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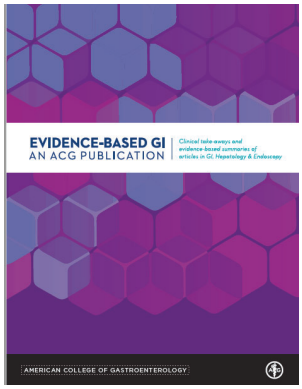

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TABLE OF CONTENTS

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Appendectomy as an Adjunct in Refractory Ulcerative Colitis: Chop It Off When Everything Else Fails!


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This article reviews WVisser E, Reijntjes MA, Heuthorst L, et al. Appendicectomy versus switching to a JAK inhibitor in inducing remission in patients with active ulcerative colitis after biologic therapy failure (COSTA): 1-year results of a multicentre, prospective, cohort study. Lancet Gastroenterol Hepatol. 2026 Mar;11(3):190-203.

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Keywords: appendectomy, JAK inhibitor, ulcerative colitis, refractory

IBD

STRUCTURED ABSTRACT

Question: In patients with moderate to severe ulcerative colitis (UC) with advanced therapy failure, does laparoscopic appendectomy as an adjunct to advanced therapy induce clinical remission more effectively than switching to a Janus kinase (JAK) inhibitor?

Design: Multicenter, patient-preference, controlled interventional cohort study.

Setting: Five hospitals in the Netherlands.

Patients: Patients ≥16 years old with moderately to severely active UC (total Mayo score [TMS] of 5-12, and endoscopic subscore of 2 or higher) despite treatment with advanced therapy. Patients were excluded if prior appendectomy, suspected Crohn's

disease, toxic megacolon, acute severe UC, or colonic dysplasia/malignancy. Patients were ineligible for appendectomy if requiring >20mg daily prednisone.

Interventions/Exposure: Patients were counseled on 3 treatment options during an outpatient visit: 1) laparoscopic appendectomy with continuation of existing advanced therapy, 2) switch from existing biologic to JAK inhibitor, 3) colectomy.

Outcomes: Primary outcome was proportion of patients at 12 months in clinical remission (TMS ≤2, with no individual subscore >1 point) without therapy failure (start or restart of oral steroids, switch to a different advanced therapy, start of clinical trial, or colectomy).

Secondary outcomes included corticosteroid-free clinical remission, clinical response (≥2-point TMS reduction and ≥30% decrease from baseline), endoscopic improvement (subscore ≤1), endoscopic response (≥1-point subscore decrease), time to symptomatic remission, therapy failure rate, and colectomy rate within 12 months. Data Analysis: Modified intention-to-treat (ITT) population. Binary outcomes between appendectomy and JAK inhibitor group compared using Fisher's exact test and Pearson chi-squared test. Time-to-first symptomatic remission analyzed by Kaplan-Maier with log rank test and Cox proportional hazards model. Missing primary outcome data treated as treatment failure.

Funding: Funded by ZonMW.

Results: A total of 125 patients were enrolled and 116 included in modified ITT analysis: 67 undergoing appendectomy and 49 with JAK inhibitor. Baseline characteristics between appendectomy and JAK inhibitor arm were overall similar, with median age 39 vs 42 years, 37% vs 53% male, median disease duration 6.6 vs 7.8 years, and 43% vs 59% pancolitis. The appendectomy arm had lower rates of baseline corticosteroid use (27% vs 45%, $P = 0.044$), and greater anti-TNF use at baseline (48% vs 27%, $P= 0.02$). The JAK inhibitor group received tofacitinib (84%), filgotinib (12%), or upadacitinib (4%). Five patients opted for colectomy, who had longer disease duration of 8.9 years, more previous exacerbations, with 80% baseline corticosteroid use.

Clinical remission without therapy failure at 12 months was achieved in 32.8% of appendectomy group compared with 12.2% of JAK inhibitor group (P = 0.01).

Clinical response at 12 months was higher in the appendectomy arm (73% vs 53%, *P*= 0.025), as were endoscopic improvement (55% vs 33%, *P*= 0.016), and endoscopic response (48% vs 26%, *P*= 0.018) at 12 months.

Therapy failure rates were similar between groups (58% vs 57%, *P*= 0.91), as were 12-month colectomy rates (9% vs 8%, *P*= 1.0). Time to symptomatic remission was similar: HR 1.06 (95% CI 0.62 – 1.82, *P*= 0.82). Surgical complication rates occurred in 4% of appendectomy arm, and all were minor. Baseline corticosteroid use was an independent predictor of lower clinical remission rates (OR 0.27, 95% CI 0.08– 0.95, *P* = 0.042).

Outcome	Appendicectomy (n=67)	JAK Inhibitor (n=49)	*P* value
Primary			
Clinical remission without therapy failure at 12 months	32.8% (22/67)	12.2% (6/49)	**0.010**
Secondary			
Corticosteroid-free clinical remission without therapy failure at 12 months	32.8% (22/67)	12.2% (6/49)	**0.010**
Clinical response at 12 months	73.1% (49/67)	53.1% (26/49)	**0.025**
Endoscopic improvement at 6 months	43.5% (27/62)	17.1% (6/35)	**0.017**
Endoscopic improvement at 12 months	55.2% (37/67)	32.7% (16/49)	**0.016**
Endoscopic response at 6 months	45.0% (27/60)	21.2% (7/33)	0.067
Endoscopic response at 12 months	48.4% (31/64)	25.6% (11/43)	**0.018**
Therapy failure within 12 months	58.2% (39/67)	57.1% (28/49)	0.91
Colectomy within 12 months	9.0% (6/67)	8.2% (4/49)	1.0
Time to symptomatic remission (HR)	HR 1.06 (95% CI 0.62–1.82)	—	0.82

Table 1. Comparison of results for primary and secondary outcomes for appendectomy vs a Janus kinase (JAK) inhibitor.

