Activation and Perceived Expectancies: Correlations with Health Outcomes Among Veterans with Inflammatory Bowel Disease

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OBJECTIVE: Inflammatory bowel disease imposes psychosocial stress on the patient. Patients' adaptive capacities may predict quality of life. We examined two adaptive capacity measures and their association with quality of life.

DESIGN: Cross-sectional mail survey of patients with inflammatory bowel disease. The Patient Activation Measure (PAM) assesses knowledge, skill, and confidence in self-health management. The Perceived Expectancies Index (PEI) measures perceived competence and dispositional optimism.

SETTING/PATIENTS: Four hundred and seventy-seven veterans at VA-Tennessee Valley Healthcare System.

MAIN OUTCOME MEASURE: Primary outcome was health-related quality of life (measured by the Short Inflammatory Bowel Disease Questionnaire). Bivariate analysis assessed unadjusted correlations. Sequential multivariate linear regression tested theoretical model relationships by calculating the variation in each dependent variable accounted for by independent variables (R-squared statistic).

RESULTS: Two hundred and sixty surveys were returned with usable data (54.5%). Median age was 63 years (range 19–91); 90.8% were men and 86.9% self-identified as white. Fifty percent reported having ulcerative colitis, 36.5% Crohn's disease, and 12.3% uncertain type. Unadjusted bivariate analysis revealed positive correlations between the PAM and PEI and the Short Inflammatory Bowel Disease Questionnaire (correlation coefficient=0.35 and 0.60, respectively; $p<0.0001$). Multivariate model including the PAM accounted for 26% of the variation in Short Inflammatory Bowel Disease

Questionnaire scores, while the model including the PEI accounted for 50% ($p<0.0001$).

CONCLUSIONS: There are positive, highly significant correlations between adaptive capacities and health-related quality of life in patients with inflammatory bowel disease.

KEY WORDS: psychosocial stress; inflammatory bowel disease; Veterans; health outcomes.

Abbreviations

HRQOL	health-related quality of life
MMAS	Morisky Medication Adherence Scale
PAM	Patient Activation Measure, 13-item version
PEI	Perceived Expectancies Index
SIBDQ	Short Inflammatory Bowel Disease Questionnaire
VA-TVHS	Veterans Affairs-Tennessee Valley Healthcare System

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Inflammatory bowel disease (IBD) is a chronic disease of the gastrointestinal luminal tract and is characterized by periods of remission and relapse. IBD includes ulcerative colitis, Crohn's disease, and indeterminate colitis. Relapses in IBD can manifest with symptoms such as diarrhea, abdominal pain and cramping, and intestinal obstruction; and these symptoms can impose psychosocial stress on the patient and decrease health-related quality of life (HRQOL).^{1,2} To mitigate the impact of relapses, patients with IBD often develop adaptive strategies as demonstrated in recent studies by Petrak et al. and van der Zaag-Loonen et al.^{3,4} Understanding a patient's capacity to adapt to IBD is essential to promoting beneficial health behaviors and avoiding exacerbations.⁵

To date, there have been few published studies investigating adaptive or coping capacities in IBD. Turnbull et al. reported that higher psychosocial coping capacities in IBD patients

correlated with lower psychological distress but did not correlate with IBD-specific quality of life.⁶ Among patients with quiescent IBD, Minderhoud et al. concluded that coping capacities did not correlate with the presence of irritable bowel-like symptoms.⁷ Oxelmark et al. measured coping capacities before and after conducting a patient-oriented intervention and found no significant change in coping capacities.⁸

It remains unknown whether more adaptive IBD patients engage in more beneficial health behaviors or have better clinical outcomes. We sought to address some of these knowledge gaps as a possible first step to improving patient outcomes in IBD. Our aim was to investigate whether there is an association between adaptive capacities and process-of-care and quality of life outcomes among an IBD population.

