5% loss of eligibility, a total of 752 participants are required. The primary outcome will be visible CRN detected at colonoscopy; secondary outcomes include the mean number of CRN, proportion

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of individuals with high-risk CRN, procedural time, adverse events, and endoscopist acceptance, with per-protocol (primary) and intention-to-treat (secondary) analyses. This protocol follows the SPIRIT 2025 guidelines.

Discussion AI has shown potential in enhancing CRN detection, but current AI systems are not specifically trained for IBD-related lesions, limiting effectiveness. This multicenter non-inferiority RCT will, for the first time, directly compare CADe-guided colonoscopy to pCE for CRN detection in individuals with IBD. This approach may increase adoption of AI-enhanced endoscopy and improve cancer prevention strategies.

Trial registration Australian New Zealand Clinical Trials Registry (ANZCTR) registration number: ACTRN12626000102370. At the time of initial submission (November 2025), recruitment for this study had not started. Participant enrollment began in April 2026, and as of June 8, 2026, 19 out of the target 752 participants have been recruited. The study is currently in the active recruitment phase and has not yet transitioned to follow-up only.

Keywords Artificial intelligence, Endoscopy, Clinical trials, Gastroenterology, Inflammatory bowel disease, Statistics & research methods

Strengths and limitations

Strengths

- The VISION-AI Trial is the first randomised controlled trial to study the utility of artificial intelligence–guided white light endoscopy for colorectal neoplasia detection in patients with inflammatory bowel disease.
- The trial compares AI–guided colonoscopy to the current gold standard of pancolonic chromoendoscopy, thus assessing its potential as a first-line surveillance strategy.
- The trial leverages endoscopists experienced with image enhanced endoscopy (IEE) in patients with IBD and combines real-world clinical conditions with advanced imaging technologies, enhancing the generalizability of the findings.
- The trial has the potential to change clinical practice through improved uptake of IEE among endoscopists caring for patients with IBD, as well as to change clinical practice guidelines in this area.
- The trial has the potential to usher a new era of IEE in IBD, focused on the development and refinement of AI-guided colonoscopy over traditional approaches.

Limitations

- The study uses first generation artificial intelligence-based Computer-Aided Detection (CADe), which has not been specifically trained for colorectal neoplasia detection in IBD patients and may undergo software updates over time.
- Investigators and participants are not blinded to the study intervention.

Background

People with inflammatory bowel disease (IBD) involving the colorectum, including ulcerative colitis (UC) and (ileo-)colonic Crohn's disease (CD), have a 1.5-2-fold higher lifetime risk of developing colorectal cancer (CRC) as compared to age-sex-matched individuals without IBD [1, 2]. This is a result of chronic and/or repeated episodes of colorectal inflammation that promote widespread colorectal carcinogenesis [3–8] and a propensity towards the development of flatter and more indistinct colorectal neoplasms [9–11]. Therefore, individuals with IBD undergo lifelong intensive colonoscopy surveillance to screen for colorectal neoplasia (CRN), typically between every 1–5 years, guided by individual-level CRC risk factors [12–16]. While white light endoscopy (WLE) is the standard for CRN detection in the general population, image-enhanced endoscopy (IEE) using absorptive or contrast dyes (dye spray chromoendoscopy, DCE) in conjunction with WLE has been traditionally recommended for CRN detection in the IBD population [12–14], due to a greater ability to detect flat and indistinct CRN [17, 18]. More recently, evidence has demonstrated non-inferiority of narrow spectrum blue-green light modalities (virtual chromoendoscopy, VCE) to DCE for detecting CRN. In addition, practical considerations such as availability and ease of use of VCE, have led to revised recommendations by some societies advocating for either DCE or VCE over WLE alone for CRN detection in people with IBD [13, 19]. However, both of these techniques require specialized training and demand meticulous bowel preparation, absence of bowel inflammation and mucosal bleeding for optimized viewing, which have limited their uptake by endoscopists. One of the main issues impairing mucosal visibility and hampering the popularity of these modalities is the relative darkness of the colorectal mucosa, particularly in the presence of stool or blood. While the newest generations of VCE have improved brightness as compared to their predecessors, this modality remains unpopular among

endoscopists. In a recent survey study of IBD specialists across Canada, only a minority of respondents claimed to use IEE on a regular basis for CRN detection in IBD patients [20]. Ultimately, this has led to a gap in the quality of colonoscopy surveillance in the IBD population, in which many endoscopists are selecting to use WLE alone for CRN detection.

Encouragingly, the CRN detection capabilities of the latest generation high-definition endoscopes by multiple manufacturers are approaching those of IEE modalities, partially bridging this gap [21]. Additionally, newer imaging modalities available with the latest-generation Fujinon endoscopes (FUJIFILM Corporation), including linked colour imaging (LCI) and artificial intelligence (AI)-based computer-aided detection (CADe) (CAD EYE), have shown improved performance for CRN detection over WLE alone in individuals without IBD [22]. This potentially offers alternative options to traditional IEE to enhance CRN detection in people with IBD. LCI offers greater brightness and colour contrast than WLE and improved ability to detect lesions at a distance from the colonoscope lens as compared to traditional VCE [22]. CADe visually and audibly highlights suspicious lesions during colonoscopy, based on training sets of expert-diagnosed CRN, enhancing endoscopist focus towards irregular areas of mucosa [22]. Both LCI and CADe can be activated instantaneously by buttons on the endoscope head and can be used in conjunction, possibly offering superior performance for CRN detection as compared to either modality alone [22]. CADe lesion recognition is not available in conjunction with blue light imaging (BLI, Fujinon's VCE technology); however, once a suspicious lesion is detected by any modality, the AI technology can be activated in conjunction with BLI to optically diagnose a lesion as either "neoplastic" or "hyperplastic", based on training sets of expert classified CRN, further increasing the utility of AI technology. Our survey of IBD specialists showed that the majority would be willing to adopt CADe as a preferred adjunct over chromoendoscopy, particularly if it demonstrates even modest improvements in CRN detection rates compared to chromoendoscopy or HD-WLE [20].

Adopting readily available imaging modalities that do not require training and have few drawbacks would be a clinical- and cost-effective approach to bridge the gap in colonoscopy quality offered to patients with IBD. Although CADe and LCI have not been formally trained or evaluated in the IBD population, given the morphologic and histologic similarities of most CRN in people with and without IBD, we hypothesize that current generation AI and LCI would permit overall CRN detection at least as effectively as traditional chromoendoscopy techniques in individuals with IBD, and would be better accepted by endoscopists. We propose a pragmatic randomized controlled trial (RCT) to compare the effectiveness and acceptance of these newer strategies to traditional chromoendoscopy (CE) for CRN detection in individuals with IBD, to establish the utility of these latest modalities for clinical practice, and to bridge the gap in quality of care. This would be the first RCT to study the utility of these modalities in individuals with IBD and the results of the trial could be practice-changing and set the stage for the future evolution of AI-guided colonoscopy in IBD care.