COMMENTARY

Why Is This Important?

Previously thought to be a vestigial organ, the appendix is increasingly thought to serve an important role in mucosal immunity and colonic microbiome stability. It contains abundant gut-associated lymphoid tissue (GALT), including IgA producing plasma cells and CD4 T cells.[1,2] Appendectomy may modulate colonic inflammation by shifting towards a more immunoprotective state, though mechanisms are incompletely understood.

Prior evidence of appendectomy

includes a small study by Bolin and colleagues in 2009 on 30 patients with ulcerative proctitis, showing 90% with improvement and 40% with complete resolution over a median 14-month follow-up.[3] The PASSION pilot study enrolled 30 refractory patients who had been referred for colectomy, finding 30% with lasting clinical response, and long-term follow-up showing one quarter with endoscopic improvement at 8 years.[4,5] Most recently, the ACCURE trial randomized 197 patients with UC in remission to appendectomy plus standard therapy vs standard therapy alone, showing a lower 1-year relapse rate (36% vs 56%).[1] In contrast to ACCURE, the COSTA study involved patients with active disease and higher advanced therapy exposure rates. Together, they suggest that appendectomy may be considered as a potential adjunct to medical therapy in select patients with ulcerative colitis.

Key Study Findings

Appendectomy as an adjunct to ongoing advanced therapy achieved clinical remission without therapy failure in 33% of patients at 12 months, compared with 12% with JAK inhibitor therapy alone in patients with moderately to severely active UC.

All secondary efficacy endpoints favored appendectomy, including clinical response (73% vs 53%), endoscopic improvement (55% vs 33%), and endoscopic response (48% vs 26%) at 12 months. Despite higher remission rates, therapy failure and colectomy rates (8-9%) remained similar between groups at 12 months. Appendectomy was safe with a surgical complication rate of 4% (all minor).

Caution

The major limitations are the non-randomized (patient-preference) design, and small sample size. The predominant use of tofacitinib in the JAK inhibitor arm is another limitation, as the preferred induction agent in the United States is now upadacitinib (only used in 2 patients in this study). The difference in clinical remission rates may have been attenuated with greater upadacitinib use.

My Practice

The COSTA trial adds data to an increasing body of evidence supporting the role of appendectomy as an adjunctive treatment in UC. Appendectomy is planned to be included in the upcoming ECCO UC guidelines for therapy-refractory UC (particularly for younger patients with proctitis or left-sided colitis). This may be an interesting option for patients with moderate to severe disease who wish to limit their risk of needing colectomy or who are averse to ongoing immunosuppression. However, the same patients may also be hesitant about risks of surgery with

appendectomy, even if laparoscopic and with low complication rates. Counseling patients in remission about prophylactic appendectomy, as suggested in the ACCURE trial, is challenging for similar reasons. Patients who feel well are often reluctant to pursue elective surgery, and it is difficult for us to confidently recommend this approach without larger studies.

As upadacitinib is our preferred JAK inhibitor in refractory UC across both outpatient and inpatient settings, we are particularly curious whether the remission gap observed in COSTA would persist.

For Future Research

Future research should identify predictors of response from appendectomy, including histologic and endoscopic features such as the presence of a cecal patch, to help guide patient selection. Studies should also compare against more effective therapies like upadacitinib or combination advanced therapy which is increasingly being used in our practice. Ultimately, larger trials with longer follow-up are needed for us to move appendectomy from an intriguing adjunctive option to something we can recommend with confidence.

Conflict of Interest

Drs. Chaudhary and Al Kazzi report no potential conflicts of interest related to this study.

Note

The authors of this study are active on social media. Tag them to discuss their work and this EBGI summary.
@Vasantham_A

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EVIDENCE-BASED GI
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HEPATOLOGY

From Confusion to Clarity: A Practical Guide to Hepatic Encephalopathy

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This summary reviews Bajaj JS, Jakab SS, Jesudian AB, Rahimi RS, Duarte-Rojo A, Chen PH, Wong RJ, Tapper EB, Tandon P. ACG Clinical Guideline: Hepatic Encephalopathy. Am J Gastroenterol. 2026;121(3):588-618.

Correspondence: Nikki Duong, MD. Associate Editor. Email: EBGI@gi.org
Keywords: hepatic encephalopathy, Guideline, cirrhosis, lactulose, rifaximin, liver transplantation

STRUCTURED ABSTRACT

Question: What is the optimal approach to diagnose, manage, and prevent hepatic encephalopathy (HE) in patients with cirrhosis?

Design: A clinical practice guideline developed under the ACG Practice Parameters Committee. The chosen expert writing group conducted a systematic literature review in PubMed, Embase, and the Cochrane Library, applying the GRADE framework to assess evidence quality and formulate recommendations based on a PICO-based approach.

