

Association of Endoscopic Healing With Clinical Outcomes in Inflammatory Bowel Disease: A Retrospective Study

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Background

- Inflammatory bowel disease (IBD), encompassing both Crohn's disease (CD) and ulcerative colitis (UC), is a progressive, relapsing-remitting condition characterized by chronic gastrointestinal inflammation, high symptomatic burden, substantial costs, and reduced quality of life.^{1,2}
- IBD treatment goals include inducing and maintaining clinical and endoscopic remission, improving quality of life, and avoiding or delaying hospitalization and surgery.²⁻⁴
- Current IBD guidelines propose endoscopic healing as a primary treatment target given its association with lower relapse rates and better clinical outcomes in both CD and UC.³⁻⁵
- However, data on the real-world impact of endoscopic healing on long-term outcomes in patients with IBD remain limited, highlighting the need for more studies examining how patient characteristics, treatment patterns, and health care outcomes differ by endoscopic healing status

Objective

- This study evaluated the association between endoscopic healing status and corticosteroid use, surgical intervention, and disease remission through 5 years in patients with IBD using electronic health record data

Methods

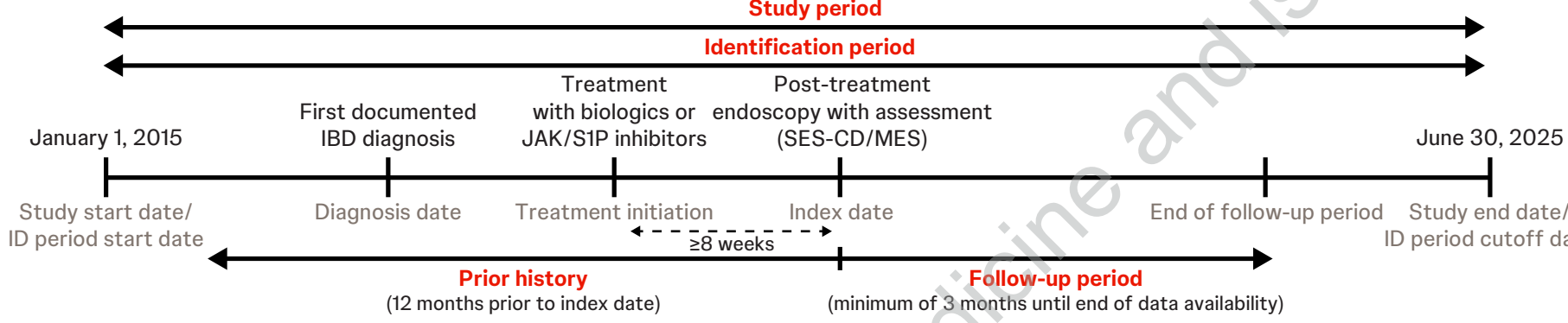
Study Design and Patients

- This retrospective cohort study utilized electronic health record data accessed through the nSights federated platform between January 2015 and June 2025^a (Figure 1)
- Patients (≥18 years of age) with CD or UC were identified using ≥2 *International Classification of Diseases*-coded diagnoses separated by ≥30 days, confirmed by natural language processing (NLP)-based phenotyping (probability >0.8)
- Eligible patients also had ≥1 prior documented exposure to biologics or Janus kinase (JAK)/sphingosine-1-phosphate inhibitors and ≥1 post-treatment endoscopy with a scorable assessment

Patient Cohorts

- Patients were stratified into endoscopic healing or non-healing cohorts based on Simple Endoscopic Score for Crohn's Disease (SES-CD) and Mayo Endoscopic Subscore (MES) for UC derived from explicit score mentions and large language model-inferred classifications from clinical narratives (validated accuracy >90%)
- Baseline characteristics, medication use, and comorbidities were assessed within a 1-year lookback window prior to the index date (Figure 1)
 - The date of the first post-treatment endoscopic evaluation was the index date

Figure 1. Study Design



IBD=inflammatory bowel disease, ID=identification, JAK=Janus kinase, MES=Mayo Endoscopic Subscore, S1P=sphingosine-1-phosphate, SES-CD=Simple Endoscopic Score for Crohn's Disease.