Rationale

We hypothesize that AI-enhanced LCI will permit CRN detection at least as effectively as traditional CE techniques in patients with IBD and would be better accepted by endoscopists. This will be the first study to test the utility of AI against CE for CRN detection in IBD and could establish an alternative standard for CRN surveillance that is more practical for endoscopists and soon to be widely accessible to all endoscopy units, if non-inferiority of the intervention is demonstrated. We have elected to use pVCE or pDCE as the reference standard in this study as these are acceptable techniques for CRN surveillance in IBD and rapidly becoming the standard technique for most endoscopists who routinely practice CE, including all investigators involved in this trial.

Objectives

Primary objective

To conduct a pragmatic non-inferiority RCT that compares Fujinon's CADe (CAD EYE), in conjunction with LCI, to pancolonic CE, either BLI/BLI-bright or DCE, at the discretion of investigators, with respect to CRN detection and endoscopist acceptance, in individuals with IBD undergoing scheduled surveillance colonoscopy.

Secondary objectives

To compare the:

1. Endoscopic/histologic information (size, location, Paris classification, histologic type, histologic grade of each high-risk visible lesion and proportion of individuals with one or more high-risk visible CRN lesion, defined as advanced CRN (either high-grade dysplasia (HGD) or CRC by pathology).
2. Proportion of individuals with one or more visible CRN lesion, defined as any visible lesion characterized by histology as harboring adenomatous, serrated lesions with dysplasia, dysplastic, or cancerous changes.
3. Proportion of individuals with >1 CRN.
4. Proportion of all resected visible lesions that are CRN.
5. The mean and median procedural and withdrawal times.
6. SAE rates.

7. Endoscopist ratings for ease of application and acceptance of each modality for clinical practice (Appendix I).

CADe systems have primarily been validated in non-IBD populations with normal background mucosa, whereas IBD mucosa is often characterized by scarring, chronic inflammation, and flat lesions, which may attenuate detection performance. In addition, imaging modality may influence CADe performance. To reduce within-trial heterogeneity, withdrawal in the CADe intervention arm will be standardized to LCI as the primary imaging modality for lesion detection, while high-definition white-light imaging may be used during insertion at the discretion of the endoscopist. The comparator arm will continue to use standard high-definition imaging with platform-appropriate enhanced imaging modalities as per routine practice. This standardization aims to improve internal consistency of CADe performance assessment across procedures while maintaining pragmatic applicability across different endoscopy platforms.

The trial is designed to assess whether this incremental enhancement in detection of raised and subtle lesions, combined with improved visual interrogation of inflamed mucosa during withdrawal, provides diagnostic performance comparable to existing enhanced imaging strategies. To reflect pragmatic practice, CADe will be used across commonly available high-definition imaging platforms within each arm.

This study is not intended to evaluate platform-specific performance differences or future iterations of CADe systems. Any advances in algorithm training specific to IBD are expected to further improve performance and may justify future comparative studies against established enhanced imaging modalities.

Methods

Study design

The VISION-AI Trial is a multicenter, parallel-group, open-label, non-inferiority, pragmatic RCT. All centers will have access to CADe technology in conjunction with LCI. For study feasibility and to maintain methodological consistency, only colonoscopies performed using the Fujinon platform will be allowed in the study. This decision is based on the fact that AI models have been developed using different training datasets, and each VCE system possesses distinct properties. This study aims to enroll approximately 752 participants in Canada, who are randomised to either CADe in conjunction with LCI, or to CE (pVCE or pDCE) in a 1:1 ratio, stratified by study investigator and participant CRN risk (high-risk only).

High-risk individuals will be defined as those with primary sclerosing cholangitis (PSC), having ≥ 1 first-degree relative with CRC diagnosed before age 50, prior HGD or CRC, prior complex neoplastic lesion (≥ 2 cm CRN, laterally spreading tumor, highly irregular morphology or locally recurrent CRN), prior multifocal or recurrent invisible neoplasia (identified through non-targeted biopsies), or dense post-inflammatory polyposis (1 or more areas of carpeting pseudopolyps that obscure the view of the underlying flat mucosa), as per recent guidelines [12]. Randomization will be performed by the study investigator, prior to colonoscope insertion, following confirmation of conditions favoring a high-quality exam with optimized viewing conditions to detect CRN, as recommended by recent guidelines [12]. This includes intubation of the entire colorectum, presence of good to excellent bowel preparation following intraprocedural cleansing (Boston Bowel Preparation Score (BBPS) of 2 or more in each segment), and absence of significant macroscopic inflammation (< 1/3 of colorectum demonstrating no more than mild inflammation, with no large (> 5 mm) ulcers, spontaneous bleeding or moderate to severe friability. This protocol has been developed in accordance with the SPIRIT 2025 guidelines for randomized trial protocols [23].

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

Study population

The inclusion – and exclusion criteria are described in Table 1.

Sample size calculation

The anticipated CRN rate is 15% in each group. The selection of a 15% rate is supported by the 13% CRN detection rate reported after the HELIOS trial and the 13.6% rate from the SCENIC meta-analysis using DCE. Additionally, ongoing improvements in detection associated with higher resolution endoscopes and the expertise of study investigators in IBD surveillance further reinforce the rationale for this benchmark [24, 25]. We will assess non-inferiority (NI) of the intervention (CADe) compared to the current standard of care (CE) for CRN detection using a 7.5% NI-margin, corresponding to roughly 1 missed CRN case per 13–14 participants. NI will be established if the lower boundary of the one-sided 97.5% CI (equivalent to the lower boundary of a two-sided 95% CI) for the difference in CRN detection rates between groups is greater than −7.5% points. Importantly, the two-sided 95% confidence interval will also allow for the detection of superiority of CADe if present. As recommended for NI trials, the primary analysis will be per-protocol, with each group analyzed according to

Table 1 Inclusion and exclusion criteria

	Adults (≥ 18 years of age) with:
Inclusion criteria	o A diagnosis of colorectal IBD of ≥ 8 years duration (or any duration if concomitant primary sclerosing cholangitis); o Historically active disease involving ≥ 1/3 of the colorectum; o In clinical remission, defined as no history of rectal bleeding or significant lower GI or systemic symptoms concerning for disease flare in the past 3 months, at the discretion of the investigator (suggested symptom criteria - partial Mayo score < = 2 for UC (rectal bleeding score = 0) or Harvey Bradshaw Index < 5) for Crohn's disease. o In biochemical remission, defined as normal C-Reactive Protein or Fecal calprotectin < 250 mcg/g o Deemed suitable for surveillance colonoscopy by the investigator o Signed informed consent
Exclusion criteria	o Pregnant females o > 50% of the colon resected

the assigned primary screening modality. An intention-to-treat analysis will be conducted as a secondary analysis, wherein individuals will be analyzed according to their allocation group, irrespective of the specific interventions performed or missing data, to preserve the comparability afforded by randomization.

Sample size

The minimum sample size required for our study, assuming 80% statistical power to conclude NI if it exists, is 714 participants, or 357 participants per arm. Accounting for a 5% rate of major protocol violations, we will aim to recruit 752 participants to achieve adequate sample size for the per protocol analysis. As group assignment and outcome assessment occur during a single procedure, no drop-outs or loss to follow-up are expected.

