

# Poor Baseline Health of IBD Patients at Presentation to a Surgeon: Results From a Patient-Reported Outcomes Database

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**Background:** Many patients with inflammatory bowel disease (IBD) are referred to surgeons when medical treatments are ineffective, signifying poor disease control. We aimed to assess the association of IBD diagnosis with physical and mental health upon presentation to a colorectal surgeon.

**Methods:** We included all new patients presenting to colorectal surgery clinic over 1.5 years. During registration, patients completed the PROMIS Global-10, a validated outcome measure assessing physical and mental health. We grouped patients by diagnosis: IBD, anorectal, benign colorectal, and malignancy. Details on IBD patients were obtained via chart review. We evaluated the interaction between PROMIS scores and diagnosis through ANOVA analysis and post hoc Tukey–Kramer pairwise comparison. We estimated the strength of association of age, sex, and visit diagnosis with poor physical and mental health (PROMIS: –1 SD) through logistic regression.

**Results:** Eight hundred ninety-seven patients were included. The cohort was as follows: IBD (99) (Crohn = 73; ulcerative colitis = 26), anorectal (378), benign colorectal (224), and malignancy (196). The mean age of patients was 56 ( $\pm 17$ ) years. Fifty-seven percent were female. The IBD group was youngest ( $P < 0.001$ ). IBD had significantly lower PROMIS scores on pairwise comparison; anorectal had the highest scores. Controlling for age and sex, the IBD group had 4.1 $\times$  odds of poor physical health (95% confidence interval 2.46–6.76) and 2.9 $\times$  odds of poor mental health (95% confidence interval 1.66–5.00).

**Conclusions:** Patients with IBD, specifically Crohn disease, have worse physical and mental health on presentation to a colorectal surgeon compared to patients presenting with other colorectal diagnoses. These patients considering surgery might benefit from added support during the perioperative period.

## Lay Summary

Our study found that patients with inflammatory bowel disease are in worse overall mental and physical health at presentation to a colorectal surgeon than patients with other colorectal diagnoses. Patients with Crohn in particular need more support during the perioperative period.

**Key Words:** inflammatory bowel disease, IBD surgery, patient-reported outcomes, mental health

## INTRODUCTION

Patients with inflammatory bowel disease (IBD), including Crohn disease (CD) and ulcerative colitis (UC), suffer a disease burden that profoundly impacts their mental health.<sup>1</sup> These patients suffer from rates of depression and anxiety 3 times higher than the general population.<sup>2</sup> Poorly controlled physical symptoms of IBD increase the likelihood of mental health sequelae and mental health issues at baseline increase the likelihood of IBD flares.<sup>3</sup> Despite the clear relationship between IBD and mental health, many patients lack access to mental health services.<sup>4,5</sup>

To add to these challenges, the majority of Crohn patients and many UC patients have a high likelihood of requiring surgery during the course of their illness.<sup>6,7</sup> Some initially present needing emergent surgical therapy, but many are referred to surgery clinic with refractory symptoms or inability to tolerate medical therapy.<sup>8</sup> Among general surgery patients undergoing common procedures such as cholecystectomy and appendectomy, poor mental health was linked to adverse outcomes, including increased mortality and incidence of readmission.<sup>9,10</sup>

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Given the correlation between poor mental health and adverse surgical outcomes, there is a need to specifically characterize the overall physical and mental health in patients presenting for surgical management of IBD to optimize their operative treatment and long-term care.

The aim of this study was to use a validated patient-reported outcome (PRO) tool to characterize the baseline health of patients with IBD at time of presentation to a colorectal surgeon and to compare their health to that of patients with other colorectal diagnoses. Through this comparison, we sought to risk stratify patients presenting for surgical consultation to understand better how to effectively allocate perioperative support. We hypothesized that patient-reported physical health and mental health measures would be lower in IBD patients than patients with other colorectal diseases at this timepoint.