Despite the findings of the Turnbull study, our *a priori* theoretical model (Fig. 1) and its related hypotheses assumed that adaptive capacities would correlate strongly and positively with IBD-related quality of life through more active engagement in processes of care such as medication adherence and the use of self-care services. Medication adherence has been shown to affect relapse rates in ulcerative colitis⁹; thus it was a plausible means by which adaptive capacities may impact HRQOL. In other chronic diseases, patients with higher adaptive capacities are significantly more likely to use self-care services such as a health education classes,¹⁰ although our model included this as another means of relating adaptive capacities to HRQOL outcomes, use of self-care services is not known to directly affect clinical outcomes.

Our theoretical model assumed that adaptive capacities result from a combination of personal traits and experiences, with demographic variables accounting for only a small part of a person's adaptive capacities. Biological/genetic factors certainly play a role in the severity of IBD and may impact physical HRQOL, but were not included in the current study.

METHODS

Setting

VA-Tennessee Valley Healthcare System (VA-TVHS) covers a large geographical area centered in middle Tennessee and includes southern Kentucky and northern Georgia. There are

two academic-affiliated teaching hospitals (Nashville, TN and Murfreesboro, TN) and eight community-based clinics. The community-based clinics are located in Bowling Green, KY; Fort Campbell, KY; Clarksville, TN; Dover, TN; Nashville, TN; Cookeville, TN; Tullahoma, TN; and Chattanooga, TN. During fiscal year 2007, VA-TVHS cared for more than 81,000 unique veterans via approximately 656,000 outpatient visits.

Study Design and Population

The study was a cross-sectional mail survey. The initial survey was mailed in December 2007. Two weeks after the initial mailing, non-responders were sent a reminder postcard. Four weeks after the initial mailing, another copy of the survey was sent to non-responders. Surveys were provided only in English. The VA-TVHS Institutional Review Board and Research and Development Committee (Nashville, TN, USA) approved the study.

Eligible patients were over 18 years old and had an International Classification of Diseases, Ninth Revision: Clinical Modification (ICD9-CM) code for Crohn's disease (555) or ulcerative colitis (556) or a Diagnosis-Related Group (DRG) code for inflammatory bowel disease (179) coded during two outpatient visits or one inpatient stay at any VA-TVHS facility from January 1, 2000 to December 31, 2006.¹¹ Patient contact information was obtained from the VA Mid-South Quality Improvement Data Warehouse, a relational database of local and network-wide data updated monthly from the Veterans' Health Information System and Technology Architecture (Vis-TA) clinical information systems. Patients were excluded if the database indicated a date of death. A total of 477 patients met study criteria.

Survey Instruments

We used two measures of adaptive capacity, the Patient Activation Measure (PAM)^{10,12,13} and the Perceived Expectancies Index (PEI). Though these measures have not been used previously in IBD, both have been used recently in studies of other chronic diseases, including asthma, diabetes, heart failure, coronary artery disease, chronic pain, hypertension, rheumatoid arthritis, and HIV.

PAM. The 13-item short version of the Patient Activation Measure (PAM, Appendix 1) has similar validity to the original 22-item version.¹³ In both versions, the PAM assesses a healthcare-specific construct via four concepts: (1) the patient believes an active role is important; (2) the patient possesses the confidence and knowledge to take action; (3) the patient takes action; and (4) the patient actually stays the course even under stress.¹² Hibbard suggests that these concepts represent four developmental stages of activation, which are partly compatible with the transtheoretical model.^{12,14} The PAM has high reliability estimates (Cronbach's alpha=0.91). It performs well for those with and without chronic conditions and across differing levels of health status. Reliability is stable across gender and age groups. Following the method of Hibbard, scores on the PAM were transformed from the continuous Rasch item response theory logit scale to a continuous 0 to 100 score for ease of interpretation with high scores representing high activation.

Figure 1. Theoretical model correlating demographic variables, activation & perceived expectancies, process-of-care measures, and health-related quality of life.