Study interventions

All study procedures will be performed by experienced gastroenterologists with expertise in colonic IBD surveillance (including ≥ 30 exams with either adjunct). High-definition endoscopes and monitors will used for all procedures. The selection of bowel preparation regimens, sedation methods, and application of non-targeted biopsies will be based on the endoscopists' discretion. Intra-procedural cleansing will be mandated during intubation of the colonoscope to provide optimal viewing during withdrawal in the two arms.

The decision whether systematic non-targeted biopsies (4 biopsies every 10 centimeters) will be taken during withdrawal will be specified prior to randomization at the discretion of the endoscopist, to ensure balance in the two study arms. The biopsy strategy will be documented in REDCap and included as a covariate in the adjusted analysis.

The biopsy strategy will be documented in REDCap and included as a covariate in the adjusted analysis. CRN identified through non-targeted biopsies (i.e., biopsies of endoscopically non-visible lesions) will be recorded separately and reported as a secondary outcome, stratified by study arm. A sensitivity analysis excluding CRN detected solely by non-targeted biopsy will be conducted to isolate the effect of the primary detection modality.

The protocol for obtaining two biopsy samples within 2 centimeters of any suspicious lesion to assess histologic inflammation in that localized area and improve diagnostic accuracy will also be specified.

The primary intervention will be CADe in conjunction with LCI, applied throughout colonoscope withdrawal, with targeted sampling (targeted biopsies or endoscopic resection) of visible lesions, with or without extensive [26–34] non-targeted biopsies (specified prior to randomization at the discretion of the endoscopists). Focal application of VCE will be allowed for characterization of visible lesions, as per routine practice. The comparator will be CE (pDCE or pVCE) without CADe, which is applied throughout colonoscope withdrawal, with targeted sampling and optional pre-specified extensive [26–34] non-targeted biopsies. When randomized to the CE arm, the use of pVCE is preferred to enhance mucosal visualization; however, its use is not mandatory within the protocol, and pDCE may also be employed as an alternative.

When CADe alerts an area that appears normal to the endoscopist, biopsy is performed at the endoscopist's discretion. All CRN lesions will be logged with the detection method (CADe alert, visual detection, or non-targeted biopsy). Post-trial analyses will calculate the CADe false-positive rate (CADe alerts without histologic confirmation of CRN) as an exploratory outcome.

CADe alerts will be used as a visual aid to prompt closer inspection of the mucosa, at the discretion of the endoscopist. Lesions selected for biopsy or resection will be determined solely by endoscopic assessment and standard clinical judgement; CADe output alone will not mandate biopsy of endoscopically normal-appearing mucosa.

All CRN lesions identified during the procedure will be recorded, including whether they were targeted for biopsy or resection. The total number of biopsies and resections, as well as the proportion demonstrating histologically confirmed CRN, will be compared between study arms to assess differences in sampling efficiency

Table 2 Study outcomes

Primary outcome	o Visible CRN detected at colonoscopy
Secondary outcomes	o The mean number of high-risk visible CRN per person o The proportion of individuals with high-risk visible CRN o The proportion of individuals with more than 1 CRN o The proportion of all resected visible lesions that are CRN o Median procedural time o Serious adverse event rates o Endoscopist ratings for ease of application and acceptance of each modality for clinical practice (Appendix 1)

and diagnostic yield. No systematic recording of individual CADe alerts will be performed.

Study outcomes

The definitions of the primary outcome and the secondary outcomes are described in Table 2.

Study procedures and communications

Pre-screening

Patients eligible for a surveillance colonoscopy per standard of care will be recruited from outpatient clinics. Treating physicians will assess interest, and potential candidates will receive study information with their colonoscopy paperwork. After time to review, a coordinator will explain the study via telephone before obtaining consent. Participants will be informed that their participation is voluntary and that they may withdraw consent at any time during the study without penalty. They will also be made aware that upon withdrawal, they can request the removal of their data and biological materials from the study. View Fig. 1 for study overview.

Procedure

Experienced physicians (≥ 30 colonoscopy procedures) will perform colonoscopies. All investigators are IBD specialists with extensive experience in IBD surveillance protocols. Investigators must have performed at least 30 CE procedures as a minimum eligibility criterion and be credentialed at their institution. Endoscopist experience level (e.g., years in practice, number of IBD procedures annually) will be captured as a covariate and included in the mixed-effects model with random intercepts for endoscopist and center. All participating endoscopists will be CADe-experienced.

Aggressive bowel cleaning using waterjet during intubation will facilitate inspection during withdrawal. WLE will be used during intubation with documented cecum/ileum intubation. During withdrawal, Group A will use LCI with CADe (periodically switched off to reduce noise, such as in areas of dense post-inflammatory polyposis) and may use DCE/VCE focally for lesion characterization; Group B will use VCE or DCE with focal CADe and occasional switching to LCI or between pDCE/pVCE to aid visibility. Pre-specified surveillance or staging biopsies are allowed. All deviations, including instances where the allocated technique is turned off, must be documented with corresponding images or video capture. As this approach reflects real-world clinical practice, any potential bias introduced would likely be toward the null rather than in favor of the intervention. Procedures will qualify for inclusion in the per-protocol analysis if the allocated technique is used for at least 80% of the mucosal inspection during withdrawal. Withdrawal time is measured from the moment the colonoscope tip reaches the cecum (or maximal insertion point if cecal intubation is not achieved) until the colonoscope is completely withdrawn. Therapeutic time (e.g., polypectomy, biopsy, bleeding control, tattooing) is not included. Endoscopists record both withdrawal time and total procedural time in the endoscopy report.

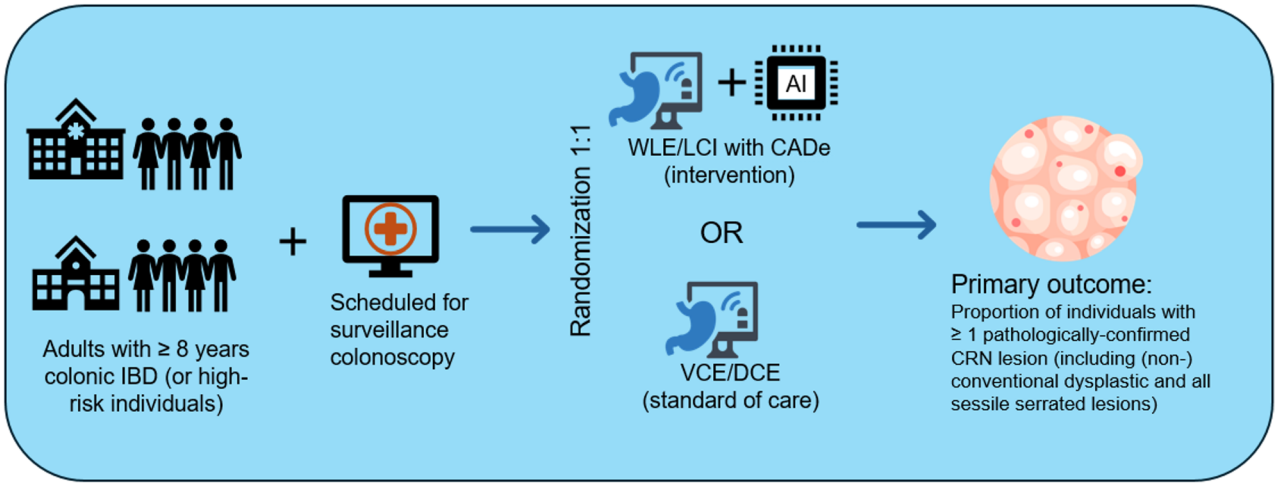


Fig. 1 Study overview

Polypectomy decisions will be protocolized across study arms based on clinician judgment supported by both BLI and AI interpretation to ensure procedural consistency and minimize inter-operator variability.