Study Outcomes

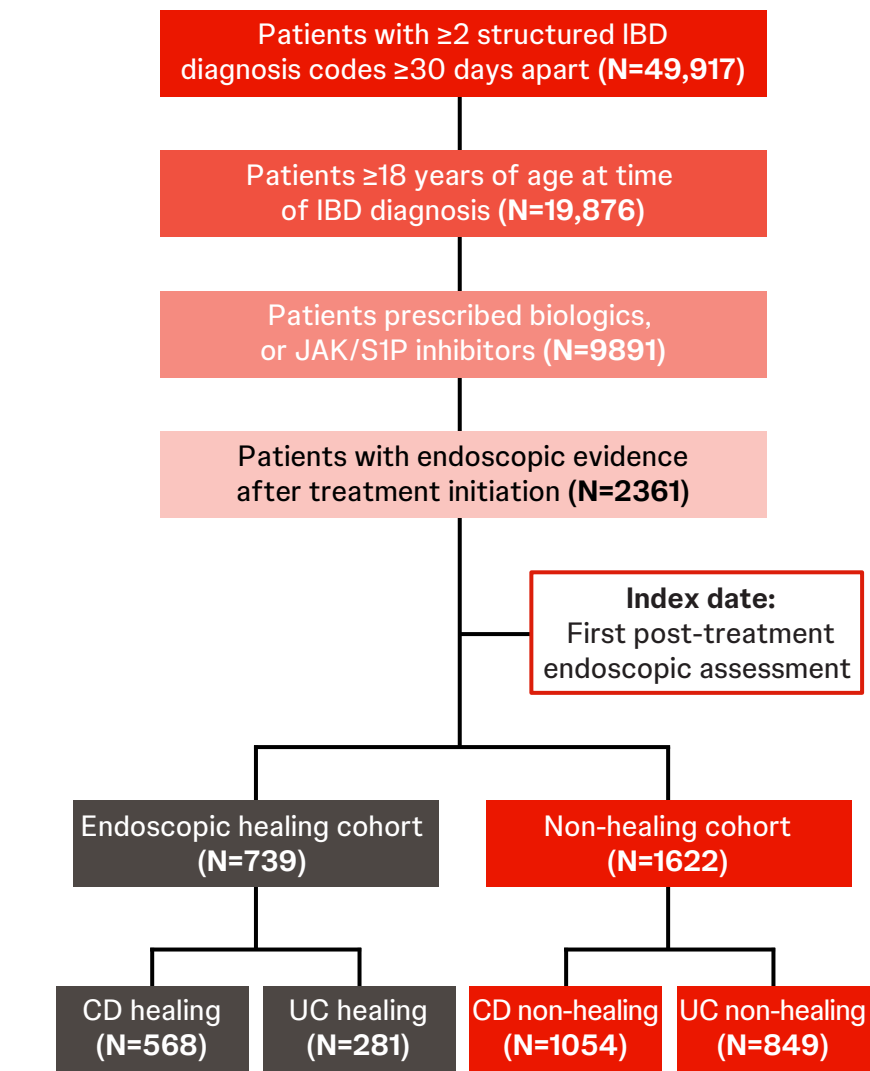
- Outcomes evaluated through 5 years post-index included corticosteroid use, surgical intervention (identified from structured records and NLP), and disease remission (evaluated at 18 months and 5 years based on clinical activity, assessed using the Harvey-Bradshaw Index for CD, Ulcerative Colitis Disease Activity Index, and NLP proxies via majority vote, with ties resolved conservatively as active disease)
- Healing and non-healing cohorts were compared using Fisher exact test, chi-square test, and odds and risk ratios

Results

Baseline Characteristics

- A total of 2361 patients were included in this study; 1622 patients were diagnosed with CD, 1130 with UC, and 391 with both CD and UC
- At baseline, 739 patients were stratified into an endoscopic healing cohort and 1622 into a non-healing cohort (Figure 2)

Figure 2. Study Disposition and Number of Patients



CD=Crohn's disease, IBD=inflammatory bowel disease, JAK=Janus kinase, S1P=sphingosine-1-phosphate, UC=ulcerative colitis.