## MATERIALS AND METHODS

### Study Design

We conducted a retrospective review of a prospectively collected database of PROs for all patients seen in outpatient consultation to colorectal surgery clinic at Dartmouth-Hitchcock Medical Center between January 2018 and July 2019.

### PROMIS-10 Measure and Data Capture

The 10-item PROMIS Global-10 is a validated Patient Reported Outcomes Measure (PRO) developed by the National Institutes of Health (NIH) to standardize PRO reporting across studies. This measure provides a short form “bottom line” indicator of health, which is the sum of 5 domains: physical function, fatigue, pain, emotional distress, and social health.<sup>11,12</sup> All 10 items of the measure use a 5-point Likert scale. This measure generates 2 raw scores: 1 for physical health and 1 for mental health. These scores are standardized to a *T*-score using a PROMIS generated rubric. A *T*-score of 50 points is the mean for the referent US general population with a standard deviation of 10. A higher *T*-score indicates better health and a lower score indicates worse health.<sup>13</sup> Scores for each participant were calculated for physical health and mental health following the PROMIS scoring system with a *T*-score generated for each participant following completion of the measure.

All patients who present to the colorectal surgery clinic at our institution are asked to complete the PROMIS Global-10 on a tablet prior to their clinic visit, the results of which are uploaded to an ongoing database. Over 95% of patients who present to clinic complete this form. Responses were electronically integrated into each patient's medical record and subsequently integrated into an ongoing REDCap database for bowel function patient-reported outcomes (REDCap 8.10.1, ©2019 Vanderbilt University). To further characterize patients with IBD, details such as presenting symptomatology, surgical

history, and medication history were obtained via chart review. Immunomodulators included: JAK inhibitors, Anti-TNF, azathioprine, 6-MP, thiopurine, methotrexate, anti-integrins, anti-interleukins, and aminosalicylates. Steroids included prednisone and budesonide.

### Inclusion/Exclusion Criteria

We utilized demographic data from the database such as age, sex, and visit diagnosis. Patients were grouped into 4 categories which represent the most common diagnostic groups that present to the clinic: (1) IBD (eg, UC and CD), (2) benign colorectal (eg, diverticular disease, pelvic floor disorders), (3) anorectal (eg, hemorrhoidal disease, anal fistula), and (4) malignancy (colorectal cancer) (Appendix 1). Patients' charts were examined if there was uncertainty of diagnosis. Patients were excluded from the study if they were <18 years of age, did not complete a baseline questionnaire, or did not have a visit diagnosis with adequate detail to be categorized. In addition, we only included patients who presented electively for treatment of their disease. We excluded patients who presented to clinic for an initial visit following emergent surgical treatment for their disease.

### Statistical Analysis

We evaluated the interaction between mean PROMIS scores and diagnosis through ANOVA analysis and subsequent Tukey–Kramer pairwise comparison. Categorical data were presented by number and percent and continuous data were presented as mean with standard deviation. Multivariable logistic regression analysis was performed to evaluate the strength of association between poor physical health and mental health (*T*-score  $\leq 40$ , 1 standard deviation below the mean for the general population) and age, sex, and visit diagnosis. These results were presented as odds ratio (OR) with 95% confidence interval (95% CI). Statistical significance was set at  $P \leq 0.05$ . Data were recorded in Microsoft Excel 2010 (Microsoft Corporation, Washington, USA) and analyzed using Stata 15 (StataCorp, Texas, USA).

### Ethical Considerations

Study procedures were approved by the Dartmouth-Hitchcock Medical Center Committee for the Protection of Human Subjects (CPHS 29129).

## RESULTS

Eight hundred ninety-seven patients were included in the study. The mean age of the study population was  $56 \pm 17$  years and 475 participants (52.9%) were female (Table 1). ANOVA analysis revealed statistically significant differences in the mean ages of these groups. IBD patients were significantly younger than the other groups (mean age =  $42 \pm 15$  years), followed by anorectal (mean age =  $52 \pm 16$  years)

and benign colorectal (mean age = 61 ± 14 years). The malignancy group contained the oldest patients (mean age = 64 ± 13) (Table 2). The IBD group was younger than all other groups on post hoc Tukey–Kramer analysis (Table 2). There was an even distribution of male and female patients except in the benign colorectal group, which contained a predominance of female patients.