Setting: Multidisciplinary guideline development intended for use across all clinical settings (outpatient clinics, community hospitals, and transplant centers) where adults with cirrhosis and HE are evaluated or managed.

Patients: Adults with cirrhosis presenting with any stage of hepatic encephalopathy, from covert (CHE/MHE) to overt (OHE) (West Haven Grades 2–4), including those

undergoing TIPS, as well as liver transplant candidates.

Definitions: ***Minimal hepatic encephalopathy*** (MHE) is the subclinical form of HE that can only be identified through specialized neuropsychological testing; it is not detectable on standard clinical examination.

Covert hepatic encephalopathy (CME) is a broader term that combines MHE with West Haven grade 1 HE, distinguishing these subclinical clinical forms from overt HE (grades 2–4). Since both MHE and grade 1 HE are clinically difficult to differentiate, MHE and CHE are generally used interchangeably in practice.

Overt hepatic encephalopathy (OHE) corresponds to West Haven grades 2–4; forms of HE that can be diagnosed on standard clinical examination without specialized neuropsychological testing.

Interventions: Key recommendations include:

- Single-test strategy preferred for CHE/MHE diagnosis; serum ammonia alone is insufficient.
- Lactulose as first-line therapy for OHE (strong recommendation); rifaximin added for recurrence prevention.
- Protein intake of 1.2–1.5 g/kg/day; branched chain amino acid (BCAA) supplementation if dietary needs unmet; late-evening snack to reduce frailty.
- Initiate rifaximin 14 days before elective transjugular intrahepatic portosystemic shunt (TIPS) and continue for ≥6 months to prevent post-TIPS HE.
- Consider living donor liver transplantation evaluation for patients with multiple HE episodes and MELD <15.

Outcomes: The primary outcomes assessed were: HE recurrence, quality of life (QoL), HE-related hospitalizations and readmissions, cognitive function, caregiver burden, mortality, and liver transplant access and outcomes.

Data Analysis: The GRADE methodology was used, rating evidence certainty as high, moderate, low, or very low based on risk of bias, heterogeneity, and directness of evidence. Many recommendations rest on low or very low certainty evidence given the paucity of high-quality randomized controlled trials (RCTs) in this population.

Strong recommendations were issued when benefits clearly outweighed harms. Key concepts not amenable to GRADE were provided as expert consensus statements.

Funding: Developed with ACG support. No external or industry funding was utilized.

Results: The guideline provides 24 formal recommendations and 29 key concepts, summarized in **Table 1**. Highlights are presented below.

Diagnosis of CHE/MHE. CHE is identified in 20-80% of patients with cirrhosis but is tested in fewer than 15% of centers. Given the low reproducibility of its clinical diagnosis, CHE should be defined by excluding OHE in the appropriate clinical context. For OHE exclusion, a single-test strategy is preferred over a 2-test combination, given that dual testing lowers sensitivity without improving predictive accuracy. Serum ammonia alone is insufficient for diagnosis. Priority populations for testing include those with hypoalbuminemia, decompensated cirrhosis, portosystemic shunts, cognitive complaints, falls, or occupational impairment. Alternative diagnoses (including obstructive sleep apnea, mild cognitive impairment, and mood disorders) should be excluded, as over 50% of referred patients with cognitive complaints do not have MHE.

Inpatient Management of OHE. The decision to admit a patient for OHE should be individualized based on key clinical domains (**Figure 1**). Clinical severity should be graded using West Haven criteria with Glasgow Coma Scale for high-grade HE. A thorough evaluation for bleeding, infection, sedating medications, and metabolic abnormalities is necessary to identify possible precipitating factors. Serum ammonia should not guide treatment; importantly, a normal ammonia level should prompt consideration of alternative diagnoses in addition to OHE. Brain imaging is not recommended routinely in cirrhosis with confusion unless new focal deficits or seizures are present. Lactulose is the cornerstone of treatment, with a target of 2-3 soft bowel movements daily; PEG 3350 is an acceptable alternative for patients who are intolerant to lactulose. Adding rifaximin to lactulose for acute OHE provides an incremental benefit. If there is marginal improvement in mental status after 48-72 hours of adequate therapy and reversal of potential precipitating factors, evaluation for alternative causes or portosystemic shunts should be considered.

Prevention of Recurrence. After a first episode of OHE, lactulose is preferred first-

subgroups. The most accurate non-invasive liver disease assessment is vibration-controlled transient elastography (VCTE). A cutoff threshold of ≥7kPa can identify patients with F2 fibrosis or higher. For individuals under 40 without significant fibrosis, treatment initiation should be based on shared decision-making. Providers should consider a family history of HCC. Close monitoring with HBV DNA and ALT testing at least every 6 months is suggested if treatment is not initiated.