- Demographic characteristics were generally balanced between cohorts. The mean age at index was 42 years; most patients were female (52%), White (89%), and had commercial insurance (88%; Table 1)
- Median follow-up time was 27.3 months, and the majority of patients received tumor necrosis factor (TNF) inhibitors or integrin receptor antagonists as first-line therapies for IBD

Table 1. Sociodemographic and Clinical Characteristics of Patients

Characteristic	Healing cohort (N=739)	Non-healing cohort (N=1622)
Age at index, years, mean (SD)	42.6 (16.0)	42.5 (17.1)
Female, n (%)	424 (57.4)	814 (50.2)
Race, n (%)		
White	671 (90.8)	1431 (88.2)
Black or African American	24 (3.2)	64 (3.9)
Asian	<1 ^a	33 (2.0)
Other or unknown	35 (4.7)	94 (5.8)
Ethnicity, n (%)		
Hispanic/Latino	37 (5.0)	66 (4.1)
Not Hispanic/Latino	683 (92.4)	1493 (92.0)
Unknown	19 (2.6)	63 (3.9)
Payer class, n (%)		
Commercial	656 (88.8)	1429 (88.1)
Medicaid	59 (8.0)	94 (5.8)
Medicare	140 (18.9)	295 (18.2)
Smoking status, n (%) ^b		
Smoker	116 (15.7)	327 (20.2)
Past smoker	146 (19.8)	310 (19.1)
Not a smoker	471 (63.7)	969 (59.7)
Alcohol status, n (%) ^b		
Drinker	306 (41.4)	588 (36.3)
Past drinker	22 (3.0)	40 (2.5)
Not a drinker	400 (54.1)	967 (59.6)
Baseline SES-CD, mean (SD) ^c	0.4 (2.7)	11.0 (8.0)
Baseline MES, mean (SD) ^c	0	2.1 (0.8)
Follow-up time, years, median (IQR)	2.27 (0.96–4.53)	2.48 (1.11–4.84)
Charlson Comorbidity Index, mean (SD) ^d	0.8 (0.3)	0.8 (0.3)
First-line therapy class, n (%)		
TNF inhibitors	475 (64.3)	945 (58.3)
Integrin receptor antagonists	144 (19.5)	362 (22.3)
Anti-IL-12/IL-23 agents	82 (11.1)	229 (14.1)
Anti-IL-23 agents	17 (2.3)	39 (2.4)
JAK inhibitors	16 (2.2)	39 (2.4)
S1P inhibitors	<1 ^a	<1 ^a

^aValues <11 not disclosed for patient privacy. ^bValues represent the closest available record to the index date and are reported only for patients with a documented smoking and drinking status. ^cCalculated from patients with an available endoscopic score; healing status for a subset of patients was derived from endoscopic reports or clinical notes via LLM where no explicit endoscopic score was documented. ^dCharlson Comorbidity Index was age-adjusted during the post-index medication analysis, with data available for 625 patients in the endoscopic healing cohort and 1342 patients in the non-healing cohort. IL=interleukin, IQR=interquartile range, JAK=Janus kinase, LLM=large language model, MES=Mayo Endoscopic Subscore, S1P=sphingosine-1-phosphate, SD=standard deviation, SES-CD=Simple Endoscopic Score for Crohn's Disease, TNF=tumor necrosis factor.