PEI. The eight-item Perceived Expectancies Index (PEI, Appendix 2) assesses an individual's future outcome expectancies. The PEI is comprised of four items from the Self-Performance Survey¹⁵ and four items from the Life Orientation Test.¹⁶ Persons who score high on the PEI believe they are capable of doing whatever is necessary to achieve desired outcomes and that those outcomes will be positive. Perceived expectancies have been measured in healthcare settings, but the construct is not healthcare-specific. The PEI has been validated in several populations, including patients with rheumatoid arthritis and HIV, as well as healthy individuals. It has high reliability estimates (Cronbach's $\alpha=0.79$ in healthy individuals to 0.85 in patients with rheumatoid arthritis). It also has high test-retest characteristics (0.62 to 0.80; personal communication, Wallston, 2008). The PEI's eight items are scored on a Likert scale ranging from "strongly disagree" (score of 1) to "strongly agree" (score of 6), and total scores range from 8 to 48 with higher scores representing higher perceived expectancies.

Healthcare Process Measurements. As noted above in the introduction, we examined two health-related process measures — medication adherence and use of self-care services for IBD.

Medication adherence was measured via the Morisky Medication Adherence Scale (MMAS), a four-item self-reported adherence scale that was originally developed and validated in a population of patients with hypertension.¹⁷ It is analyzed as an ordinal scale (range 0–4) with higher scores indicating higher medication adherence.

We modified the measure of use of self-care services from a PAM study for our IBD population.¹⁰ It measures whether or not each of five self-care services were used over the prior 6 months. Services included VA My HealtheVet, IBD support groups, IBD reference books or articles, IBD internet sites, or IBD health-education classes. Scores are analyzed as a single variable on an ordinal scale (range 0–5) with higher scores representing use of more self-care services.

Healthcare Outcome Measurements. The primary outcome measure was IBD-specific HRQOL measured by the Short Inflammatory Bowel Disease Questionnaire (SIBDQ). The SIBDQ is a 10-item quality of life scale that has been validated in both Crohn's disease and ulcerative colitis; it performs similarly to the original 32-item IBDQ,^{18,19} which shows strong correlation with measures of disease activity,²⁰ but can be administered more quickly. The SIBDQ demonstrates good reliability (Cronbach's $\alpha=0.78$) and a test/retest stability coefficient of 0.65. The SIBDQ is responsive to changes in disease activity and has high correlation to the Simple Clinical Colitis Activity Index ($r=-0.83$) for colitis patients. Each of the SIBDQ's questions is scored on a seven-point Likert scale, yielding a final score between 10 and 70 with higher scores representing higher quality of life. The SIBDQ has four sub-domains (Systemic, Social, Bowel, and Emotional) each scored on a 1 to 7 scale.

Covariates

Important covariates collected at the time of the survey included self-reported age (continuous variable), sex, race

(white, black/African-American, Asian, native Hawaiian/Pacific Islander, or more than one race), ethnicity (Hispanic/Latino or not), highest level of education (< 8th grade, 9th to 12th grade but no diploma, high school diploma, some college, but no degree, associates or technical degree, or 4-year college degree or higher), type of IBD (Crohn's, ulcerative colitis, or unknown), and years since IBD diagnosis (0–4, 5–9, 10–14, 15–19, or > 20 years).

Statistical Analysis

Any individual survey measure was excluded from data analysis if less than 75% of the questions were completed. If the measure had enough completed items to be included but also contained unanswered items, we imputed the patient's mean from the answered items on that survey measure as the value of the unanswered items.

The PAM and PEI were each used as a single score and summarized as continuous measures. Using descriptive statistics (proportions, means, standard deviations, and ranges), we examined the distribution of the PAM, PEI, and other variables in the theoretical model. Factor analysis on the PAM and PEI examined whether the responses to the scales cluster around single domains as seen in their original validation studies. Bivariate analysis examined the PAM and PEI's Spearman rank-order correlations with each other and other variables in the theoretical model. Sequential multivariate linear regression was used to test the various relationships set out in the theoretical model. The key result from each multivariate analysis was the percentage of variation in each dependent variable accounted for by the independent variables (the R-squared statistic). The R-squared statistic was considered significant if the p-value for the F-statistic was less than 0.05. Regression coefficients with a p-value of less than 0.05 for independent variables within each model were noted as contributing statistically significant unique variance to the dependent variable. All analyses were performed with Stata/SE 9.2 for Windows (Stata Corporation, College Station, TX).