Pragmatic design and modality flexibility

This trial was designed to reflect real-world IBD surveillance practice. Flexibility in imaging modality will be permitted in the comparator arm, allowing either DCE or VCE, consistent with contemporary expert guidance. In the intervention arm, LCI will be mandated as the image-enhancing modality , given that all participating sites have access to Fujinon systems.

Transient focal switching from CE to white light will be permitted at the endoscopist's discretion to facilitate inspection of the underlying mucosa in areas that are not easily amenable to CE, such as areas of suboptimal bowel preparation or inflamed mucosa, in which visibility with CE would generally be quite poor. In practice, endoscopists would typically do this reflexively. Rather than attenuating differences in CRN detection between groups, this approach could increase differences between the groups by permitting better visibility overall in the CE arm, thus increasing stringency in a per protocol NI analysis while also improving generalizability to clinical practice. Importantly, CADe will not be permitted at any time in the CE arm, nor will CE be permitted at any time in theLCI arm, for the purposes of CRN detection. Focal application of VCE or DCE will be allowed in the intervention arm for assistance with classification of visible lesions identified using white light imaging and/or CADe as neoplastic or non-neoplastic, to aid in decision-making regarding suitability of lesion resection. This is often performed by experienced endoscopists in clinical practice and would be in keeping with standard of care. Focal application of Computer-Aided Diagnosis (CADx) will be performed on visible lesions identified in the intervention arm as part of an exploratory analysis to assess the characterization accuracy of early generation CADx as compared to clinician judgement and histopathology interpretation. These modalities will be promptly turned off in their respective arms following lesion interpretation.

Recording of modality use and sensitivity analyses

Detailed procedural data will be collected, including primary modality and duration of use. Whether switching occurred will be recorded as a binary indicator (yes/no), but detailed switching patterns will not be captured in detail. This allows a crude estimation of actual modality exposure. In addition to the primary intention-to-treat analysis, a pre-specified per-protocol analysis will be conducted to assess the robustness of findings with respect to adherence to the allocated modality. The per-protocol population is defined as use of the allocated modality for at least 80% of withdrawal time. This threshold was chosen to balance adherence with feasibility in a pragmatic setting, where strict modality use throughout the entire withdrawal period is often impractical. In the first 19 patients included so far, allocated modality use has consistently been >90%, supporting feasibility of this threshold. An as-treated analysis is not planned as a primary sensitivity approach, as it deviates from the randomization scheme and may introduce bias.

Allocation concealment

While investigators and participants cannot be blinded to the intervention, concealment of participant allocation will be achieved through permuted block randomization, with varying block sizes.

Procedure timing and modality use

Procedure timing will be recorded using three standardized time points: (1) time of colonoscope insertion (2), time at initiation of withdrawal from the cecum (or maximal insertion point if cecal intubation is not achieved), and (3) time of colonoscope withdrawal completion. Withdrawal time is defined as the interval between initiation of withdrawal and colonoscope withdrawal completion. Total procedure time is defined as the interval between colonoscope insertion and colonoscope withdrawal completion. Therapeutic interventions performed during the procedure will not be timed separately. Endoscopists will record time points in the endoscopy report.

The assigned modality must be used as the primary detection method throughout mucosal inspection. Crop-by-modality timestamps are not routinely captured; instead, the per-protocol definition requires that ≥80% of mucosal inspection time uses the allocated modality. This is assessed based on the endoscopist's documented procedure notes and confirmed by the colonoscopy report.

Routine switching between modalities for lesion detection is not permitted and will be considered a protocol deviation. Temporary adjustments are allowed only when necessary to optimize visualization, such as in the presence of stool, bleeding, or dense post-inflammatory polyposis. The assigned modality must be resumed as soon as feasible.

The impact of CADe will be evaluated through comparisons of overall CRN detection rates between study groups. Individual CADe-generated alerts and false-positive detections will not be systematically recorded, as attribution of lesion detection to the endoscopist versus the CADe system is not reliably ascertainable in routine clinical practice.

Any Fujinon CADe software updates occurring during the study period will be documented, including the timing of implementation and software version. The study will evaluate the effectiveness of commercially available CADe technology as used in routine clinical practice. As advances in CADe software are expected to maintain or improve detection performance, no formal analyses stratified by software version are planned.

Detection of colorectal neoplasia lesions

All suspected CRN lesions will be classified according to the Paris and/or Kudo pit pattern classifications, counted, and documented with location and characteristics. Lesion removal and biopsies will follow standard of care, with procedural times recorded. CRN lesions are digitally recorded and study arm allocation will be documented. After the procedure, patients receive standard of care, with an assessment of patient-related outcomes 30–60 min after colonoscopy.

CADe detections are logged through the lesion log in REDCap, including ID, segment, size, Paris classification, Kudo type, and action (biopsy or polypectomy). While the trial does not mandate real-time audit of false positives, the lesion log allows post-trial adjudication of CADe detection accuracy and false-positive rate.

Central pathology review

Upon receipt of pathology results indicating any CRN (conventional adenoma, sessile serrated adenoma, indefinite dysplasia, low-grade or high-grade dysplasia, or CRC), the complete slide set is obtained from the local pathology department. This includes all tissue blocks, levels, and immunostains if performed. Histopathologic assessment will follow routine clinical practice. A single central expert gastrointestinal pathologist will perform final study-related adjudication using de-identified slide sets, with final diagnosis based on central review. The adjudication process will be documented, and the final consensus diagnosis will be used for the primary outcome.

Safety reporting

It is important to consider the potential risks associated with the intervention in this trial. First, there is the risk of missed clinically relevant CRN, which could lead to delayed diagnosis and treatment, adversely affecting patient outcomes. Although AI has been shown to reduce miss rates, this remains a critical safety concern that requires vigilant monitoring. Second, the use of AI may lead to over-detection of lesions, resulting in longer procedure times and the resection of additional polyps that may not be clinically significant. This over-detection could increase patient exposure to procedural risks and healthcare costs. Both under- and over-detection scenarios will be closely monitored and reported as part of safety surveillance in the trial. In addition, adverse events (AEs) and serious adverse events (SAEs) are registered during follow-up, and all SAEs are reported to the Health Research Ethics Board (HREB) at the University of Alberta.

SAEs relevant to the intervention will be predefined to capture procedure-related harms attributable to over-detection and overtreatment. These will include unnecessary polypectomies (defined retrospectively based on histopathology findings of non-neoplastic lesions such as hyperplastic polyps) and post-procedural complications, including bleeding or perforation. Emergency department visits, unplanned admissions, or additional clinical encounters occurring within two weeks of the index procedure will also be classified as SAEs.