HBeAg-negative Indeterminate Phase. There has been a paradigm shift from prior recommendations favoring monitoring alone to this guideline which now suggests antiviral therapy using a shared decision-making approach for HBeAg-negative adults without cirrhosis in the indeterminate phase (conditional recommendation, very low certainty). A meta-analysis demonstrated that antiviral treatment was associated with a 64% reduction in HCC incidence (adjusted incidence rate ratio 0.36, 95% CI 0.16-0.81). [2,4]

Nucleos(t)ide Analogue Discontinuation. The guideline conditionally recommends against discontinuing nucleos(t)ide analogue therapy until HBsAg loss is achieved. This recommendation reflects results from systematic reviews demonstrating modest rates of HBsAg loss (10.6% at 2 years) offset by substantial risks, including ALT flares (26.9% at 2 years), need for re-treatment (42% at 5 years).[5–10] Patients that can be considered to stop therapy should have no cirrhosis or hepatic decompensation, no HCC or extrahepatic HBV disease, no HIV or HDV coinfection, have ≥2 years of undetectable HBV DNA (after HBeAg seroconversion if initially HBeAg-positive), HBsAg <100 IU/mL, and be reliable for close monitoring.

HCC Surveillance Expansion. Following HBsAg loss, continued surveillance is suggested for patients with cirrhosis, a family history of HCC, men with loss of HBsAg after age 40, and women with loss of HBsAg after age 50. For HDV coinfection, surveillance is suggested for all adults regardless of cirrhosis status, given that the annual rates of incident HCC are 1.87% even without cirrhosis. For HIV coinfection, surveillance is suggested for men ≥18 years and women ≥40 years. For HCV coinfection, DAA therapy is recommended with subsequent surveillance following HBV mono-infection criteria.

The presented information is summarized in **Table 1**.

Domain	Recommendation	Evidence
CHE/MHE		
Diagnosis	Single-test strategy preferred over 2-test combination	Conditional, very low certainty
Ammonia	Suggest against serum ammonia alone for CHE/MHE diagnosis	Conditional, very low certainty
Treatment	Lactulose suggested over no treatment for MHE/CHE	Conditional, low certainty
Inpatient Management of OHE		
Ammonia monitoring	Routine testing not recommended to guide inpatient HE decisions	Conditional, very low certainty
Brain imaging	Not recommended if new focal neurologic deficits are not present	Conditional, very low certainty
Lactulose	Recommended for OHE treatment to improve outcomes	Strong, moderate certainty
PEG 3350	Alternative to lactulose for acute OHE	Conditional, low certainty
Rifaximin (add-on)	Adding rifaximin to lactulose in acute OHE is suggested	Conditional, low certainty
Prevention of HE Recurrence		
Lactulose	First-line outpatient prophylaxis, titrated to 2–3 soft BMs/day	Strong, high certainty
Bristol Stool Scale	Recommended for lactulose titration to reduce readmissions	Conditional, very low certainty
Rifaximin	Suggested for outpatient prophylaxis	Conditional, low certainty
Rifaximin (add-on)	Recommended for patients with OHE breakthrough on lactulose	Strong, high certainty
Zinc (add-on)	Suggested as add-on in those with documented zinc deficiency	Conditional, very low certainty
Digital tools	Health IT interventions (Patient Buddy App, e-reminders) suggested when feasible	Conditional, very low certainty
Shunt embolization	Suggested for refractory HE in patients with adequate hepatic function and no contraindications	Conditional, very low certainty
Nutrition and Sarcopenia		
Protein intake	Target 1.2–1.5 g/kg/day in outpatients with HE	Strong, moderate certainty
BCAA	Recommended if protein needs unmet by diet alone	Strong, moderate certainty
Late-evening snack	Suggested to reduce frailty and HE	Conditional, very low certainty

Table 1. Summary of guideline recommendations.

Table 1 Continued. Summary of guideline recommendations.

Domain	Recommendation	Evidence
Nutrition and Sarcopenia		
Protein restriction	Discouraged; worsens muscle breakdown without reducing HE duration	Conditional, very low certainty
Exercise	Suggested to reduce fall risk, lower portal pressure, and improve ammonia metabolism	Conditional, low certainty
TIPS and HE		
Rifaximin pre-TIPS	Initiate 14 days before elective TIPS; continue ≥6 months	Strong, moderate certainty
Collateral embolization	Suggested at time of TIPS to reduce post-TIPS HE	Conditional, low certainty
Liver Transplant and HE		
LDLT evaluation	Suggested for patients with multiple HE episodes and MELD <15	Conditional, low certainty

COMMENTARY

Why Is This Important?

In patients with cirrhosis, HE is the first decompensating event1 and a leading driver of hospital readmissions, with rates as high as 53% at 90 days.[2,3] The downstream effects are far reaching and extend beyond the patient. Caregivers report financial hardship, schedule disruption, impaired quality of life, and emotional burden.[4] HE is underdiagnosed and inconsistently managed, with fewer than 15% of centers routinely testing for covert forms. This ACG guideline is the first to consolidate diagnosis, management, recurrence prevention, nutrition, TIPS-related HE, and transplant access into a unified, GRADE-based framework.

Key Study Findings

The guideline reinforces that HE is a multiorgan disorder of the gut-brain axis and that successful management requires a "village" encompassing patients, caregivers, hepatologists, dietitians, social workers, physical therapists, and mental health professionals. Several findings are notable:

- Serum ammonia, once central to clinical decision-making, is now firmly de-emphasized. In a study of 551 HE patients, 40% had normal ammonia levels; venous ammonia does not correlate with HE severity or prognosis and should not guide treatment decisions in any setting.
- Protein restriction, still practiced in some centers, is explicitly discouraged. Adequate protein intake (1.2-1.5 g/kg/day), BCAA supplementation

when dietary goals are unmet, and late-evening snacks, are essential to counter sarcopenia and improve outcomes.