RESULTS

Of the 477 surveys mailed, 260 were returned with usable data (Fig. 2). After excluding surveys sent to incorrect addresses, to patients identified by family as dead or demented, or to

Figure 2. Patient eligibility and flow.

patients who reported no history of IBD, our response rate was 57.6% (260/451). Because we required that any individual survey measure must have at least 75% of the questions completed, there were 98.5% (256/260) with usable PAM data, 96.5% (251/260) with usable PEI data, and 96.9% (252/260) with usable SIBDQ data. Eleven of the 256 (4.3%) usable PAM survey forms were missing one or two items (9 and 2 forms, respectively), requiring imputed values; imputation was performed on 7/251 (2.8%) usable PEI surveys (6 with one missing item and 1 with two missing items) and 9/252 (3.6%) SIBDQ surveys (all missing a single item). No information was collected on the characteristics of non-responders.

Demographics

Respondent demographics are given in Table 1. The median age was 63 years (range 19 to 91 years) and 90.8% (236/260) were men. A large majority (86.9%, 226/260) self-identified as white. The highest educational level for slightly more than one-third was a high school diploma or less (36.9%, 96/260), while slightly less than one-third had some college but no degree (29.2%, 76/260) and one-third had a college or technical degree (31.9%, 83/260). Half of respondents reported having ulcerative colitis (50.0%, 130/260), 36.5% (95/260) reported having Crohn's disease, and 12.3% (32/260) had an unknown type of IBD. Self-reported duration of IBD was 31.9% (83/260) for those reporting duration of 0–9 years, 31.2% (81/260) for 10–19 years, and 33.5% (87/260) for greater than 20 years.

Table 1. Baseline Demographic and Clinical Characteristics of Survey Responders

Variable	N=260
Age Median (range)	63 (19–91)
Gender N (%)	
Male	236 (90.8%)
Female	16 (6.2%)
No response	8 (3.1%)
Race N (%)	
White	226 (86.9%)
Black/African-American	21 (8.1%)
More than one	10 (3.8%)
No response	3 (1.2%)
Hispanic/Latino N (%)	
No	170 (65.4%)
Yes	4 (1.5%)
No response	86 (33.1%)
Highest education N (%)	
1st to 8th grade	17 (6.5%)
9th to 12th but no diploma	8 (3.1%)
High school diploma	71 (27.3%)
Some college but no degree	76 (29.2%)
Associates/technical degree	28 (10.8%)
College degree	55 (21.2%)
No response	5 (1.9%)
Type of IBD N (%)	
Crohn's	95 (36.5%)
Ulcerative colitis	130 (50.0%)
Unknown	32 (12.3%)
No response	3 (1.2%)
Years since IBD diagnosis N (%)	
0 to 4 years	29 (11.2%)
5 to 9 years	54 (20.8%)
10 to 14 years	54 (20.8%)
15 to 19 years	27 (10.4%)
More than 20 years	87 (33.5%)
No response	9 (3.5%)

Factor Analysis

Because neither the PAM nor PEI has been used previously in IBD populations, factor analysis without orthogonal rotation was done to ensure that both scales loaded onto a single factor consistent with prior studies. The factor analysis revealed that the PAM loaded onto a single factor (eigenvalue=4.14). The PEI also loaded onto a single factor (eigenvalue=3.63).