Follow-up duration

All outcomes relating to CRN will be assessed at the time of index colonoscopy. Each participant will be followed for a total duration of 14 days post-procedure for safety monitoring. Follow-up assessments include an immediate post-procedure evaluation and a structured safety follow-up conducted at or after 14 days, during which AEs, emergency department visits, and hospital readmissions are assessed and documented. All AEs will be followed until resolution or stabilization and may involve additional clinical evaluation, investigations, or specialist referral as required. SAEs and protocol deviations will be reported to the lead site within 24 hours, with detailed documentation completed in the electronic case report form.

Study timeline

This pragmatic, multicenter RCT is planned over approximately 2–3 years, including recruitment, follow-up, and data analysis. Recruitment began in April 2026, and as of June 2026, 19 of the target 752 participants have been enrolled. The study includes an internal pilot phase of 188 participants, which is anticipated to be completed within the first 6–12 months, depending on site activation and recruitment rates. Following completion of the pilot phase, the remaining 564 participants will be recruited over an additional 1–2 years. Based on prior experience from the CIRC-supported IBD-Dysplasia RCT [35, 36] and accounting for fewer participating endoscopists but fewer operational restrictions, recruitment rates are expected to accelerate as additional sites become fully active.

Each participant will undergo a single study colonoscopy with a 14-day follow-up period for safety assessment, allowing for rapid completion of individual participant involvement. Data cleaning, analysis, and manuscript preparation are anticipated to take approximately 6–12 months following completion of recruitment and follow-up. Overall, the total study duration from initiation to primary publication is expected to take no longer than 4 years.

Monitoring and quality assurance

Data safety monitory board

An independent Data Safety Monitoring Board (DSMB) will provide oversight of participant safety, trial feasibility, and overall study conduct throughout the VISION-AI trial. The DSMB will function in an advisory capacity to the principal

investigators and will consist of three independent members with expertise in gastroenterology/endoscopy, clinical trials methodology/biostatistics, and patient safety. All members will be independent of the study investigators and participating sites and will have no competing financial or intellectual conflicts of interest.

The DSMB will meet at three key time points: after completion of the internal pilot phase, at the approximate midpoint of recruitment, and after full recruitment has been completed. At these meetings, the DSMB will review study feasibility, safety, and overall trial conduct and may provide recommendations regarding continuation or modification of the study if needed.

Following each review, the DSMB will provide written recommendations to the primary investigators. Recommendations may include continuation of the trial without modification, continuation with protocol amendments, temporary suspension pending further review, or termination of the trial. Final decisions will remain the responsibility of the Principal Investigators and relevant Research Ethics Boards.

Planned primary data analysis

Continuous data on demographic and baseline characteristics will be presented as means with standard deviations for normally distributed variables and compared between groups using the *t*-test. For variables not normally distributed, medians with interquartile ranges will be reported, and comparisons will be made using the Mann-Whitney U test. Categorical variables will be summarized as proportions (percentages) and compared using the $\chi 2$ test or Fisher's exact test, as appropriate. A two-tailed p-value of less than 0.05 will be considered statistically significant. Statistical analyses will be conducted using SPSS (IBM Corp., Armonk, NY, USA) version 25 and/or *R* statistical software (R Foundation for Statistical Computing, Vienna, Austria).

The primary outcome will be visible CRN detected at colonoscopy. NI will be assessed using the risk difference (CADe minus control) with a one-sided 97.5% confidence interval (equivalent to the lower bound of a two-sided 95% confidence interval). NI will be declared if the lower bound exceeds – 7.5% points. A two-sided 95% confidence interval will also be reported to allow assessment of potential superiority. Confidence intervals will be calculated using the Wald method under a normal approximation.

The 7.5% NI margin was selected a priori as a clinically acceptable threshold intended to preserve at least 50% of the established benefit of standard colonoscopy surveillance. This margin represents a midpoint between previously used thresholds in related trials, including 10% in the HELIOS study [24] and 5% in the IBD-Dysplasia RCT [35] and is therefore considered a balanced and defensible compromise. This corresponds to approximately one additional missed CRN case per 13–14 individuals. Although this may appear numerically large, it is consistent with margins used in comparable NI surveillance studies and remains within accepted methodological guidance for preserving clinically meaningful treatment effects [20].

The primary analysis will be conducted on the per-protocol population, defined as all randomized participants who complete a high-quality examination with cecal intubation and adequate mucosal inspection, analyzed according to assigned group. Individuals with incomplete procedures or inadequate colonic examination will be excluded from the primary analysis. A secondary intention-to-treat analysis will include all randomized participants according to allocation; missing primary outcome data will be treated as no CRN detected in the primary intention-to-treat analysis, with sensitivity analyses using alternative assumptions.

To account for potential clustering by endoscopist and center, mixed-effects logistic regression models with random intercepts for endoscopist and study center will be used. This approach accounts for potential intra-operator and intra-center correlation in detection rates, which may otherwise lead to underestimation of standard errors in multicenter endoscopic trials. Prespecified fixed effects will include stratification variables and key clinical covariates.

Sensitivity analyses will include exclusion of sessile serrated lesions without dysplasia, which may represent sporadic rather than IBD-related CRN.

Secondary and exploratory analyses will include comparison of lesion yield across study arms and contextual comparison with historical HD-WLE-based surveillance cohorts. These analyses will be descriptive and hypothesis-generating.

Secondary and exploratory analyses

At the end of the trial, we will compare the mean number of visible CRN lesions detected per individual in each study arm (CADe and CE) to the CRN detection rate reported in the IBD-Dysplasia trial [35, 37], which utilized HD-WLE as the surveillance modality. This comparison will be conducted as an exploratory cohort analysis to contextualize the performance of the interventions in the current trial relative to historical standards of care. The analysis will involve descriptive and inferential statistics to assess whether either intervention demonstrates a clinically meaningful improvement over historical HD-WLE-based surveillance. The results will provide additional context for interpreting the efficacy of CADe and CE in CRN detection among patients with IBD.

CRN identified through non-targeted biopsies (i.e., biopsies of endoscopically non-visible lesions) will be recorded separately and reported as a secondary outcome, stratified by study arm. Each histologically confirmed neoplastic finding from a non-targeted biopsy will be counted as an individual event. In contrast, multiple biopsies obtained from a single endoscopically visible

lesion will be considered collectively as a single CRN lesion for outcome determination.

Cost-effectiveness and budget impact analysis

To evaluate the economic implications of the intervention, a cost-effectiveness and budget-impact analysis will be conducted. To this end, resource utilization data will be systematically collected, including total procedure time, the number of biopsies obtained, and the use of endoscopic equipment such as snare devices. These data will enable estimation of procedural costs and assessment of the overall budgetary impact within participating centers.

