Taylor & Francis
Taylor & Francis Group

Close outpatient follow-up associated with reduced readmission rates in patients with inflammatory bowel disease

Phi Tran, DO[a] [iD], Matthew Tjahja, MD[a], Yilun Wang[b], Nikhil Seth, MD[a], Rylyn Reyes[c], Charles Bussell, MD[c], Audrene Edwards, MS[d], and Christopher M. Johnson, MD, PhD[a,c,e]

[a]Department of Internal Medicine, Baylor Scott and White Medical Center, Temple, Texas, USA; [b]Texas A&M School of Medicine, College Station, Bryan, Texas, USA; [c]Division of Gastroenterology, Baylor Scott and White Medical Center, Temple, Texas, USA; [d]Baylor Scott and White Research Institute, Dallas, Texas, USA; [e]Baylor College of Medicine, Temple, Texas, USA

ABSTRACT

Background: Few studies have shown the effects of prompt outpatient follow-up in relation to reducing readmission rates in patients hospitalized with inflammatory bowel disease (IBD). Our study evaluated whether postdischarge follow-up was associated with fewer IBD-related readmissions.

Methods: This single-center retrospective study included 477 patients with Crohn's disease (CD) or ulcerative colitis (UC) who were readmitted to our tertiary care hospital from January 1, 2016, to June 1, 2022. Rehospitalization admissions were defined as admissions that occurred within 90 days after discharge date. We used a chi-square or Fisher's exact test to test for bivariate comparisons to determine if there was an association in patients readmitted for IBD and primary care or gastroenterology follow-up at 1, 2, 3, and 4 weeks versus no follow-up.

Results: In UC patients, there were 118 admissions from 2016 to 2022; 36/118 (31%) and 41/118 (34.7%) of the patients were readmitted at 30 days and 90 days, respectively. In the CD group, there were 101 (36.73%) readmissions among 277 patients, with 174 nonreadmissions (63.27%).

Conclusions: Gastroenterology follow-up within 1 month was associated with reduced rates of admission in both groups ($P < 0.05$). This study highlights the importance of close gastroenterology follow-up for IBD-related hospitalizations.

nflammatory bowel disease (IBD) is a chronic inflammatory condition of the digestive tract associated with high rates of morbidity. Including Crohn's disease (CD), ulcerative colitis (UC), and IBD unclassified, it is associated with high readmission rates of roughly 19% within 30 days.[1]

Despite advances in medical and surgical therapy, IBD readmission rates remain high and contribute to high healthcare utilization. Studies have shown that increased hospitalization rates represent a negative prognostic factor in IBD outcomes.[2,3] More than half of readmitted patients are found to have issues with outpatient follow-up or inadequate hospital discharge instructions.[4,5]

Few studies have examined the effects of prompt outpatient follow-up on readmission rates in IBD patients. One study by Malhotra et al found that veterans with IBD lacking follow-up with a gastroenterology (GI) provider or primary care physician (PCP) had higher rates of 90-day readmission.[4] Our study aimed to evaluate whether postdischarge follow-up was associated with fewer IBD-related readmissions.

METHODS

We received institutional review board approval from the Baylor Scott and White Research Institute for this study. A retrospective chart review was performed to search for

patients with CD or UC who were readmitted to our tertiary care hospital from January 1, 2016, to June 1, 2022. All patients over the age of 18 with an established or new diagnosis of UC or CD who were hospitalized due to symptomatic IBD in this period were included in the study. Patients with CD were identified with ICD-10 codes K50.0, K50.1, K50.8, and K50.9. UC patients were identified with ICD-10 codes K51.0, K51.2, K51.3, K51.8, and K51.9. Exclusion criteria included colectomy prior to or during hospitalization, or death prior to discharge. Patients were followed for 90 days after index hospitalization, with rehospitalization admissions defined as admissions that occurred within 90 days after discharge date. Patients were included multiple times if they had separate admissions more than 90 days apart.

Patients were divided into CD or UC patients that were readmitted and not readmitted. We used a chi-square or Fisher's exact test to test for bivariate comparisons to determine if there was a significant difference in patients readmitted for CD or UC and PCP or GI follow-up at 1, 2, 3, and 4 weeks versus no follow-up.