Descriptive Statistics and Bivariate Correlations

Table 2 shows the descriptive statistics and bivariate correlations of survey variables. PAM scores were normally distributed with a mean of 55.7 and standard deviation (SD) of 14.2 (range 29.7 to 100.0; Fig. 3a, online). PEI scores were skewed with a mean and SD of 34.2±8.1 and interquartile range of 29–41 (overall range 11–48) but showed sufficient variability to find significant correlations (Fig. 3b, online). Use of self-care services was heavily skewed, with 34.2% using no services (score of 0), 36.1% using one service (score of 1), and only 0.5% using all possible services (score of 5). The MMAS was also heavily skewed, with only 4.0% self-reporting a score of 0 (lowest adherence), but 32.4% and 43.6% with scores of 3 and 4, respectively (highest adherence). The SIBDQ was also not normally distributed but showed reasonable variation with a mean and SD of 45.9±13.9 (range 15–70).

As seen in Table 2, there was a moderate correlation of 0.44 between the PAM and PEI. Correlations between the PAM/PEI and the use of self-care services were small but significant, while those between the PAM/PEI and the SIBDQ were larger and significant. No variable was significantly correlated with the MMAS. Bivariate correlations between the PAM or PEI and the demographic variables in the theoretical model (age, educational level, and years since IBD diagnosis) revealed small, non-significant correlation coefficients.

Multivariate Linear Regression

Sequential multivariate linear regression (Table 3) was done to test the various relationships set out in the theoretical model. The demographic variables in the model (age, education, and years since IBD diagnosis) accounted for only a small amount of the variation in PAM and PEI scores (3% and 7%, respectively). The demographic variables plus the PAM or PEI accounted for a small amount of the variation in either the use of self-care services or the MMAS (6–10%); the F-statistic was statistically significant for the model with the MMAS as the dependent variable but not for the model predicting the use of self-care services. By contrast, a large amount of the variation in the SIBDQ scores was accounted for by the preceding variables in the theoretical model. In the model that excluded the PEI, the variables age, educational level, years since IBD diagnosis, PAM, use of self-care services, and MMAS accounted for 26% of the variation in the SIBDQ. By contrast, in the model that excluded the PAM, a patient's age, educational level, years since IBD diagnosis, PEI score, use of self-care services, and MMAS accounted for 50% of the SIBDQ's variation. The F-statistic for both models was highly significant. Adding the PAM to the model containing the PEI did not account for any further variation in the SIBDQ.

The multivariate analysis controlling for demographic factors, activation or perceived expectancies, and process-of-care

Table 2. Bivariate Spearman's Rank Correlations (p-value) Between Variables in Theoretical Model (columns 1–4), Mean Score $\pm$ Standard Deviation (SD) by Survey Instrument (column 5)

Survey instrument	(1) Perceived Expectancies Index (PEI)	(2) Use of self-care services	(3) Morisky Medication Adherence Scale (MMAS)	(4) Short IBD Questionnaire (SIBDQ)	(5) Mean score $\pm$ SD
PAM	0.44 (< 0.0001)	0.16 (0.02)	0.04 (0.54)	0.35 (< 0.0001)	55.7 $\pm$ 14.2
PEI	–	0.15 (0.03)	0.05 (0.47)	0.60 (< 0.0001)	34.2 $\pm$ 8.1
Self-care	–	–	-0.03 (0.63)	-0.03 (0.71)	1.1 $\pm$ 1.1
MMAS	–	–	–	0.12 (0.07)	3.1 $\pm$ 1.1
SIBDQ	–	–	–	–	45.9 $\pm$ 13.9

Abbreviations: PEI = Perceived Expectancies Index; MMAS = Morisky Medication Adherence Scale
PAM = Patient Activation Measure; SIBDQ = Short Inflammatory Bowel Disease Questionnaire

measures was repeated using SIBDQ sub-domains as the dependent variables instead of the total SIBDQ score (Table 3). The model containing the PAM accounted for variation ranging from 17% (SIBDQ Systemic) to 26% (SIBDQ Bowel), while the PEI model accounted for more variation in every subgroup, ranging from 28% (SIBDQ Systemic) up to 50% (SIBDQ Emotional). All p-values were less than 0.0001.