- At baseline, more patients in the non-healing cohort received prednisone, budesonide, adalimumab, and vedolizumab, while significantly more patients in the healing cohort received infliximab compared with the non-healing cohort (all $p<0.05$; Table 2)
- Additionally, significantly more patients in the healing cohort had arthralgia, eczema, fatigue, or fatty liver disease compared with the non-healing cohort, while more patients in the non-healing cohort had osteopenia and iron-deficiency anemia (all $p<0.05$)

Table 2. Baseline Medication Use and Comorbidities of Patients^a

Variable	Healing cohort (N=739)	Non-healing cohort (N=1622)	Odds ratio	Risk ratio	p value
Medication, n (%)					
Prednisone	155 (21.0)	623 (38.4)	0.43	0.55	<0.0001
Budesonide	98 (13.3)	306 (18.9)	0.66	0.70	0.0008
Infliximab	202 (27.3)	345 (21.3)	1.39	1.29	0.0013
Adalimumab	164 (22.2)	442 (27.3)	0.76	0.81	0.0095
Vedolizumab	132 (17.9)	364 (22.4)	0.75	0.80	0.0122
Ustekinumab	106 (14.3)	279 (17.2)	0.81	0.83	0.0819
Methylprednisolone	100 (13.5)	248 (15.3)	0.87	0.89	0.0287
Comorbidity, n (%)					
Iron-deficiency anemia	84 (11.4)	246 (15.2)	0.72	0.75	0.0149
Arthralgia	108 (14.6)	148 (9.1)	1.70	1.60	0.0001
Fatigue	91 (12.3)	148 (9.1)	1.40	1.35	0.0186
Depression	68 (9.2)	151 (9.3)	0.99	0.99	1.0000
Vitamin D deficiency	63 (8.5)	115 (7.1)	1.22	1.20	0.2392
Rheumatoid arthritis	53 (7.2)	59 (3.6)	2.05	1.97	0.0003
Anxiety	47 (6.4)	109 (6.7)	0.94	0.95	0.7891
Malnutrition	36 (4.9)	105 (6.5)	0.74	0.75	0.1348
Fatty liver disease	36 (4.9)	49 (3.0)	1.64	1.61	0.0315
Eczema	35 (4.7)	44 (2.7)	1.78	1.75	0.0135
Osteopenia	18 (2.4)	75 (4.6)	0.51	0.53	0.0117

^aThis is not an exhaustive list of baseline medications and comorbidities; only variables found in ≥5% of patients or with statistically significant differences between cohorts ($p<0.05$) are shown.