### PROMIS Physical Health

The mean PROMIS Physical Health score for all patients was 47 ± 9.4 (Table 1). The mean score for the anorectal group was highest (50.3 ± 8.9) and the mean score for the IBD group

was lowest (43.1 ± 9.2) (Fig. 1). Benign colorectal and malignancy had similar mean physical health scores (46.6 ± 9.3 and 47.4 ± 9.3, respectively). The groups were statistically different from one another on ANOVA analysis (*P* < 0.0001). On post hoc Tukey–Kramer analysis, the IBD group had a significantly lower mean physical health score (43.1 ± 9.2) compared to the other groups (Table 2). The anorectal group had the highest mean physical health score (50.3 ± 8.9) compared to the other groups.

### PROMIS Mental Health

Overall, the mean PROMIS Mental Health score for patients was 49.2 ± 9.2. The mean score for the anorectal group

**TABLE 1.** Cohort Summary and Mean PROMIS Scores

Groups	Total N = 897	Anorectal N = 378	Benign Colorectal N = 224	IBD N = 99	Malignancy N = 196	<i>P</i>
Age, mean (SD)	55.7 (16.5)	51.8 (16.4)	60.6 (14.3)	42.0 (14.9)	64.4 (12.6)	<0.0001
Sex, n (%)						0.001
Male	422 (47.1)	192 (50.8)	79 (35.3)	52 (52.5)	99 (50.5)	
Female	475 (52.9)	186 (49.2)	145 (64.7)	47 (47.5)	97 (49.5)	
PROMIS scores, mean (SD)						
Physical health	47 (9.4)	50.3 (8.9)	46.6 (9.3)	43.1 (9.2)	47.4 (9.3)	<0.0001
Mental health	49.2 (9.6)	51.0 (9.6)	48.7 (9.3)	44.6 (9.0)	48.7 (9.2)	<0.0001

**TABLE 2.** Post Hoc Tukey–Kramer Pairwise Comparisons of Age, Physical Health, and Mental Health

Groups	Mean Difference	Standard Error	<i>P</i>
<b>Age</b>			
IBD vs anorectal	−9.8	1.69	<0.001
IBD vs benign colorectal	−18.6	1.26	<0.001
IBD vs malignancy	−22.4	1.84	<0.001
Anorectal vs benign colorectal	−8.78	6.97	<0.001
Anorectal vs malignancy	−12.7	1.31	<0.001
Benign colorectal vs malignancy	−3.79	1.46	0.047
<b>PROMIS Physical Health</b>			
IBD vs anorectal	−7.2	1.03	<0.001
IBD vs benign colorectal	−3.6	1.10	0.007
IBD vs malignancy	−4.3	1.1	0.001
Anorectal vs benign colorectal	3.7	0.77	<0.001
Anorectal vs malignancy	2.9	0.80	0.002
Benign colorectal vs malignancy	−0.77	0.89	0.83
<b>PROMIS Mental Health</b>			
IBD vs anorectal	−6.31	1.06	<0.001
IBD vs benign colorectal	−4.02	1.33	0.002
IBD vs malignancy	−4.02	1.16	0.003
Anorectal vs benign colorectal	2.29	0.79	0.020
Anorectal vs malignancy	2.30	0.83	0.028
Benign colorectal vs malignancy	0.0048	0.92	1.0

was highest ( $51.0 \pm 9.6$ ) and the mean score for the IBD group was lowest ( $44.6 \pm 9.0$ ). Benign colorectal and malignancy had similar mean scores ( $48.7 \pm 9.3$  and  $48.7 \pm 9.2$ , respectively). The groups were significantly different from one another on ANOVA analysis ( $P < 0.0001$ ). Post hoc Tukey analysis demonstrated that the IBD group had a significantly lower mean PROMIS Mental Health score ( $44.6 \pm 9.0$ ) compared to the other groups. The anorectal group had the highest mean mental health scores compared to all other groups ( $51.0 \pm 9.6$ ). Benign

colorectal and malignancy patients had similar mean scores ( $48.7 \pm 9.3$  and  $48.7 \pm 9.2$ , respectively).