- SPSS affect 46% to 71% of patients with refractory HE and represent a remediable cause often overlooked in clinical practice. Cross-sectional imaging should be performed in all patients failing standard therapy, with embolization considered for shunts 8 mm or greater in diameter in patients with preserved hepatic function.
- Rifaximin therapy pre and post-TIPS now carries a strong recommendation, supported by a dedicated RCT showing significant reduction in post-TIPS HE when rifaximin is initiated pre-TIPS and continued for 6 months. This is an immediately actionable change for hepatologists managing TIPS candidates.
- Liver transplant prioritization for HE remains inadequate under the current MELD 3.0 system. Adding 4 to 5 MELD points more accurately reflects 90-day mortality from OHE[5]; multiple HE episodes cause cumulative, potentially irreversible cognitive deficits that may not resolve even after successful transplantation, making early evaluation essential.[6]

Caution

Most recommendations are supported by low or very low certainty evidence, reflecting the difficulty of conducting RCTs in patients with advanced liver disease. Several key concepts (including social infrastructure as the "fifth axis" of HE management and driving restrictions after OHE) are based on expert consensus only. The guideline does not fully address the management of HE in patients with acute-on-chronic liver failure (ACLF), which is covered in a separate 2022 ACG document. Additionally, access to rifaximin remains a major implementation barrier, with persistent disparities across race, ethnicity and insurance status in the United States.[7]

My Practice

HE management requires maintaining a broad differential diagnosis, recognizing the complex social determinants of health that influence patient outcomes, and communicating effectively to enable early intervention and appropriate counseling. Equally important is thoughtful resource utilization – being deliberate about what we order and why. For example, in a patient with clear OHE and no focal neurologic deficits, a head CT is not necessary.

In my practice, I do not routinely check ammonia levels in patients with known liver disease and emphasize this principle to the trainees I work with. There are two important caveats. I will consider ammonia testing in patients without established chronic liver disease who present with suspected new HE,

and in cases of ALF where ammonia has prognostic value.

In the inpatient setting, multi-disciplinary care is essential. Collaborating with families and social workers to obtain collateral information, reviewing cross-sectional imaging to identify potential shunts, and partnering with pharmacists to identify potential medication culprits to HE can be time-intensive but are high-yield interventions. Finally, early consideration of transfer to the ICU and/or transplant evaluation are paramount.

Across both the inpatient and outpatient settings, barriers to lactulose adherence are common (taste, bloating, diarrhea, distention, nausea, confusion amongst patients and providers around titration). I prioritize understanding my patient's individual circumstances, involving caregivers, and tailoring counseling accordingly. Equally important is ensuring that our trainees, nursing staff, and primary medicine teams are aligned in how HE is diagnosed, prevented and managed, as this harmonized understanding impacts patient outcomes.

For Future Research

The guideline identifies several critical knowledge gaps. High-quality RCT data are needed on: the optimal duration and de-escalation strategy for rifaximin; the impact of SPSS embolization on long-term cognitive and survival outcomes; the role of fecal microbiota transplant (currently confined to clinical trials)8; and the safety and efficacy of exercise interventions specifically designed for patients with OHE or MHE. On the systems side, prospective validation of MELD-HE composite scoring is urgently needed to inform transplant allocation policy. Finally, given documented disparities in rifaximin access, implementation science studies addressing cost, insurance coverage, and subspecialty referral equity are warranted.

Conflict of Interest

The authors do not have conflicts of interest to disclose

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EVIDENCE-BASED GI
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An Artificial Intelligence-Guided Strategy to Reduce Poor Bowel Preparation: A Multicenter Randomized Controlled Study

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This article reviews This summary reviews Gimeno-García AZ, Benítez-Zafra F, Redondo-Zaera I, et al. An artificial intelligence-guided strategy to reduce poor bowel preparation: A multicenter randomized controlled study. Am J Gastroenterol. 2026;121(4):890-898.

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Keywords: artificial intelligence, bowel prep, colonoscopy

STRUCTURED ABSTRACT

Question: Can artificial intelligence (AI) be used to reduce poor bowel preparation?

Design: Multicenter, randomized, controlled, parallel-group trial.

Setting: Four hospitals in Spain.

Patients: Inclusion criteria included those older than 18 years of age, those who had a scheduled outpatient colonoscopy, and those who agreed to participate in the intervention. Exclusion criteria included subjects who had reasons for which colonoscopy could not be performed, diagnosis of certain metabolic conditions which could make preparation challenging, those who had had a history of total or subtotal colectomy, those who would have had difficulty ingesting bowel preparations such

as those as dementia, those lacking a smartphone in order to be able to be given the intervention those who were not technologically literate, and those who refused participation.