The following data were obtained: age, gender, race, IBD type, duration of index hospitalization, surgical history, medication regimen prior to index hospitalization, non-IBD medical history such as congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), psychiatric diagnoses and medications, opioid, narcotic, or tobacco history, chief complaint, principal diagnosis at discharge, intensive care unit (ICU) stay or transfer, albumin level at admission, total parental nutrition (TPN) use, inpatient steroid use, surgical procedures during hospitalization, hospital-acquired infections or venous thromboembolisms, length of stay, IBD medication regimen changes at discharge, disposition, and mention of GI follow-up and time to follow-up to GI and PCP after hospital discharge. Our approach involved removing and encrypting personally identifiable information such as names, addresses, and Social Security numbers from the dataset. All data were stored in an encrypted Excel worksheet. Upon completion of chart review, all medical record numbers were deleted from the document, and all patient file numbers were randomized.

All statistical analyses were performed in SAS 9.4. Sample characteristics were described using descriptive statistics. Frequencies and percentages were used to describe categorical variables. Means and standard deviations (or medians and ranges where appropriate) were used to describe continuous variables. A chi-square test (or Fisher's exact test when low cell counts were present) was used to test for associations in bivariate comparisons. A two-sample t test (or Wilcoxon rank-sum test when appropriate) was used to test for differences in continuous variables between two groups. Analysis of variance (or Kruskal-Wallis test when appropriate) was used to test for differences in continuous variables between more than two groups. Level of significance is $\alpha = 0.05$.

RESULTS
Demographics and descriptive statistics
In the CD group, there were 101 (36.73%) readmissions among 277 patients; 209/277 (75.45%) of patients were White, with the second largest group being Black or African American (64/277, 23.1%). Females comprised the majority of IBD patients in both groups. In the UC group, there were 118 admissions during the study period; 36/118 (31%) and 41/118 (34.7%) of the patients were readmitted at 30 days and 90 days, respectively. Most patients (95/118, 81%) were White. Further descriptive statistics for both CD and UC groups can be found in Table 1.

Crohn's patients
Index admission. Prior to the index admission, the number of patients on biologic therapy and or immunomodulator therapy was 133 and 47, respectively. During the index admission for CD patients, 184 patients (66.4%) received some degree of steroids, and 50 patients received some type of surgical procedure, with the majority being incision and drainage. Only five patients developed a venous thromboembolism or hospital-acquired infection. New prescriptions upon discharge included prednisone (120 patients, 44.3%), biologics (141 patients, 50.9%), and immunomodulators (53 patients, 19.13%).

Readmissions. The 30-day readmission rate was 22%, compared to a 35% 90-day readmission rate among the 101 patients. The mean postdischarge GI follow-up time of readmitted patients was 40.65 days ($\sigma = 58.36$ days), and CD nonreadmit patients had a mean follow-up time of 38.00 days ($\sigma = 70.04$ days).

Risk factors. A significant difference was detected regarding GI follow-up in relation to readmission for patients admitted with a chief diagnosis of CD ($P < 0.001$). However, when comparing specific follow-up time frames, no significant difference was found between follow-up times (7-day follow-up, 14-day follow-up, 21-day follow-up, 1-month follow-up). PCP follow-up was not found to be statistically significant in reducing readmission rates.

Length of stay was significantly associated with history of psychiatric conditions, opioid use, ICU stay, TPN use, biologic use prior to admission, inpatient steroids, and prednisone on discharge. Inpatient steroids, prednisone prescription on discharge, and GI follow-up were all associated with a reduced rate of CD readmission. CD patients exhibited similar rates of biologic use prior to admission and after discharge (48.01% vs 50.90%, respectively, with an increase of 2.89% postdischarge). Biologic use prior to admission and at discharge were not associated with fewer readmissions. Univariate analysis of factors associated with readmission in CD patients is outlined in Table 2.

Ulcerative colitis patients
Index admission. Prior to the index admission, the number of patients on mesalamine, biologic therapy, and or immunomodulator therapy was 34, 34, and 17, respectively. During the index admission for UC patients, 84 patients

Table 1. Overall descriptive statistics of variables in patients with inflammatory bowel disease