### Patients With IBD

The majority of patients with IBD had CD ( $n = 73$ , 74%) (Table 3). The UC group had a predominance of male patients ( $n = 18$ , 69%), but the Crohn group was fairly evenly divided by sex ( $n = 34$  male, 46.6%). Most patients had active disease ( $n = 76$ , 76.8%). Crohn patients most commonly presented with stricture ( $n = 19$ , 26%), colitis and perianal disease ( $n = 17$ , 23.3%), or colitis alone ( $n = 12$ , 16.4%). Over half of IBD patients had prior abdominal surgery ( $n = 53$ , 53.5%). The majority of these patients had Crohn ( $n = 43$ , 58.9%) and many of these had a history of bowel resection ( $n = 33$ , 45.2%). Thirty-seven patients were on immunomodulators or biologics (37.9%) and 39 were on immunosuppressants (39.4%). Seventeen of these were on both immunomodulators and immunosuppressants (17.4%). Patients with Crohn had tried a median of 3 medications (range 0–11) and patients with UC had tried a median of 4 (range 0–12).

The patients with Crohn had significantly lower Physical Health scores (41.9) than the patients with UC (CD  $41.9 \pm 9.2$  vs UC  $46.4 \pm 8.6$ ,  $P = 0.03$ ). This difference was less for mental health scores. Crohn patients had a mean score of  $44.2 \pm 9.1$  and the UC group had a mean score of  $46.0 \pm 8.6$ . Overall,

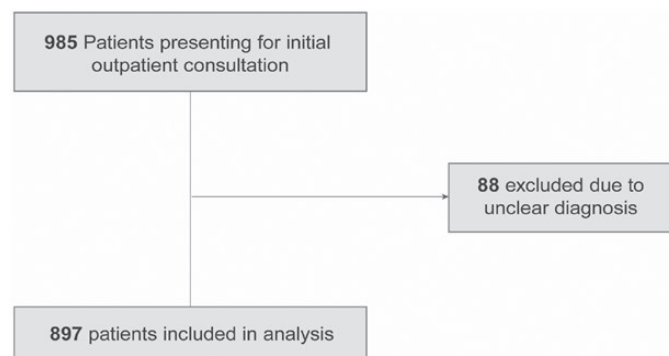


FIGURE 1. Mean physical and mental health of colorectal patients upon presentation to a surgeon.

TABLE 3. IBD Cohort Summary

Groups	Total	CD	UC	P
	N = 99	N = 73	N = 26	
Age, mean (SD)	42.0 (14.9)	42.6 (15.2)	40.4 (14.2)	0.51
Sex, n (%)				0.047
Male	52 (52.5)	34 (46.6)	18 (69.2)	
Female	47 (47.5)	39 (53.4)	8 (30.8)	
Active disease, n (%)	76 (76.8)	55 (75.3)	21 (80.8)	0.16
Crohn phenotype, n (%)				
Colitis		12 (16.4)		
Colitis and perianal disease		17 (23.3)		
Stricture		19 (26.0)		
Stenosis		11 (15.1)		
Other		14 (19.2)		
Prior abdominal surgery, n (%)	53 (53.5)	43 (58.9)	10 (38.5)	0.73
Prior bowel resection, n (%)	37 (37.4)	33 (45.2)	4 (15.4)	0.007
On biologics or immunomodulators,* n (%)	37 (37.9)	26 (35.6)	11 (42.3)	0.55
On steroids, n (%)	39 (39.4)	21 (28.8)	18 (73.1)	<0.001
On both biologics/immunomodulators and steroids, n (%)	17 (17.2)	9 (12.3)	8 (30.8)	0.032
Total no. medications tried over time, median (range)	3 (0–12)	3 (0–11)	4 (0–12)	0.65
PROMIS scores, mean (SD)				
Physical health	43.1 (9.2)	41.9 (9.2)	46.4 (8.6)	0.03
Mental health	44.6 (8.6)	44.2 (9.1)	46.0 (8.6)	0.36