Interventions/Exposure: Eligible subjects were randomized 1 to 1 using a computer-generated scheme at a research university in Spain. Group 1 included those individuals who would be deemed control who received standard oral and written bowel preparation instructions. Group 2 deemed the intervention received the same instructions but in addition were instructed to use a mobile phone application. Each subject was provided an individual code to access the application, or a code was provided if any participant had any difficulty. These subjects then followed the software instructions and were then told to take an image of their last rectal effluent in the toilet bowl under specific conditions. This would be deemed as adequate or inadequate for the purposes of endoscopic evaluation. If the preparation was deemed to be adequate, participants were advised to proceed with colonoscopy as previously scheduled. If the preparation was deemed to be inadequate, additional bowel preparation was recommended. Colonoscopies were performed by experienced endoscopists who were blinded to the assigned group. The Boston Bowel Preparation Scale was used to assess the quality of bowel cleansing.

Outcome: The primary outcome of this study was to assess the proportion of subjects in each arm with adequate bowel preparation as measured by the Boston Bowel Preparation Scale. According to the scheme each bowl segment is scored from zero to three points with the maximum possible score of nine and a score of two or more points per segment is considered adequate. Secondary outcomes included proportion of subjects with excellent bowel preparation, the use of mobile application among patients assigned to the intervention group, as well as satisfaction with the intervention using a questionnaire. Finally, both groups were compared via the adenoma detection rate.

Data Analysis: Associations were reported as odds ratios with typical characteristics surrounding confidence intervals. There was also a per protocol analysis of the primary outcome as well as an intention to treat analysis.

Funding: Funding for this study was provided in part from the Spanish Society of Gastrointestinal Endoscopy. The foundation was not involved in any phase of the

research.

Results: In this study, 774 participants were eligible and randomized. The intention to treat analysis demonstrated statistically significant differences in bowel cleansing quality favoring the intervention group receiving the application examining rectal effluent through AI. Namely 91% of the individuals in the intervention arm had favorable bowel cleansing quality parameters versus 84.2% in the control arm. The differences between right and left exhibited better cleaning in the intervention group as well (90.4% versus 84.8%).

Global and per segment adequate cleansing	AI group	Control	OR (95% CI)	*P* value
Intention to treat analysis	**(n=387)**	**(n=387)**		
Global BBPS scored ≥ 6, n (%)	352 (91)	326 (84.2)	1.88 (1.21-2.93)	0.005
Left BBPS scored ≥2, n (%)	369 (95.3)	354 (91.5)	1.91 (1.06-3.46)	0.03
Transverse BBPS scored ≥2, n (%)	363 (93.8)	349 (90.2)	1.65 (0.97-2.80)	0.064
Right BBPS scored ≥2, n (%)	350 (90.4)	328 (84.8)	1.70 (1.10-2.64)	0.016
Mean BBPS in the whole colon (X ± SD)	6.93±1.81	6.54±		0.003
Mean BBPS in the left colon (X ± SD)	2.37 ± 0.62	2.27 ± 0.65		0.019
Mean BBPS in the transverse colon (X ± SD)	2.39 ± 0.67	2.24 ± 0.72		0.003
Mean BBPS in the right colon (X ± SD)	2.19 ± 0.72	2.05 ± 0.73		0.011

Table 1. Comparison of adequate bowel cleansing in control vs intervention/AI group.

COMMENTARY

Why Is This Important?

This study[1] demonstrates the use of AI as a way in which to bolster clinical productivity as well as the success of a relatively invasive procedure like a colonoscopy. Bowel preparation remains one of the most challenging elements of colorectal examination through endoscopy. Many patients find the process to be unpleasant. Individuals also find out often at the last minute that they are unable to go through colonoscopy evaluation due to inadequate prep. From the perspective of clinical throughput as well as revenue generation, inability to perform a scheduled examination results in a wasted spot as well as a potential for lost income. This is due to the relatively static nature in which bowel preparation instructions are typically administered, in the form of written or verbal instructions. This study demonstrates a more dynamic process as being potentially successful and easily adoptable throughout the world. Namely, by having patients able to interact with an application at home

prior to endoscopy they can alert offices to difficulty with preparation or only present to endoscopy suites when their preparation has completed. That the Boston Bowel Preparation Scale was used makes the study easy to interpret as well as applicable in other centers2.

Key Study Findings

The randomization scheme appears to be successful in this study with no major differences between the intervention and control groups. In both the intention to treat and per protocol analysis group, there were improvements in bowel preparation in different segments as well as overall in the entire colon in the intervention AI group. As expected, given that an expert group of endoscopists were selected for the study there were no major differences in this study as it related to other colonoscopy outputs such as adenoma detection rate period.

Caution

While overall I find that the study was very well executed and has the potential to provide additional tools for bowel preparation prior to colonoscopy, I do have some reservations regarding its use in clinical practice. I am concerned about the types of groups that were excluded because these are the types of groups that tend to have difficulty with bowel preparation and thus a higher chance of having incomplete colonoscopy. Namely those with cognitive difficulties or those who have had prior surgical interventions are individuals that perhaps would be better served by identifying additional tools in which to reduce the risk of failed bowel preparation. Given the need to be technologically savvy to participate this also can worsen inequity, namely among older individuals who are not as able to navigate newer technologies, or people with reduced resources who are unable to use or access a smartphone.