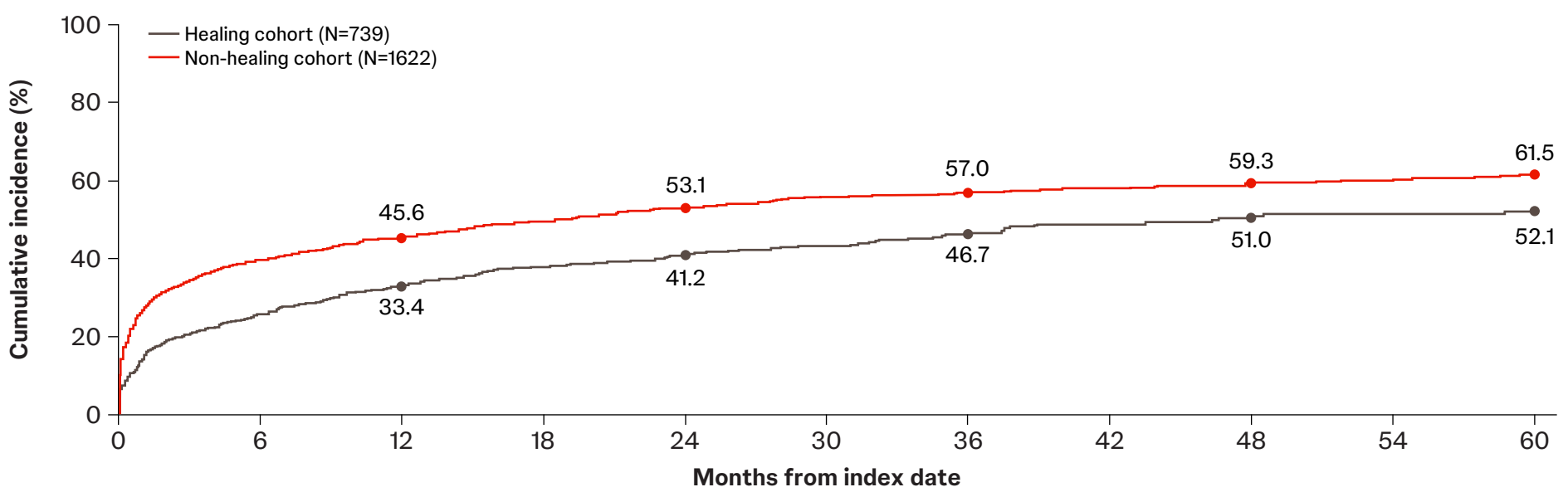
Corticosteroid Use

- After the index date, corticosteroid use was consistently higher in the non-healing versus healing cohort (Figure 3)
 - However, median treatment duration with corticosteroids was longer in the healing cohort compared with the non-healing cohort (223 vs 167 days, respectively)

Surgical Intervention

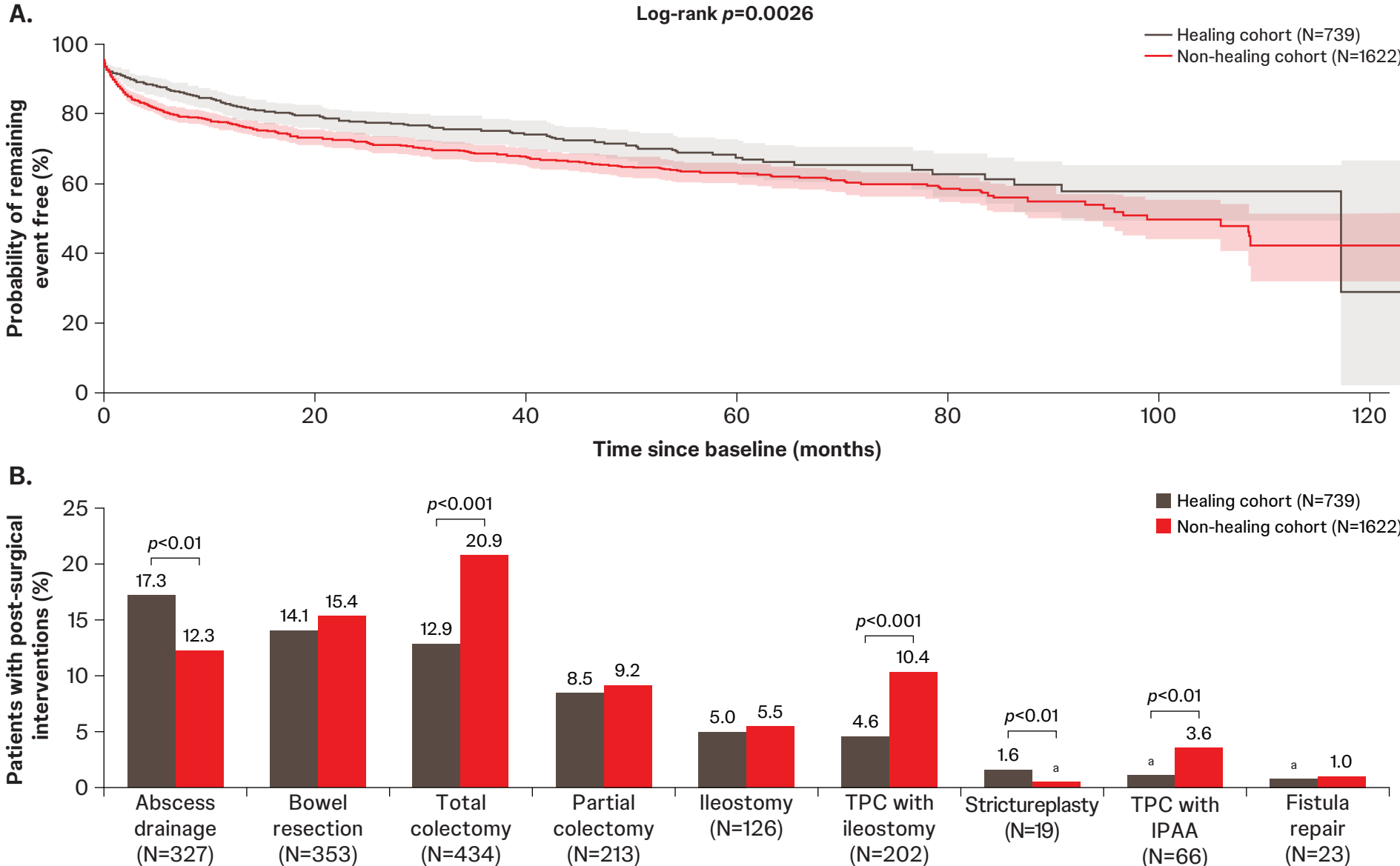
- Patients in the non-healing cohort needed IBD-related surgical intervention at a higher cumulative rate than those in the healing cohort (log-rank $p=0.0004$); they also had significantly higher rates of total colectomy and total proctocolectomy with ileostomy (both $p<0.001$) and total proctocolectomy with ileal pouch-anal anastomosis ($p<0.01$; Figure 4)
 - More patients in the healing cohort underwent abscess drainage and strictureplasty than in the non-healing cohort ($p<0.01$)