\*Biologics or immunomodulators defined as: JAK inhibitors, Anti-TNF biologics, immunomodulators, anti-interleukins, anti-integrins, 5-ASA, sulfasalazine, and balsalazide.

both of these scores were significantly lower than the non IBD groups.

### Multivariable Regression

IBD patients were 4.1 times as likely to have poor physical health scores (OR 4.1, 95% CI 2.46–6.76) and almost 3 times as likely to have poor mental health scores (OR 2.9, 95% CI 1.66–5.00) compared to anorectal patients (Table 4). Benign colorectal patients were 2.0 times as likely to have worse physical health scores (OR 2.0, 95% CI 2.46–6.76). No other factors were associated with poor physical or mental health scores.

### DISCUSSION

This large, single-center study assessed the relationship between patient-reported Global Health and diagnosis upon presentation to a colorectal surgeon. We demonstrate that when presenting for surgical consultation, patients with IBD suffer from significantly worse overall physical and mental health compared to patients with other common colorectal diagnoses. In particular, both surgeons and physicians should be aware that Crohn patients are especially vulnerable to poor physical and mental health when referred for surgery. Using this information, providers can partner to engage appropriate resources to optimize surgical outcomes and long-term management of their disease.

To our knowledge, this is the first study to compare patient-reported baseline physical health between different colorectal diagnostic groups upon presentation to a surgeon. Patients with IBD had lower physical health scores than

patients in the benign colorectal, anorectal, and malignancy groups. This result reflects the severity of IBD symptoms at surgical consultation, particularly for Crohn patients who presented with problems requiring surgery such as stricture or stenosis. The benign colorectal group also had increased odds of poor physical health, but the effect size was weaker than it was for the IBD group. We believe that patients with pelvic floor disorders within the benign colorectal group may contribute to this result as those patients experience daily symptoms that reduce health-related quality of life.<sup>14</sup> It is likely that poor physical health correlates with symptom burden, so it is not surprising that elective symptomatic patients seeking surgical consultation report poor physical health.

IBD was the only group with significantly worse mean mental health scores, with patients with Crohn experiencing slightly greater burden on their mental health than patients with UC. In general, patients with IBD suffer from a greater prevalence of depression, anxiety, and suicide than the general population.<sup>15</sup> They also endure burdensome daily symptoms, such as fatigue and sleep disturbance, loss of work productivity, and chronic pain.<sup>16,17</sup> Further, physical and mental health are connected for patients with IBD. Mental health sequelae have the potential to drive disease flares, predict worse response to treatment, and even increase the likelihood of surgery.<sup>18–21</sup> Conversely, remission can drive the resolution of psychiatric symptoms.<sup>22</sup>

Patients with Crohn present with more severe physical symptoms than patients with UC possibly due to their different disease process. In their paper validating PROMIS-29 scores in patients with IBD, Ishak et al established that Crohn patients had worse physical function than UC patients, which is consistent with our study results. We add to their results using a simplified PROMIS metric, the PROMIS-10, which may be easier implemented in a clinic setting. Further, our results differ from theirs, showing that patients with Crohn at our institution have a greater mental health burden than patients with UC. Since Crohn is a life-long disease devoid of a cure, people diagnosed with Crohn are inherently at risk for worse mental health due to long term social and emotional consequences. UC patients in contrast can be cured by surgical treatment if disease modifying medications are not enough to control the disease process. Crohn patients present for surgical consultation with advanced disease but without possibility of cure and with the potential for many operations down the road. Future work should focus on elucidating what specific factors lead to this inequity in mental health among Crohn patients and how to meaningfully improve their mental health.