Additionally, while this is outside of the scope of the study, it would seem to be difficult to implement this in a high-volume practice. For example, if an early morning case needs more bowel preparation and the rest of the morning and afternoon is fully scheduled, one could be left with the troubling situation where one takes additional purgative only to be told that there is no availability later in the day to perform the procedure. I would recommend that practices considering use of an AI or software-based approaches to determine bowel prep operation quality make sure that there is some flexibility to allow for changing of schedules the day of procedures to allow for people to be given additional bowel preparation. I would also state as a potential limitation use of this application in people who have reduced vision as well or difficulties with literacy. Additionally, a recent United States task force[3] would have the control arm fall below accepted quality standards (>90%); this may exaggerate the reported

benefit in the intervention arm.

My Practice

In my practice I could see the immediate possible benefits of such a strategy as employed in the intervention arm. Like many colleagues at my institution, I have a heavy portion of my endoscopy practice dedicated to colorectal cancer screening. I have taken care historically of two special populations who are at risk of poor bowel preparation outcomes. One population includes those individuals I care for in a community health center with limited English proficiency. An application could, when appropriately translated, allow for some of the inequity that exists related to language proficiency to be reduced by being able to give additional administrations of bowel preparation in a language concordant fashion without needing English. The second population of individuals that care for at risk of poor bowel preparation are people with cystic fibrosis given the intraluminal nature of the disease. While a priori such individuals are recommended to take more aggressive purgative at times it may not be successful, particularly in those with the history of prior surgery such as surgical correction of meconium ileus. Use of this application could potentially spare those patients with CF who may not need additional bowel preparation but are blanket recommended to take additional bowel preparation. It could allow for a more dynamic administration to reduce the burden in people with CF as well.

For Future Research

For future research, it would be valuable to see this application validated in other languages, as well as further exploration of different software use with different cell phone types. A lower technology effort should alsob be developed to improve access to such advances for those who historically have been marginalized both in research and in clinical care.

Conflict of Interest

Dr. Vélez has no relevant conflicts.

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EVIDENCE-BASED GI
AN ACG PUBLICATION

SSLDR-A Calculated Using All Examinations Performs Similarly to Screening SSLDR-S in Predicting Post-Colonoscopy CRC

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This summary reviews This article reviews Hagen R, Rex DK, MacKenzie TA, Amox CI, Butterly LF, Anderson JC. Higher sessile serrated lesion detection rates calculated using all examinations are associated with lower risk for post-colonoscopy colorectal cancer: Data from the New Hampshire Colonoscopy Registry. Clin Transl Gastroenterol. 2026; 17(4).

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Keywords: serrated polyps; colonoscopy; adenomas; surveillance

STRUCTURED ABSTRACT

Question: The goal was to examine the association between post-colonoscopy colorectal cancer (PCCRC) risk and sessile serrated lesion detection rate (SSLDR) which was calculated using exams with all indications (SSLDR-A), as compared to SSLDR restricted to data from screening exams (SSLDR-S).

Design: Retrospective analysis of data from the New Hampshire Colonoscopy Registry (NHCR) which is a prospective statewide colonoscopy registry.

Setting: Endoscopy centers across New Hampshire

Patients: The analysis included NHCR patients with an index exam and at least 1 follow-up event 6 months or longer after the colonoscopy, either a colonoscopy or a

CRC diagnosis.

Exposure: The exposure variable was endoscopist-specific SSLDR-A, calculated for all indications, divided into quintiles. The SSLDR-A was also compared to a SSLDR-S.

SSLDR-A= The proportion of all colonoscopies in patients 45 years or older with an adequate bowel preparation performed by an endoscopist regardless of indication with at least 1 SSL divided by the total number of colonoscopies in patients 45 years or older with an adequate bowel preparation performed by that endoscopist regardless of indications.

SSLDR-S= The proportion of screening colonoscopies in patients 45 years or older with an adequate bowel preparation performed by an endoscopist with at least one SSL divided by the total number of screening colonoscopies in patients 45 years or older with an adequate bowel preparation performed by that endoscopist.

Outcomes: The primary outcome, PCCRC was any CRC diagnosed ≥ 6 months after an index exam.

Data Analysis: Cox regression was used to model the hazard of PCCRC on ADR, controlling for age, sex, and other covariates.

Funding: Division of Cancer Prevention, National Cancer Institute, 5R01CA243449, Optimizing colorectal cancer prevention: a multi-disciplinary, population-based investigation of serrated polyps using risk prediction and modeling; Grant Recipient: Lynn F. Butterly, M.D. and ACG 2023 clinical research grant (Anderson).

Results: There were 177 PCCRCs diagnosed in 115,762 patients with index colonoscopies. Procedures were performed by 126 endoscopists, with at least 50 exams recorded in the NHCR. Index exams were conducted between October 2004 and December 2020. Higher SSLDR-A and SSLDR-S rates were associated with lower PCCRC risks (Table 1). After adjusting for covariates, we observed that higher SSLDR-A rates were associated with lower hazard ratios (HR) as compared to the reference group (SSLDR-A: <1.5%; HR=1.0 vs SSLDR-A: 1.5-<3.0%; HR=0.53, 95% confidence interval (CI) 0.35-0.79; SSLDR-A: 3.0-<5.0%; HR=0.59, 95% CI

0.38-0.92; SSLDR: 5.0-<8.0%; HR=0.44, 95% CI 0.28-0.70; and SSLDR:8.0+% HR=0.20, 95% CI 0.08-0.46). The highest quintile of SSLDR-A (8.0%+) (HR=0.20, 95%CI 0.08-0.46) and SSLDR-S (8.0%+)(HR=0.20, 95% CI 0.09-0.44) provided similar protection from PCCRC. The 95% CI was narrower (median= 73%; IQR:0.09) for endoscopists when calculating SSLDR-A versus SSLDR-S. In contrast, when calculating the 95% CI for SSLDR-S compared to SSLDR-A, the CI increased nearly two-fold (median=137%; IQR 0.17).