Item	Ulcerative colitis patients N = 118	Crohn's disease patients N = 277
Age: Median (IQR)	38.48 (30.64)	37.32 (23.88)
Race		
Asian	0.85% (1)	0.72% (2)
Black or African American	14.41% (17)	23.10% (64)
White or Caucasian	80.51% (95)	75.45% (209)
Gender		
Female	58.47% (69)	55.96% (155)
Male	41.53% (49)	44.04% (122)
Smoking status		
Every day	3.67% (4)	21.95% (54)
Former	34.86% (38)	30.89% (130)
Never	55.96% (61)	39.43% (97)
Psychiatric conditions		
No	70.34% (83)	58.48% (162)
Yes	29.66% (35)	41.52% (115)
Inpatient steroid use		
No	28.81% (34)	33.57% (93)
Yes	71.19% (84)	66.43% (184)
Surgical procedure during hospital stay		
No	75.42% (89)	81.95% (227)
Yes	24.58% (29)	18.05% (50)
VTE/HAI		
No	93.22% (110)	98.19% (271)
Yes	6.78% (8)	1.81% (5)
Mesalamine prior to admission		
No	71.19% (84)	
Yes	28.81% (34)	
Biologic use prior to admission		
No	71.19% (84)	51.99% (144)
Yes	28.81% (34)	48.01% (133)
Immunomodulator prior to admission		
No	85.59% (101)	83.03% (230)
Yes	14.41% (17)	16.97% (47)
Mesalamine on discharge		
No	70.34% (83)	
Yes	29.66% (35)	

(*Continued on next column*)

Item	Ulcerative colitis patients N = 118	Crohn's disease patients N = 277
Prednisone on discharge		
No	70.34% (83)	43.32% (120)
Yes	29.66% (35)	56.68% (157)
Biologic on discharge		
No	59.32% (70)	49.10% (136)
Yes	40.68% (48)	50.90% (141)
Immunomodulator on discharge		
No	86.44% (102)	80.87% (224)
Yes	13.56% (16)	19.13% (53)
Mention of follow-up on discharge summary		
No	23.73% (28)	
Yes	76.27% (90)	
Was GI seen prior to readmission		
1-week GI follow-up	12.71% (15)	11.91% (33)
2-week GI follow-up	9.32% (11)	16.61% (46)
3-week GI follow-up	10.17% (12)	12.64% (35)
4-week GI follow-up	22.88% (27)	26.35% (73)
No GI follow-up	38.14% (45)	32.49% (90)
PCP follow-up		
1-week PCP follow-up	27.12% (32)	19.13% (53)
2-week PCP follow-up	10.17% (12)	11.91% (33)
3-week PCP follow-up	4.24% (5)	6.14% (17)
4-week PCP follow-up	5.08% (5)	4.33% (12)
No PCP follow-up	53.39% (63)	58.48% (162)
Time to readmission		
1-week	39.02% (16)	7.94% (22)
2-week	19.51% (8)	6.50% (18)
30 days	29.27% (12)	7.58% (21)
31–60 days	7.32% (3)	8.30% (23)
61–90 days	4.88% (2)	4.69% (13)
Admitted from GI clinic		
No	92.68% (38)	
Yes	7.32% (3)	
IBD-related readmission		
No	65.25% (77)	63.27% (174)
Yes	34.75% (41)	36.73% (101)

GI indicates gastroenterology; HAI, hospital-acquired infection; IBD, inflammatory bowel disease; IQR, interquartile range; PCP, primary care physician; VTE, venous thromboembolism.

Table 2. Univariate analysis of factors associated with readmission in Crohn's disease patients

Variables	No readmission (n = 101)	Readmission (n = 264)	P value
Age: Median (IQR)	37.36 (26.29)	37.01 (21.11)	0.37
Race			0.27
Asian	0.73% (2)	0.00% (0)	
Black or African American	12.73% (35)	10.55% (29)	
Some other race only	0.36% (1)	0.36% (1)	
White or Caucasian	49.45% (136)	25.82% (71)	
Ethnicity			0.49
Hispanic or Latino	6.91% (19)	3.27% (9)	
Not Hispanic or Latino	54.55% (150)	33.09% (91)	
Unknown	1.82% (5)	0.36% (1)	
Gender			0.03
Female	38.18% (105)	17.45% (48)	
Male	25.09% (69)	19.27% (53)	
Smoking status			0.96
Every day	13.93% (34)	7.79% (19)	
Former	20.08% (49)	10.66% (26)	
Heavy smoker	0.41% (1)	0.00% (0)	
Light smoker	2.05% (5)	1.64% (4)	
Never	25.82% (63)	13.93% (34)	
Never assessed	0.41% (1)	0.00% (0)	
Some days	2.05% (5)	1.23% (3)	
Length of stay			0.08
<3 days	12.73% (35)	5.45% (15)	
<7 days	38.55% (106)	21.82% (60)	
>1 week	9.82% (27)	5.45% (15)	
>2 weeks	2.18% (6)	4.00% (11)	
Congestive heart failure			0.67
No	62.18% (171)	35.64% (98)	
Yes	1.09% (3)	1.09% (3)	
COPD			0.24
No	61.09% (168)	34.18% (94)	
Yes	2.18% (6)	2.55% (7)	
Psychiatric conditions			0.01
No	40.73% (112)	17.82% (49)	
Yes	22.55% (62)	18.91% (52)	
Opioid use			0.10
No	53.82% (148)	28.36% (78)	
Yes	9.45% (26)	8.36% (23)	