DISCUSSION

This study is the first to suggest that adaptive capacities correlate positively with HRQOL outcomes in an IBD population. Our results demonstrate that activation and perceived expectancies scores correlate positively and significantly with the SIBDQ in bivariate analysis. Furthermore, multivariate models containing the PAM or PEI account for substantial variation in SIBDQ scores. Additionally, side-by-side use of the PAM and PEI has revealed an unexpected finding — the PEI which is not a healthcare-specific measure correlates more strongly with the SIBDQ and accounts for more of the variation in health-related quality of life scores than the healthcare-specific PAM. The multivariate model containing the PEI accounted for nearly twice the variation in SIBDQ scores than the PAM model (50% versus 26%, respectively). Adding the

PAM to the model with the PEI accounted for no additional variation in the SIBDQ; this suggests that the PAM's ability to account for SIBDQ variation is subsumed by the PEI and that there is no advantage administering the PAM if the PEI has already been administered to predict HRQOL. SIBDQ sub-domain analysis showed that the model containing the PAM accounted for approximately the same amount of variation in each of the sub-domains (range 17–26%), while the model with the PEI was especially good at accounting for variation in the SIBDQ Emotional sub-domain (50%).

Our finding of a positive and highly significant correlation between adaptive capacities and IBD-specific quality of life outcomes is in direct contrast to the findings of Turnbull et al.⁶ That study, published more than a decade ago, found that psychological coping capacities were not significantly correlated with IBD-specific quality of life. Turnbull et al. did find, however, that coping capacities were significantly and negatively correlated with psychological distress. Their study was limited by a very small sample size (n=22) and used a different measure of adaptive capacity, the Self-Control Schedule, than our study. Our study is also unique in that it is the first to report side-by-side comparisons of the PAM and PEI in any chronic disease.

It has previously been shown that IBD patients have decreased health-related quality of life compared with matched normal controls.^{1,2} Numerous studies have identified indepen-

Table 3. Multivariate Linear Regressions Exploring Variation in Theoretical Model

Dependent variable	Independent variables	R ²	Prob > F1	Significant variables
PAM	Age, education, IBD yrs	0.03	0.82	none
PEI	Age, education, IBD yrs	0.07	0.09	education, IBD yrs
Use of self-care services	Age, education, IBD yrs + PAM	0.08	0.16	PAM
	Age, education, IBD yrs + PEI	0.06	0.37	none
MMAS	Age, education, IBD yrs + PAM	0.10	0.01	age, IBD yrs
	Age, education, IBD yrs + PEI	0.10	0.008	age, IBD yrs
SIBDQ	Age, education, IBD yrs, self-care, Morisky MAS + PAM	0.26	<0.0001	age, IBD yrs, PAM
	Age, education, IBD yrs, self-care, Morisky MAS + PEI	0.50	<0.0001	age, IBD yrs, PEI
	Age, education, IBD yrs, self-care, Morisky MAS + PAM & PEI	0.50	<0.0001	age, IBD yrs, PEI
SIBDQ Systemic	Age, education, IBD yrs, self-care, MMAS + PAM	0.17	0.001	age, PAM
	Age, education, IBD yrs, self-care, MMAS + PEI	0.28	<0.001	age, PEI
SIBDQ Social	Age, education, IBD yrs, self-care, MMAS + PAM	0.21	0.0001	age, IBD yrs, PAM
	Age, education, IBD yrs, self-care, MMAS + PEI	0.36	<0.0001	age, IBD yrs, PEI
SIBDQ Bowel	Age, education, IBD yrs, self-care, MMAS + PAM	0.26	<0.0001	age, IBD yrs, PAM
	Age, education, IBD yrs, self-care, MMAS + PEI	0.40	<0.0001	age, IBD yrs, PEI
SIBDQ Emotional	Age, education, IBD yrs, self-care, MMAS + PAM	0.23	<0.0001	age, IBD yrs, PAM
	Age, education, IBD yrs, self-care, MMAS + PEI	0.50	<0.0001	age, IBD yrs, PEI, self-care