SSLDR-S					
	<1.0	1.0-<2.5	2.5-<4.5	4.5-<8.0	8.0+
N	16,710	31,986	20,105	29,141	17,820
PCCRC (N)	62	53	28	27	7
PCCRC (%)[a]	0.37	0.17	0.14	0.09	0.04
HR (95% CI)	1.0 (reference)	0.42 (0.29-0.62)	0.59 (0.37-0.94)	0.38 (0.24-0.60)	**0.20 (0.09-0.44)**
Endoscopists (N)	25	28	22	26	25
SSLDR-A					
	<1.5	1.5-<3.0	3.0-<5.0	5.0-<8.0	8.0+
N	25,972	21,172	23,421	28,768	16,429
PCCRC (N)	79	36	30	26	6
PCCRC (%)[a]	0.30	0.17	0.13	0.09	0.04
HR (95% CI)	1.0 (reference)	0.53 (0.35-0.79)	0.59 (0.38-0.92)	0.44 (0.28-0.70)	**0.20 (0.08-0.46)**
Endoscopists (N)	21	30	22	29	24

Table 1. Unadjusted risks and adjusted hazard ratios for post-colonoscopy colorectal cancer for quintiles of endoscopist SSLDR-S and SSLDR-A.

COMMENTARY

Why Is This Important?

The detection and resection of precancerous polyps is important for colonoscopy to be effective in CRC prevention. Endoscopists have been monitoring their adenoma detection rates (ADR), which have been shown to be inversely associated with post-colonoscopy colorectal cancer (PCCRC) incidence.[1, 2] Recent recommendations from the joint American College of Gastroenterology (ACG)/American Society of Gastrointestinal Endoscopy (ASGE) task force suggest that ADR can be calculated using data from all exams.[3-6] Using data from examinations using all indications (ADR-A), rather than screening exams alone (ADR-S), can be beneficial by allowing a larger sample size, which may provide a more accurate assessment of an endoscopist's overall performance. It can also mitigate potential gaming by endoscopists to manipulate their metrics.[7]

Serrated polyp detection is also crucial for CRC prevention since the serrated pathway may account for up to one-third of all CRCs and a large percentage of post-colonoscopy cancers. Serrated polyps include hyperplastic polyps (HPs), sessile serrated lesions, and traditional serrated adenomas of any size. New Hampshire Colonoscopy Registry data suggest that even if endoscopists achieve an adequate ADR, they could still have a low serrated detection rate.8-10 Therefore SSLDRs should be tracked by endoscopists. Sessile serrated lesion detection rate for screening exams (SSLDR-S) is defined as the number of screening colonoscopies with at least one SSL divided by the total number of screening colonoscopies for each endoscopist. An analysis of NHCR data suggests that a SSLDR-S of 6% may offer the most protection from PCCRC.10

As with ADR-A, a major advantage of using SSLDR-A (sessile serrated lesion detection rate using all exams) is its inclusion of all colonoscopies, regardless of the indication. This approach simplifies calculations by removing the need to distinguish between exam types, which in turn reduces endoscopist-level biases and prevents potential misclassification based on the reason for the exam. Furthermore, incorporating all colonoscopies increases the total sample size, resulting in higher statistical power, generalizability, and a noticeably narrower confidence interval as observed in this analysis, reflecting greater data precision and lower variability.

Key Study Findings

In this study, the authors observed that SSLDR-A performed similarly to that of SSLDR-S. A striking observation was that the quintiles for both metrics were similar, suggesting no difference after

including all examinations. This is in stark contrast to ADR in which ADR-A was higher than ADR-S. Both metrics observed optimal protection from PCCRC for endoscopists with SSLDRs in the highest quintile. Furthermore, the highest quintile for both metrics were an SSLDR of 8% or higher. These data suggest that an SSLDR-A of 8% be recommended as a possible new benchmark for endoscopists to achieve.

Caution

The low racial diversity in NH may decrease the generalizability of the findings. Thus, more data are needed in other more racially diverse populations.

My Practice

An important factor in optimizing serrated detection is the bowel preparation. All of my patients have a split bowel preparation.[11] When performing a colonoscopy, I make the assumption that the patient has an SSL that I should be detecting. Thus, during inspection I carefully interrogate and wash every fold, adequately distending the lumen, utilizing an adequate withdrawal time, typically of 8 minutes or longer. I also re-intubate the proximal colon as highlighted in the recent ACG/ASGE recommendations.[6, 12] In our endoscopy unit we track our ADR and SSLDRs as well as quality of bowel preparation and completion rates, ensuring that we are meeting established benchmarks.[6, 11,12] Although, current benchmark as per the recent ACG/ASGE latest recommendations on quality indicators for colonoscopy is 6%, I try to achieve an SSLDR-A of 8% or greater.

For Future Research

These data should be validated in other populations.

Conflict of Interest

Dr Anderson has no financial conflict of interest.

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