(*Continued on next column*)

Table 2. Continued

Variables	No readmission (n = 101)	Readmission (n = 264)	P value
ICU stay			1.00
No	62.36% (169)	35.06% (95)	
Yes	1.85% (5)	0.74% (2)	
TPN use			0.07
No	61.45% (169)	33.82% (93)	
Yes	1.89% (5)	2.91% (8)	
Inpatient steroid use			0.20
No	22.91% (63)	10.55% (29)	
Yes	40.36% (111)	26.18% (72)	
Surgical procedure during hospitalization			0.15
No	50.18% (138)	31.64% (87)	
Yes	13.09% (36)	5.09% (14)	
HAI or VTE			0.006
No	63.14% (173)	35.04% (96)	
Yes	0.00% (0)	1.82% (5)	
Steroid use prior to admission			0.03
No	53.09% (146)	26.91% (74)	
Yes	10.18% (28)	9.82% (27)	
Biologic use prior to admission			0.53
No	32.00% (88)	20.00% (55)	
Yes	31.27% (86)	16.73% (46)	
Immunomodulator prior to admission			0.15
No	50.91% (140)	32.00% (88)	
Yes	12.36% (34)	4.73% (13)	
Prednisone on discharge			0.14
No	29.45% (81)	13.82% (38)	
Yes	33.82% (93)	22.91% (63)	
Biologic planned on discharge			0.91
No	30.91% (85)	18.18% (50)	
Yes	32.36% (89)	18.55% (51)	
Immunomodulator on discharge			0.43
No	50.18% (138)	30.55% (84)	
Yes	13.09% (36)	6.18% (17)	
Disposition			0.09
AMA	0.00% (0)	0.73% (2)	
Home	61.68% (169)	34.31% (94)	
SNF	1.09% (3)	1.82% (5)	

(*Continued on next page*)

Table 2. Continued			
Variables	No readmission (n = 101)	Readmission (n = 264)	*P* value
Transferred	0.36% (1)	0.00% (0)	
Mention of follow-up on discharge summary			0.23
No	10.18% (28)	4.00% (11)	
Yes	53.09% (146)	32.73% (90)	
GI follow-up			0.02
1-week GI follow-up	8.00% (22)	4.00% (11)	
2-week GI follow-up	11.27% (31)	5.45% (15)	
3-week GI follow-up	9.45% (26)	3.27% (9)	
4-week GI follow-up	18.55% (51)	7.64% (21)	
No GI follow-up	16.00% (44)	16.36% (45)	
PCP follow-up			0.65
1-week PCP follow-up	19.13% (34)	6.91% (19)	
2-week PCP follow-up	11.91% (23)	3.64% (10)	
3-week PCP follow-up	6.14% (12)	1.82% (5)	
4-week PCP follow-up	4.33% (9)	1.09% (3)	
No PCP follow-up	58.48% (96)	23.27% (64)	
Lost to follow-up			0.34
No	54.55% (150)	33.09% (91)	
Yes	8.73% (24)	3.64% (10)	
Time to readmission			<0.001
1 week	0.36% (1)	7.94% (12)	
2 weeks	0.00% (0)	6.55% (18)	
30 days	0.73% (2)	6.91% (19)	
31–60 days	0.00% (0)	8.00% (22)	
61–90 days	0.00% (0)	4.73% (13)	
No readmission	64.98% (171)	64.98% (8)	
CD-related readmission			<0.001
No	62.91% (173)	12.73% (35)	
Yes	0.36% (1)	24.00% (66)	

AMA indicates against medical advice; COPD, chronic obstructive pulmonary disease; GI, gastroenterology; HAI, hospital-acquired infection; ICU, intensive care unit; IQR, interquartile range; PCP, primary care physician; SNF, skilled nursing facility; TPN, total parental nutrition; VTE, venous thromboembolism.

(71.2%) received some degree of steroids, and 29 patients received some type of surgical procedure. Eight patients developed a venous thromboembolism or hospital-acquired infection. Upon discharge, new prescriptions included mesalamine (35 patients, 29.7%), prednisone (35 patients, 29.7%), biologics (48 patients, 40.7%), and immunomodulators (16 patients, 13.6%). Most patients were recommended to follow-up with GI upon discharge (76.3%).