Figure 3. Time to First Corticosteroid Prescription^a



^aSurvival analysis of Kaplan-Meier cumulative incidence was capped at 5 years.

Figure 4. IBD-Related Surgery by Endoscopic Healing Status: (A) Time to Surgery and (B) Rates of Post-Surgical Interventions



^aValues for groups with n<11 not disclosed for patient privacy. IBD=inflammatory bowel disease, IPAA=ileal pouch-anal anastomosis, TPC=total proctocolectomy.

Key Takeaways

In this retrospective cohort study, endoscopic healing in patients with IBD was associated with lower use of corticosteroids, fewer IBD-related surgeries, and significantly higher remission rates compared with patients who did not have endoscopic healing after initiation of therapy

These findings show that for patients with IBD, endoscopic healing may be associated with improved long-term outcomes and reduced patient burden, which supports endoscopic healing as an important therapeutic target in IBD

Disease Remission

- Overall disease remission rates were significantly higher for the healing versus non-healing cohort over 18 months (69.5% vs 32.1%) and 5 years (69.6% vs 40.1%; both $p<0.001$; Figure 5)
 - Change from baseline in endoscopic scores by healing status is shown in Table 3

Figure 5. Clinical Remission Rates at 18 Months and 5 Years by Endoscopic Healing Status