Risks and benefits assessment

Participating subjects will not be exposed to additional risk beyond the standard of care for colonoscopies in general. Risks of diagnostic colonoscopy as standard of care are considered low: significant bleeding in 0.005% and perforation in 0.01% of subjects [37]. The risks related to polypectomy are low and are considered usual care and not influenced by the study protocol. The risk of multiple biopsies (in part usual care) is considered extremely low (0.008% to 0.03% [38]. For comparison, the older guidelines (before 2015) recommended at least 30 random biopsies with every surveillance colonoscopy in regular care. There are no expected additional benefits for patients as CADe is predicted to perform non-inferior compared to the standard of care.

Protocol amendments

Any modifications to the protocol will be communicated directly and promptly to all sub-investigators and local research staff to ensure timely implementation and compliance.

Discussion

AI is rapidly emerging and has already been integrated into colonoscopy procedures to enhance lesion detection and diagnostic accuracy. However, current AI technologies have yet to be specifically trained for CRN detection in IBD colons. A large single-center study demonstrated that AI, trained on non-IBD colons, has only a 50% sensitivity for CRN in IBD, which could improve to over 95% with targeted IBD training, alongside high specificity [39]. Most prospective trials have excluded patients with IBD due to their unique mucosal characteristics and limited AI training data [40]. For AI to be clinically impactful in IBD surveillance, it must be trained specifically on IBD colonoscopy images and rigorously tested in a NI RCT against the current standard adjuncts, (pDCE/pVCE), a comparison not yet performed. Most IBD specialists surveyed are willing to adopt CADe over CE, especially if it shows even modest improvements in CRN detection [20].

The sample size and 7.5% NI margin were selected to ensure that at least 50% of the established protective effect of the standard of care would be preserved, a threshold deemed clinically acceptable by the study investigators. The chosen margin corresponds to an upper limit of 1 in 13–14 missed CRN cases using CADe rather than pVCE or pDCE. Previously, we used a 10% NI margin in the HELIOS trial [24] and found that it was more permissive by our group of investigators.

Including colons with numerous pseudopolyps (or even "carpeting pseudopolyposis") was deemed important because pseudopolyps are common in this population and reflect prior severe inflammation. Although pseudopolyps may obscure mucosal visualization, patients with pseudopolyps do not have a clearly increased independent CRN risk [41]. Their inclusion ensures the trial reflects real-world clinical scenarios, allowing assessment of detection methods in challenging but relevant conditions where surveillance remains necessary. In addition, the trial criteria allow for periodically turning of CADe in areas of dense post-inflammatory polyposis, to reduce the noise.

We chose Fujinon for its high-quality imaging technology and reliable performance. Additionally, Fujinon equipment is available at both the University of Alberta Hospital, The Ottawa Hospital, and all other participating centers, allowing us to use consistent software across sites, which reduces variability and enhances the generalizability of our trial results. Should Fujinon CADe software updates occur during the course of the trial, the research team will assess the impact of any changes on study procedures and data integrity. Updates will be implemented only after validation to ensure consistency with the study protocol. All modifications will be documented, and any potential effects on analysis will be addressed in the final study report.

CADe systems were primarily validated in non-IBD populations with normal background mucosa, whereas IBD mucosa often shows scarring, inflammation, and flat lesions that may reduce CADe performance. The reported 50% sensitivity for AI tools in non-IBD colons suggests this limitation may attenuate the observed effect. In addition, the pragmatic design allows flexibility in imaging modalities within both study arms (CADe with LCI in the intervention arm; BLI/BLI-bright or DCE in the comparator arm). Non-uniformity across arms may also affect the replication of results in settings with different equipment or protocols. However, our investigators' expertise in IBD surveillance, use of high-resolution endoscopes, and the pragmatic design's enhancement of external validity partially offset these concerns. To mitigate these issues, we will record the primary modality used for each procedure and conduct stratified analyses by modality to assess performance differences across imaging platforms. Future CADe systems specifically trained on IBD mucosa and standardized modality protocols will be needed to fully realize AI-assisted detection in this population.

In summary, this pragmatic NI RCT will compare the promising CADe to the current recommended standard CE for CRN detection in patients with IBD scheduled for surveillance colonoscopy. This approach could increase the adoption of AI-enhanced endoscopy and improve cancer prevention strategies for individuals with IBD.

Appendix

Survey on endoscopist ratings on ease of application and acceptance of each modality for clinical practice.

At the end of the trial, each endoscopist will be ask to rank the following questions on a scale of 1 to 5:

1. On average, how helpful was it to use this adjunct (AI or CE) to aid in neoplasia detection?

    a) Not at all helpful
    b) Slightly helpful
    c) Moderately helpful
    d) Very helpful
    e) Extremely helpful

2. On average, how easy/convenient was it to apply this adjunct (AI or CE)

    a) Not at all easy/convenient
    b) Slightly easy/convenient
    c) Moderately easy/convenient
    d) Very easy/convenient
    e) Extremely easy/convenient

3. On average, how likely are you to use this adjunct (AI or CE) outside of a clinical trial setting if it demonstrates benefit for neoplasia detection?

    a) Not at all likely
    b) Slightly likely
    c) Moderately likely
    d.) Very likely
    e) Extremely likely

Abbreviations

AE	Adverse event
AI	Artificial intelligence
CADe	Computer-aided detection
CD	Crohn's disease
CE	Chromoendoscopy
CI	Confidence interval
CRN	Colorectal neoplasia
GCP	Good Clinical Practice
HDE	High-definition endoscopy
HREB	Health Research Ethics Board
LCI	Linked colour imaging
NI	Non-inferiority
PSC	Primary sclerosing cholangitis
pVCE	Pancolonic virtual chromoendoscopy
pDCE	Pancolonic dye spray chromoendoscopy
RCT	Randomized controlled trial
SAE	Serious adverse event
UC	Ulcerative colitis

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12876-026-05046-3.

Supplementary Material 1.

Acknowledgements

Not applicable.

Clinical trial number

Australian New Zealand Clinical Trials Registry (ANZCTR) registration number: ACTRN12626000102370; date of registration: January 27, 2026.

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Authors' contributions

FH and SM designed the VISION-AI trial. LLvL, RD, NN, and RI critically reviewed the study design. LLvL will ensure daily study management. LLvL and RD drafted the manuscript and all authors read, revised, and approved the final manuscript. Principal investigators FH, MD PhD and SM, MD MSc FRCPC share senior authorship.

Funding

At the time of manuscript submission, this study has not received specific grant funding. Funding will be sought to support operating costs from multiple granting agencies over the course of the trial. In the event that grant funding is not procured, all co-investigators, including the central pathologist, have agreed to participate in kind, including recruiting patients and supporting local coordinator costs. The study PIs (S.M. and F.H.) will use discretionary research funding to support all other logistical costs (data management/REDCap, pathology slide transport, etc.). The study PIs certify that all of the necessary resources and infrastructure are available to support trial completion.

Data availability

The data generated during this study, which will support its findings, will be made available upon reasonable request to the corresponding author.