Readmissions. Of 41 admissions, 19 (46%) were UC related. The 30-day and 90-day readmission rates were 31% and 34.7%, respectively. Three patients were referred to the emergency department from the GI clinic upon follow-up evaluation. UC readmitted patients had a mean GI follow-up time of 15.25 days ($\sigma = 8.09$ days), while UC patients who were not readmitted had a mean follow-up time of 21.12 days ($\sigma = 7.76$ days).

Risk factors. GI follow-up in relation to preventing readmission was statistically significant ($P < 0.001$). When breaking down GI follow-up into 1, 2, 3, or 4-week follow-up versus no GI follow-up, there was no significant difference in readmission in the no GI follow-up group. PCP follow-up in relation to preventing readmission was also found to be statistically significant ($P < 0.03$).

Increased LOS was significantly associated with inpatient surgery, healthcare-associated infection, and inpatient steroid use. The relationships between readmission and GI follow-up, GI referral, and time to readmission were all statistically significant ($P < 0.05$). UC patients exhibited a 12.5% increase (13.9% to 26.4%) in biologic use after admission in the readmission group, and a 9.09% increase (33.8% to 42.9%) in biologic use after admission in the nonreadmission group. Biologic use prior to admission and at discharge were not significant. Univariate analysis of factors associated with readmission in UC patients and factors independently associated with readmission in UC patients are outlined in *Tables 3 and 4*.

DISCUSSION

This retrospective study evaluated IBD-related risk factors for readmission and possible interventions to assist with reducing readmission frequency. Readmission rates remained high for both CD and UC. In the CD group, the 30-day readmission rate was 22%, and the 90-day rate, 35%. In the UC group, the 30-day and 90-day readmission rates were 31% and 34.7%, respectively. Risk factors for UC included length of stay, hospital-acquired infections, and unplanned surgery. Length of stay was significantly associated with history of psychiatric conditions, opioid use, ICU stay, TPN use, biologic use prior to admission, inpatient steroids, and prednisone on discharge in UC patients. Factors associated with reduced rate of readmission for CD included inpatient steroids, steroids on discharge, PCP follow-up, and GI follow-up. PCP follow-up was found not to be significant when comparing follow-up with readmission.

Multiple studies have identified 30-day and 90-day readmission rates ranging from 18.1% to 35.1%,[6–8] with higher readmission risk associated with UC patients, as seen in our patient population.[9] Common readmission reasons included IBD flare, infection, and complications from unplanned surgeries.[1,4–6] Inpatient use of corticosteroids, chronic pain, anxiety, and depression were also associated with an increased risk of readmission within 90 days.[5] However, few studies have focused on interventions to reduce readmission.

Table 3. Univariate analysis of factors associated with readmission in patients with ulcerative colitis (n = 118)

Item	No readmission	Readmission	P value
Age: Median (IQR)	34.35 (26.75)	47.14 (37.73)	0.01
Race			0.49
Asian	0.85% (1)	0.00% (0)	
Black or African American	9.32% (11)	5.08% (6)	
White or Caucasian	50.85% (60)	29.66% (35)	
Gender			0.68
Female	37.29% (44)	21.19% (25)	
Male	27.97% (33)	13.56% (16)	
Smoking status			0.24
Every day	2.75% (3)	0.92% (1)	
Former	17.43% (19)	17.43% (19)	
Never	40.37% (44)	15.60% (17)	
Length of stay			<0.001
1-2 weeks	10.17% (12)	0.00% (0)	
<3 days	5.93 (%)	4.24% (5)	
<7 days	43.22% (51)	16.10% (19)	
>1 week	0.00% (0)	9.32% (11)	
>2 weeks	5.93% (7)	5.08% (6)	
History of colorectal surgery			<0.001
No	0.00% (0)	50.00% (30)	
Yes	31.67% (19)	18.33% (11)	
Congestive heart failure			0.01
No	65.25% (77)	31.36% (37)	
Yes	0.00% (0)	3.39% (4)	
COPD			0.04
No	64.41% (76)	31.36% (37)	
Yes	0.85% (1)	3.39% (4)	
Psychiatric conditions			0.43
No	47.46% (56)	22.88% (27)	
Yes	17.80% (21)	11.86% (14)	
Opioid use			0.61
No	55.08% (65)	30.51% (36)	
Yes	10.17% (12)	4.24% (5)	
ICU stay			0.008
No	63.56% (75)	28.81% (34)	
Yes	1.69% (2)	5.93% (7)	