Currently, it is not standard of care to refer patients with IBD presenting for surgical consultation to mental health services for evaluation. However, given the poor mental health scores of Crohn patients at the outset of surgical consultation,

**TABLE 4.** Multivariable Logistic Regression for Poor Physical Health and Mental Health\* at Time of Initial Presentation to a Colorectal Surgeon, by Diagnosis Group

	Adjusted OR (95% CI) <sup>†</sup>	P
PROMIS Physical		
Benign colorectal	2.03 (1.34–3.08)	0.001
IBD	4.08 (2.46–6.75)	<0.0001
Malignancy	1.40 (0.88–2.21)	0.15
Age	1.01 (1.01–1.02)	0.14
Sex	1.09 (0.79–1.51)	0.59
PROMIS Mental		
Benign colorectal	1.60 (0.99–2.61)	0.057
IBD	2.88 (1.66–5.00)	<0.0001
Malignancy	1.49 (0.89–2.52)	0.13
Age	0.99 (0.98–1.01)	0.53
Sex	1.01 (0.70–1.46)	0.96

\*Poor physical and mental health defined as a PROMIS  $\leq 40$ , 1 standard deviation below the mean.

<sup>†</sup>Model adjusted for age and sex, anorectal group used as reference.

providers should fully capitalize on the resources available at their institutions, including but not limited to mental health referrals. Perhaps this subset of patients with IBD who need surgery are distinct from those managed medically and thus need different treatment. It is established in the literature that patients with poor mental health have worse surgical outcomes, though this connection has not been made in patients with IBD specifically.<sup>9,10</sup> Some hospitals have multidisciplinary IBD centers which provide mental health resources; integrating these services into perioperative IBD treatment has the potential to improve outcomes. Lee et al, in their paper on a multidisciplinary approach to biopsychosocial care for patients with IBD, scored patients based on PRO measured including the PROMIS-10 and, based on the results referred patients for different social work interventions.<sup>23</sup> Other studies have shown that patients with access to multidisciplinary IBD care have decreased rates of hospitalization, decreased opioid and steroid use, improved compliance, and improvements in mental health-related quality of life.<sup>24–27</sup> For hospitals without multidisciplinary IBD services, surgeons should partner with medical IBD providers to screen patients for mental health as they do for physical health, allowing for anticipatory action that can improve surgical outcomes and patient quality of life.<sup>28</sup>

We acknowledge several strengths and limitations of our study. While our study benefits from its large sample size and prospective data collection, it was performed at a single institution which may reduce its generalizability. A limitation was that we grouped diagnoses and so were not able to assess PROMIS scores for specific diseases. We did include the top diagnoses from our database that comprised each group as an [Appendix](#). We did not directly record a previous history of mental health diagnoses. But given that nearly a quarter of the general population carry a diagnosis of anxiety, and that documentation is typically unreliable, we mainly focused on the mental health scores that were calculated as part of PROMIS. Lastly, patients tend to underreport mental health issues due to fear of stigma, so the severity and incidence of mental health concerns are likely underrepresented in our study.<sup>29</sup>

## CONCLUSIONS

Colorectal surgeons and GI physicians often see patients with diagnoses of IBD, malignancy, anorectal disease, and benign colorectal disease in the course of 1 clinic day. There is not a 1 size fits all approach to treatment for such different diseases. Patients with IBD, particularly Crohn, presenting for surgical evaluation have mental health needs that are not currently addressed in our standard IBD algorithms and they may need additional support during the perioperative period. Further study is necessary to delineate which patients are at highest risk of poor mental health and could benefit most from increased support.

## SUPPLEMENTARY MATERIAL

Supplementary data are available at *Crohn's & Colitis 360* online.

## DATA AVAILABILITY

Data not publicly available.

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