Declarations

Ethics approval and consent to participate

The study has received approval from the Health Research Ethics Board (HREB) at the University of Alberta (registration number #Pro00157570). Following this approval, the University of Calgary was added as a participating site in

the ARISE system. The study has also received approval from the Ottawa Health Science Network Research Ethics Board (OHSN-REB) at the University of Ottawa. Provisional approval has been obtained from the Hamilton Integrated Research Ethics Board (HiREB) at McMaster University. ARISE stands for Alberta Research Information Services. It is the online platform used for research ethics submissions and review in Alberta, primarily through the University of Alberta's Health Research Ethics Board and related committees. In Alberta, there is a harmonized, province-wide approach to research ethics, which allows multi-site studies to be managed efficiently across institutions. Within this framework, additional institutions (such as the University of Calgary) can be added as participating sites to an existing ethics file in ARISE, with local documents and investigators reviewed and approved under the primary ethics approval.

Consent for publication

This manuscript does not contain any data from individual persons in any form; therefore, consent for publication was not required.

Competing interests

N.N. has received honoraria for serving on advisory boards and/or the speakers bureau from Janssen, AbbVie, Takeda, Pfizer, Merck, Sandoz, Novartis, Fresinius Kabi, Amgen, Celltrion, Viatris, Innomar Strategies, Iterative Health, and Ferring. R.I. has received speaker's fees for AbbVie, Amgen, BioJAMP, Eli Lilly, Pfizer, and Takeda Pharmaceuticals, and is on the advisory board for AbbVie, Amgen, CellTrion, Eli Lilly, J&J Innovative Medicine, Pfizer, Sanofi, Takeda Pharmaceuticals. S.M. has participated in scientific advisory board meetings for Janssen, Abbvie, Takeda, Pfizer and Ferring and is a consultant for a research study by Janssen. F.H. has served on advisory boards or as speaker for AbbVie, CCRN, Janssen, MSD, Takeda, Pfizer, Celltrion, Teva, Sandoz, Amgen, and Pendopharm, and has received independent research funding from Celltrion, Janssen, AbbVie, Pfizer, and Takeda. L.L.v.L. and R.D. state that they have nothing to disclose.

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Received: 7 November 2025 / Accepted: 19 June 2026
Published online: 17 July 2026

References

1. Lutgens MW, van Oijen MG, van der Heijden GJ, Vleggaar FP, Siersema PD, Oldenburg B. Declining risk of colorectal cancer in inflammatory bowel disease: an updated meta-analysis of population-based cohort studies. Inflamm Bowel Dis. 2013;19(4):789–99.
2. Murthy SK, Tandon P, Matthews P, Ahmed F, Pugliese M, Taljaard M, et al. A Population-Based Matched Cohort Study of Digestive System Cancer Incidence and Mortality in Individuals With and Without Inflammatory Bowel Disease. Am J Gastroenterol. 2024;119(11):2275–87.
3. Lofberg R, Brostrom O, Karlen P, Ost A, Tribukait B. DNA aneuploidy in ulcerative colitis: reproducibility, topographic distribution, and relation to dysplasia. Gastroenterology. 1992;102(4 Pt 1):1149–54.
4. Lyda MH, Noffsinger A, Belli J, Fischer J, Fenoglio-Preiser CM. Multifocal neoplasia involving the colon and appendix in ulcerative colitis: pathological and molecular features. Gastroenterology. 1998;115(6):1566–73.
5. Lyda MH, Noffsinger A, Belli J, Fenoglio-Preiser CM. Microsatellite instability and K-ras mutations in patients with ulcerative colitis. Hum Pathol. 2000;31(6):665–71.
6. Rubin CE, Haggitt RC, Burmer GC, Brentnall TA, Stevens AC, Levine DS, et al. DNA aneuploidy in colonic biopsies predicts future development of dysplasia in ulcerative colitis. Gastroenterology. 1992;103(5):1611–20.
7. Soderlund S, Tribukait B, Ost A, Brostrom O, Karlen P, Lofberg R, et al. Colitis-associated DNA aneuploidy and dysplasia in Crohn's disease and risk of colorectal cancer. Inflamm Bowel Dis. 2011;17(5):1101–7.
8. Willenbucher RF, Aust DE, Chang CG, Zelman SJ, Ferrell LD, Moore DH 2, et al. Genomic instability is an early event during the progression pathway of ulcerative-colitis-related neoplasia. Am J Pathol. 1999;154(6):1825–30.
9. Rutter MD. Importance of nonpolypoid (flat and depressed) colorectal neoplasms in screening for CRC in patients with IBD. Gastrointest Endosc Clin N Am. 2014;24(3):327–35.
10. Tytgat GN, Dhir V, Gopinath N. Endoscopic appearance of dysplasia and cancer in inflammatory bowel disease. Eur J Cancer. 1995;31A(7–8):1174–7.
11. Rubio CA, Slezak P. The unique pathology of nonpolypoid colorectal neoplasia in IBD. Gastrointest Endosc Clin N Am. 2014;24(3):455–68.
12. East JE, Gordon M, Nigam GB, Sinopoulou V, Bateman AC, Din S, et al. British Society of Gastroenterology guidelines on colorectal surveillance in inflammatory bowel disease. Gut. 2025;75(3):e335023. https://doi.org/10.1136/gutjnl-2025-335023. Epub ahead of print. PMID: 40306978; PMCID: PMC13018778.
13. Murthy SK, Feuerstein JD, Nguyen GC, Velayos FS. AGA Clinical Practice Update on Endoscopic Surveillance and Management of Colorectal Dysplasia in Inflammatory Bowel Diseases: Expert Review. Gastroenterology. 2021;161(3):1043–51. e4.
14. American Society for Gastrointestinal Endoscopy Standards of, Practice C, Shergill AK, Lightdale JR, Bruining DH, Acosta RD, Chandrasekhara V, et al. The role of endoscopy in inflammatory bowel disease. Gastrointest Endosc. 2015;81(5):1101–e211.
15. Rubin DT, Ananthakrishnan AN, Siegel CA, Sauer BG, Long MD. ACG Clinical Guideline: Ulcerative Colitis in Adults. Am J Gastroenterol. 2019;114(3):384–413.
16. Magro F, Gionchetti P, Eliakim R, Ardizzone S, Armuzzi A, Barreiro-de Acosta M, et al. Third European Evidence-based Consensus on Diagnosis and Management of Ulcerative Colitis. Part 1: Definitions, Diagnosis, Extra-intestinal Manifestations, Pregnancy, Cancer Surveillance, Surgery, and Ileo-anal Pouch Disorders. J Crohns Colitis. 2017;11(6):649–70.
17. Wan J, Wang X, Yang ZP, Wu KC. Systematic review with meta-analysis: Chromoendoscopy versus white light endoscopy in detection of dysplasia in patients with inflammatory bowel disease. J Dig Dis. 2019;20(4):206–14.
18. Wan J, Zhang Q, Liang SH, Zhong J, Li JN, Ran ZH, et al. Chromoendoscopy with targeted biopsies is superior to white-light endoscopy for the long-term follow-up detection of dysplasia in ulcerative colitis patients: a multicenter randomized-controlled trial. Gastroenterol Rep (Oxf). 2021;9(1):14–21.
19. Bisschops R, East JE, Hassan C, Hazewinkel Y, Kaminski MF, Neumann H, et al. Advanced imaging for detection and differentiation of colorectal neoplasia: European Society of Gastrointestinal Endoscopy (ESGE) Guideline - Update 2019. Endoscopy. 2019;51(12):1155–79.
20. van Lierop LD, Bessissow R, Narula T, Ramsay N, Greenstreet T, Hoentjen P, Murthy F. SK. Practices and Perceptions of Advanced Endoscopic Imaging Techniques for Colorectal Neoplasia Detection in Patients with Inflammatory Bowel Disease (IBD): Report of a Survey Among Canadian IBD Specialists. iGIE. 2026.
21. Feuerstein JD, Rakowsky S, Sattler L, Yadav A, Foromera J, Grossberg L, et al. Meta-analysis of dye-based chromoendoscopy compared with standard- and high-definition white-light endoscopy in patients with inflammatory bowel disease at increased risk of colon cancer. Gastrointest Endosc. 2019;90(2):186–95. e1.
22. Sakamoto T, Cho H, Saito Y. Clinical Applications of Linked Color Imaging and Blue Laser/Light Imaging in the Screening, Diagnosis, and Treatment of Superficial Colorectal Tumors. Clin Endosc. 2021;54(4):488–93.
23. Chan AW, Boutron I, Hopewell S, Moher D, Schulz KF, Collins GS, et al. SPIRIT 2025 statement: updated guideline for protocols of randomised trials. BMJ. 2025;389:e081477.
24. Te Groen M, Wijnands AM, den Broeder N, de Jong DJ, van Dop WA, Duijvestein M, et al. Surveillance in inflammatory bowel disease: white light endoscopy with segmental re-inspection versus dye-based chromoendoscopy - a multi-arm randomised controlled trial (HELIOS). Gut. 2025;74(4):547–56.
25. Rabinowitz LG, Kumta NA, Marion JF. Beyond the SCENIC route: updates in chromoendoscopy and dysplasia screening in patients with inflammatory bowel disease. Gastrointest Endosc. 2022;95(1):30–7.
26. Force AAT, Parasa S, Berzin T, Leggett C, Gross S, Repici A, et al. Consensus statements on the current landscape of artificial intelligence applications in endoscopy, addressing roadblocks, and advancing artificial intelligence in gastroenterology. Gastrointest Endosc. 2025;101(1):2–9. e1.