Table 3. Continued

Item	No readmission	Readmission	P value
Inpatient steroid use			0.35
No	16.95% (20)	11.86% (14)	
Yes	48.31% (57)	22.88% (27)	
Mesalamine prior to admission			0.10
No	43.22% (51)	27.97% (33)	
Yes	22.03% (26)	6.78% (8)	
Biologic use prior to admission			0.10
No	43.22% (51)	27.97% (33)	
Yes	22.03% (26)	6.78% (8)	
Immunomodulator prior to admission			0.29
No	54.24% (64)	31.36% (37)	
Yes	11.02% (13)	3.39% (4)	
Mesalamine on discharge			0.18
No	43.22% (51)	27.12% (32)	
Yes	22.03% (26)	7.63% (9)	
Prednisone on discharge			0.94
No	70.34% (23)	70.34% (12)	
Yes	29.66% (54)	29.66% (29)	
Biologic on discharge			0.50
No	37.29% (44)	22.03% (26)	
Yes	27.97% (33)	12.71% (15)	
Immunomodulator on discharge			0.37
No	55.08% (65)	31.36% (37)	
Yes	10.17% (12)	3.39% (4)	
GI seen prior to readmission			<0.001
1-week GI follow-up	12.71% (8)	12.71% (7)	
2-week GI follow-up	9.32% (11)	0.00% (0)	
3-week GI follow-up	10.17% (12)	0.00% (0)	
4-week GI follow-up	22.88% (27)	0.00% (0)	
No GI follow-up	38.14% (19)	22.03% (26)	
PCP follow-up			0.02
1-week PCP follow-up	18.64% (22)	8.47% (10)	
2-week PCP follow-up	8.47% (10)	1.69% (2)	
3-week PCP follow-up	4.24% (5)	0.00% (0)	
4-week PCP follow-up	5.08% (6)	0.00% (0)	
No PCP follow-up	28.81% (34)	24.58% (29)	

AMA indicates against medical advice; COPD, chronic obstructive pulmonary disease; GI, gastroenterology; HAI, hospital-acquired infection; ICU, intensive care unit; IQR, interquartile range; PCP, primary care physician; SNF, skilled nursing facility; TPN, total parental nutrition; VTE, venous thromboembolism.

Table 4. Factors independently associated with readmission in patients with ulcerative colitis

Item	Odds ratio	95% CI	P value
Age	1.68	1.02–2.76	0.03
Length of stay	1.92	1.16–3.16	0.01
Albumin	1.90	1.05–3.46	0.03
Congestive heart failure	2.95	1.245–7.01	0.12
Chronic obstructive pulmonary disease	2.11	1.01–4.45	0.04
Intensive care unit stay	2.48	1.29–4.79	0.06
GI seen prior to readmission			
2 week vs no GI follow-up	31.26	1.74–563.07	<0.001
3 week vs no GI follow-up	33.97	1.89–609.21	<0.001
4 week vs no GI follow-up	74.74	4.29–1301.71	<0.001
PCP follow-up			
4 week vs no PCP follow-up	11.12	0.60–205.72	0.03

GI indicates gastroenterology; PCP, primary care physician.

One retrospective cohort study focused on the impact of specialized IBD inpatient care. This study found an increased frequency of high-dose biologic induction therapy and patients in remission at 90 days after discharge. This population was also more likely to have surgery in the hospital or within 30 days of discharge.[9] Other studies focusing on reducing readmission have shown a correlation between high-volume IBD hospitals and early intervention of biologic therapy or surgery.[10–12]

A significant difference was observed when comparing GI follow-up, or lack thereof, with patients who required readmission. Our study focused on outpatient follow-up as a factor associated with decreased frequency of readmission. GI follow-up was found to be statistically significant when involving readmission at 30 and 90 days. Further subanalyses did not reveal any superiority when evaluating follow-up at 1, 2, 3, and 4 weeks. Previous studies have also suggested that close outpatient follow-up may be associated with decreased readmissions, including those with a principal diagnosis of COPD, CHF, and IBD.[3,4,13] However, optimal timing of follow-up remains unclear, with some studies suggesting that follow-up that is too early may not be as beneficial.[4] Other studies have implied that follow-up within 7 days should be reserved for only high-risk patients.[14]