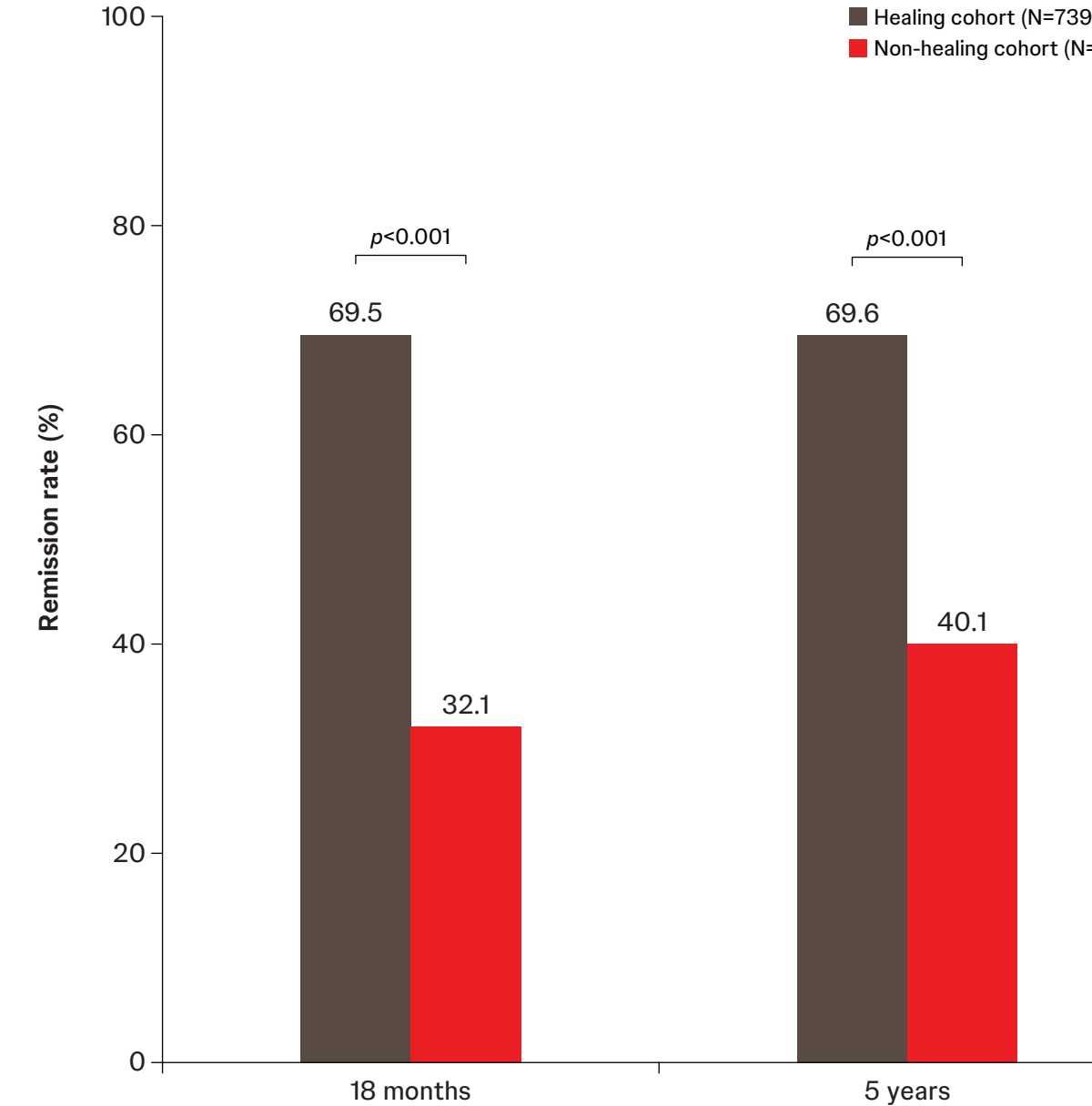


Table 3. Change From Baseline in Endoscopic Scores by Healing Status

Change from baseline, mean (SD) ^a	Healing cohort (N=739)	Non-healing cohort (N=1622)
SES-CD	-4.15 (7.81)	0.61 (6.72)
MES	-1.04 (1.17)	0.22 (0.92)

^aCalculated for each patient as follow-up score minus baseline score using all available scored events occurring after the baseline/index date. MES=Mayo Endoscopic Subscore, SD=standard deviation, SES-CD=Simple Endoscopic Score for Crohn's Disease.