Abbreviations: education = educational level; IBD yrs = years since IBD diagnosis; self-care = use of self-care services; MMAS = Morisky Medication Adherence Scale

dent predictors of decreased HRQOL in IBD patients, including increased IBD symptom severity,^{19,21–30} female sex,^{21–23,26} co-existing depression and anxiety,^{29,31} and co-existing non-psychiatric medical conditions such as heart disease and arthritis.²⁹ Studies have also identified independent predictors of increased HRQOL, including decreased IBD symptom severity (achieved by either medical or surgical intervention),^{24,30,32} longer disease duration,^{23,26} higher level of education,²⁶ longer time since hospitalization,²⁶ and the presence of social support structures.³³ Despite the consensus that IBD imposes psychosocial stress and decreases HRQOL in afflicted patients, we did not know until the current study whether patients with higher adaptive capacities have better HRQOL outcomes.

The strengths of our study include the large number of survey respondents, the development of an a priori theoretical model to guide our analysis, the use of well-validated measures of activation and perceived expectancies as our measures of adaptive capacities, and the measurement of our IBD-specific quality of life outcome via the well-validated SIBDQ. There are also several limitations to the current study that should be noted. First, the study was cross-sectional; therefore, we cannot imply causality between adaptive capacities and SIBDQ outcomes. The arrows in the theoretical model may in fact be multi-directional with a reverse causal effect between HRQOL and adaptive capacities. Specifically, better HRQOL may lead to more resource utilization (from better access or other factors), which may empower, educate, and provide social support that enhances the adaptive capacities. This highlights the need for future longitudinal research in the area. Second, the population was comprised entirely of veterans, predominantly older and male, who received care in a limited geographical region (Kentucky and Tennessee); thus, our conclusions may not apply to other clinical IBD populations. Third, as all data in the study was self-reported, we do not know how non-responders may have differed from responders. In particular, responders may have higher adaptive capacities and/or higher HRQOL scores. Finally, we did not question survey recipients about history of total colectomies, which would likely be curative in ulcerative colitis; exclude patients with total colectomies; or collect data on disease activity to determine the percentage of patients in prolonged remission. Patients in remission for at least a year would likely report HRQOL similar to the general population³⁴; likewise, patients cured of ulcerative colitis by means of a total colectomy would likely report higher quality of life scores than those with active disease. Qualitative analysis of unsolicited comments from our study shows that at least 20 patients returning surveys had undergone curative total colectomies, 10 of whom completed the survey and 10 who opted not to complete the survey.

While we have demonstrated that models containing the PAM and PEI account for significant amounts of variation in SIBDQ scores, it remains unclear whether this is mediated by the use of self-care or medication adherence. Perhaps examining use of all healthcare self-care services rather than IBD-specific services would have better correlated adaptive capacities with HRQOL, especially for patients with other chronic diseases. As medication adherence is the key patient behavior necessary to avoid relapse,^{9,35} it is surprising that medication adherence was poorly correlated with other variables in the theoretical model. However, as we noted in our population,

the MMAS was heavily skewed toward high levels of adherence and thus showed limited response variability. Future research should utilize objective measures or more sensitive self-report measures of medication adherence to determine if adaptive capacities are associated with medication adherence.

In conclusion, our study demonstrates that adaptive capacities are strongly correlated with IBD-specific HRQOL. Our findings suggest that measurement of perceived expectancies may have the ability to predict future health outcomes and to identify IBD patients likely to benefit from patient-oriented interventions. Further research is needed to understand the role of adaptive capacities in IBD health outcomes, especially as these constructs may be sensitive to changes in time and disease activity. Use of short instruments such as the PAM and PEI by general internists and other providers at the point of care may be able to identify patients appropriate for more intensive self-care interventions and even tailor the content of those interventions based on individuals' adaptive capacities. Even minimal increases in patient adaptability via such interventions have the potential to dramatically improve patient outcomes.

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