Similarly with specialized inpatient management, we suspect that early GI follow-up may allow for better optimization of medical therapy or involvement of surgical intervention. Our data could not point to a specific ideal follow-up timeframe but did suggest that postdischarge follow-up appointments with GI were associated with reduced 90-day readmission rates. We postulate that GI follow-up may allow discussion of newly prescribed medications, initiation of biologic therapy, surgical options, and the daily challenges of living with IBD. Of note, PCP follow-up was associated with reducing readmission in UC patients, but not CD patients. We suspect that UC patients had a higher risk of acute blood loss anemia and unplanned surgical interventions, necessitating more frequent and regular follow-up for management of comorbidities or secondary manifestations. Further studies may investigate the efficacy of transitional care management of IBD patients, similarly to other chronic conditions, such as COPD and CHF.[14–17]

Biologic use prior to admission and continuation of biologics after discharge were also evaluated as risk factors for readmission. Previous studies have established biologic use as a risk factor for hospitalization in general, though not a risk factor for readmission after discharge.[12] This is likely due to non–IBD-related complications of biologic and immunosuppressant use such as infections.[16] Another study reported that immunosuppressive therapy before surgery in CD patients appeared to be related to increased unplanned postoperative readmission.[18] The impact of early biologic initiation has shown varying results. Studies have shown worse outcomes with early biologic intervention in UC, whereas other research has shown growing efficacy with early initiation in CD.[8,19] Falek et al found that early versus late initiation of vedolizumab had no effect on short-term treatment outcomes in UC, whereas early initiation of vedolizumab in CD patients with shorter duration had higher rates of response.[20] Other studies have shown improvement in treatment outcomes in UC patients on vedolizumab among tumor necrosis factor (TNF) antagonist–naive patients versus those who have previously trialed TNF antagonists.[21,22] Berg et al even suggested that vedolizumab may be a first-line biologic agent in TNF antagonist–naive patients with early UC.[21] Our study did not show any relationship to biologics on discharge in either CD or UC groups, but further studies should evaluate timing of starting biologics on readmitted patients for IBD flares.

Our study is not without limitations. As confounding variables cannot be ruled out, future studies will need to include larger population samples. As an example of one confounding variable, some patients had follow-up scheduled further out than their readmission dates, such as having a 2-week follow-up but being readmitted at 10 days. We were also unable to assess which patients were readmitted multiple times and match our datasets accordingly, which may have skewed some of the results. Patients also may have presented to outside facilities, which may have not been accurately recorded within our dataset. Further studies would benefit from a larger population sample, identification of a measurable intervention, implementation of the intervention, and possible prospective data collection.

In conclusion, our study shows that GI follow-up within 4 weeks is associated with decreased hospital readmission rates for both CD and UC patients. PCP follow-up was associated with decreased readmission rates for UC, but not CD. Secondary analysis revealed that length of stay was increased

with a history of psychiatric conditions, opioid use, ICU stay, TPN use, biologic use prior to admission, inpatient steroids, and prednisone on discharge. Overall, this study highlights the importance of close GI follow-up for patients hospitalized for IBD to reduce the risk of readmission.

ORCID

Phi Tran http://orcid.org/0000-0002-3968-7327

1. George LA, Martin B, Gupta N, Shastri N, Venu M, Naik AS. Predicting 30-day readmission rate in inflammatory bowel disease patients: performance of LACE index, *Crohn's & Colitis 360.* 2019; 1(1):otz007. doi:10.1093/crocol/otz007.

2. Bickston SJ, Waters HC, Dabbous O, et al. Administrative claims analysis of all cause annual costs of care and resource utilization by age category for ulcerative colitis patients. *J Manag Care Pharm.* 2008; 14:352–362.

3. Naylor MD, Brooten D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA.* 1999;281(7):613–620. doi:10.1001/Jama.281.7.613.

4. Malhotra A, Phatharacharukul P, Thongprayoon C. Risk factors for 90-day readmission in veterans with inflammatory bowel disease—does post-discharge follow-up matter? *Mil Med Res.* 2018;85(1):5. doi:10.1186/s40779-018-0153-x.

5. Nguyen NH, Koola J, Dulai PS, Prokop LJ, Sandborn WJ, Singh S. Rate of risk factors for and interventions to reduce hospital readmission in patients with inflammatory bowel diseases. *Clin Gastroenterol Hepatol.* 2020;18(9):1939–1948.e7. doi:10.1016/j.cgh.2019.08.042.

6. Ghahramani S, Tamartash Z, Sayari M, et al. Risk factors affecting 90-day readmission of patients with inflammatory bowel disease. *Middle East J Dig Dis.* 2022;14(1):34–43. doi:10.34172/mejdd.2022.253.