27. Vinsard DG, Mori Y, Misawa M, Kudo SE, Rastogi A, Bagci U, et al. Quality assurance of computer-aided detection and diagnosis in colonoscopy. Gastrointest Endosc. 2019;90(1):55–63.
28. Gong D, Wu L, Zhang J, Mu G, Shen L, Liu J, et al. Detection of colorectal adenomas with a real-time computer-aided system (ENDOANGEL): a randomised controlled study. Lancet Gastroenterol Hepatol. 2020;5(4):352–61.
29. Repici A, Badalamenti M, Maselli R, Correale L, Radaelli F, Rondonotti E, et al. Efficacy of Real-Time Computer-Aided Detection of Colorectal Neoplasia in a Randomized Trial. Gastroenterology. 2020;159(2):512–20. e7.
30. Wallace MB, Sharma P, Bhandari P, East J, Antonelli G, Lorenzetti R, et al. Impact of Artificial Intelligence on Miss Rate of Colorectal Neoplasia. Gastroenterology. 2022;163(1):295–304. e5.
31. Desai M, Ausk K, Brannan D, Chhabra R, Chan W, Chiorean M, et al. Use of a Novel Artificial Intelligence System Leads to the Detection of Significantly Higher Number of Adenomas During Screening and Surveillance Colonoscopy: Results From a Large, Prospective, US Multicenter, Randomized Clinical Trial. Am J Gastroenterol. 2024;119(7):1383–91.
32. Guerrero Vinsard D, Fetzer JR, Agrawal U, Singh J, Damani DN, Sivasubramaniam P, et al. Development of an artificial intelligence tool for detecting colorectal lesions in inflammatory bowel disease. IGIE. 2023;2(2):91–101. e6. https://doi.org/10.1016/j.igie.2023.03.004. PMID: 41647618; PMCID: PMC12850770.
33. Abdelrahim M, Siggens K, Iwadate Y, Maeda N, Htet H, Bhandari P. New AI model for neoplasia detection and characterisation in inflammatory bowel disease. Gut. 2024;73(5):725–8.
34. Yamamoto S, Kinugasa H, Hamada K, Tomiya M, Tanimoto T, Ohto A, et al. The diagnostic ability to classify neoplasias occurring in inflammatory bowel disease by artificial intelligence and endoscopists: A pilot study. J Gastroenterol Hepatol. 2022;37(8):1610–6.
35. Murthy SK, Ahmed FK, Castelli J, Bernstein CN, Nguyen GC, Jairath V, PRAGMATIC NON-INFERIORITY RANDOMIZED CONTROLLED TRIAL COMPARING SYSTEMATIC NON-TARGETED BIOPSIES TO MUCOSAL INSPECTION ALONE FOR COLORECTAL NEOPLASIA DETECTION IN ADULTS WITH INFLAMMATORY BOWEL DISEASE UNDERGOING HIGH-DEFINITION WHITE LIGHT COLONOSCOPY. 483 A. Gastroenterology. 2026;170(6):S–885.
36. Murthy SK, Bernstein CN, Nguyen GC, Jairath V, Riddell R, Fergusson D, et al. Interim Analysis of a Trial Evaluating the Utility of Non-Targeted Biopsies for Colorectal Neoplasia Detection in Inflammatory Bowel Disease. Clin Gastroenterol Hepatol. 2024;22(7):1535–8. e2.
37. Murthy SK, Marderfeld L, Fergusson D, Ramsay T, Bernstein CN, Nguyen GC, et al. A randomized trial evaluating the utility of non-targeted biopsies for colorectal neoplasia detection in adults with inflammatory bowel disease: a pilot study protocol. Pilot Feasibility Stud. 2024;10(1):20.
38. Coward S, Benchimol EI, Bernstein CN, Avina-Zubieta A, Bitton A, Carroll MW, et al. Forecasting the Incidence and Prevalence of Inflammatory Bowel Disease: A Canadian Nationwide Analysis. Am J Gastroenterol. 2024;119(8):1563–70.
39. Vinsard DG, Fetzer JR, Agrawal U, Singh J, Damani DN, Sivasubramaniam P, Arunachalam SP, Leggett CL, Raffals LE. and Coelho-Prabhu, N. Development of an artificial intelligence tool for detecting colorectal lesions in inflammatory bowel disease. iGIE. 2023;2:91–101.
40. Nazarian S, Glover B, Ashrafian H, Darzi A, Teare J. Diagnostic Accuracy of Artificial Intelligence and Computer-Aided Diagnosis for the Detection and Characterization of Colorectal Polyps: Systematic Review and Meta-analysis. J Med Internet Res. 2021;23(7):e27370.
41. Mahmoud R, Shah SC, Ten Hove JR, Torres J, Mooiweer E, Castaneda D et al. No Association Between Pseudopolyps and Colorectal Neoplasia in Patients With Inflammatory Bowel Diseases. Gastroenterology. 2019;156(5):1333–44 e3.

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