7. Barnes EL, Kochar B, Long MD, et al. Modifiable risk factors for hospital readmission among patients with inflammatory bowel disease in a nationwide database. *Inflamm Bowel Dis.* 2017;23(6):875–881. doi:10.1097/MIB.0000000000001121.

8. White EC, Melmed GY, Vasiliauskas E, et al. Does preoperative immunosuppression influence unplanned hospital readmission after surgery in patients with Crohn's disease? *Dis Colon Rectum.* 2012; 55(5):563–568. doi:10.1097/DCR.0b013e3182468961.

9. Law CCY, Sasidharan S, Rodrigues R, et al. Impact of specialized inpatient IBD care on outcomes of IBD hospitalizations. *Inflamm Bowel Dis.* 2016;22(9):2149–2157. doi:10.1097/mib.0000000000000870.

10. Ananthakrishnan AN, McGinley EL, Binion DG. Does it matter where you are hospitalized for inflammatory bowel disease? A nationwide analysis of hospital volume. *Am J Gastroenterol.* 2008;103(11): 2789–2798. doi:10.1111/j.1572-0241.2008.02054.x.

11. Kaplan GG, McCarthy EP, Ayanian JZ, et al. Impact of hospital volume on postoperative morbidity and mortality following a colectomy for ulcerative colitis. *Gastroenterology.* 2008;134(3):680–687. doi:10.1053/j.gastro.2008.01.004.

12. Nguyen NH, Zhang X, Long MD, Sandborn WJ, Kappelman MD, Singh S. Patient-reported outcomes and risk of hospitalization and readmission in patients with inflammatory bowel diseases. *Dig Dis Sci.* 2022;67(6):2039–2048. doi:10.1007/s10620-021-07082-3.

13. Gavish R, Levy A, Dekel OK, Karp E, Maimon N. The association between hospital readmission and pulmonologist follow-up visits in patients with COPD. *Chest.* 2015;148(2):375–381. doi:10.1378/chest.14-1453.

14. Jackson C, Shahsahebi M, Wedlake T, DuBard CA. Timeliness of outpatient follow-up: an evidence-based approach for planning after hospital discharge. *Ann Fam Med.* 2015;13(2):115–122. doi:10.1370/afm.1753.

15. Bergethon KE, Ju C, DeVore AD, et al. Trends in 30-day readmission rates for patients hospitalized with heart failure: Findings from the Get with the Guidelines-Heart Failure registry. *Circ Heart Fail.* 2016;9(6):10–1161. e002594. doi:10.1161/CIRCHEARTFAILURE.115.002594.

16. Mudireddy P, Scott F, Feathers A, Lichtenstein GR. Inflammatory bowel disease: predictors and causes of early and late hospital readmissions. *Inflamm Bowel Dis.* 2017;23(10):1832–1839. doi:10.1097/MIB.0000000000001242.

17. Poojary P, Saha A, Chauhan K, et al. Predictors of hospital readmissions for ulcerative colitis in the United States: a national database study. *Inflamm Bowel Dis.* 2017;23(3):347–356. doi:10.1097/MIB.0000000000001041.

18. Tak HJ, Goldsweig AM, Wilson FA, et al. Association of post-discharge service types and timing with 30-day readmissions, length of stay, and costs. *J Gen Intern Med.* 2021;36(8):2197–2204. doi:10.1007/s11606-021-06708-6.

19. Dahiya DS, Perisetti A, Kichloo A, et al. Increasing thirty-day readmissions of Crohn's disease and ulcerative colitis in the United States: a national dilemma. *World J Gastrointest Pathophysiol.* 2022;13(3):85–95. doi:10.4291/wjgp.v13.i3.85.

20. Faleck DM, Winters A, Chablaney S, et al. Shorter disease duration is associated with higher rates of response to Vedolizumab in patients with Crohn's disease but not ulcerative colitis. *Clin Gastroenterol Hepatol.* 2019;17(12):2497–2505.e1. doi:10.1016/j.cgh.2018.12.040.

21. Berg DR, Colombel J-F, Ungaro R. The role of early biologic therapy in inflammatory bowel disease. *Inflamm Bowel Dis.* 2019;25(12): 1896–1905. doi:10.1093/ibd/izz059.

22. Feagan BG, Rubin DT, Danese S, et al. Efficacy of Vedolizumab induction and maintenance therapy in patients with ulcerative colitis, regardless of prior exposure to tumor necrosis factor antagonists. *Clin Gastroenterol Hepatol.* 2017;15(2):229–239.e5. doi:10.1016/j.cgh.2016.08.044.