

Heterogeneity in Psychological Adaptation Patterns and Its Predictive Factors Among Patients with Inflammatory Bowel Disease: A Latent Profile Analysis

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Purpose: To identify the distinct profiles of psychosocial adaptation of Chinese inflammatory bowel disease (IBD) patients and the predictive factors.

Patients and Methods: A cross-sectional survey method was used to recruit 263 IBD patients who were treated in a tertiary hospital in Shandong Province from July 2022 to April 2023. The general information questionnaire, Inflammatory Bowel Disease Psychosocial Adaptation Questionnaire, Resilience Scale for Inflammatory Bowel Disease, Chinese Benefit Finding Scale, and Stigma Scale for Chronic Illnesses, Medical Coping Modes Questionnaire and Inflammatory Bowel Disease-Disk were used as the instruments for investigation. Latent profile analysis was conducted with the six dimensions of the IBD Psychosocial Adaptation Questionnaire as the explicit indicators. The predictors of profile membership were analyzed by multinomial logistic regressions.

Results: Four profiles of psychosocial adaptation in IBD patients were identified: Low level psychosocial adaptation (14.1%), Medium level psychosocial adaptation – High body image distress (25.5%), Medium level psychosocial adaptation – Low body image distress (30.0%) and High level psychosocial adaptation (30.4%). Compared with Low level psychosocial adaptation group, High level psychosocial adaptation group had a higher level of positive cognition ($OR=2.930$, 95%IC 0.017–0.305, $p < 0.001$) and overall psychological resilience ($OR=1.832$, 95%IC 0.000–0.016, $p < 0.001$), more health behaviors ($OR=2.520$, 95%IC 0.191–1.358, $p=0.001$), a lower level of internal stigma ($OR=0.135$, 95%IC 0.043–0.420, $p < 0.001$) and overall stigma ($OR=0.010$, 95%IC 0.003–0.118, $p=0.001$), less acceptance-resignation coping style ($OR=0.055$, 95%IC 0.209–3.200, $p < 0.001$) and lower disease burden ($OR=0.407$, 95%IC 0.298–0.698, $p=0.006$).

Conclusion: About a half of IBD patients had a medium level of psychosocial adaptation. Psychological resilience, benefit finding, stigma, medical coping styles and disease burden predicted psychosocial adaptation profiles. Healthcare providers need to focus on the heterogeneity of psychosocial adaptation of IBD patients and formulate personalized intervention programs for patients with different profiles to improve their psychosocial adaptation.

Keywords: inflammatory bowel disease, latent profile analysis, psychosocial adaptation, benefit finding, resilience, coping, stigma

Introduction

Inflammatory bowel disease (IBD) is a chronic and life-threatening inflammatory disease of the gastrointestinal tissue.¹ There are two main subtypes of IBD, ie, ulcerative colitis (UC) and Crohn's disease (CD). IBD causes intestinal (e.g, abdominal pain, diarrhea, and rectal bleeding) and extra-intestinal symptoms (eg, fatigue, anemia, and arthritis).² The global disease burden of IBD has been increasing over the past few decades.³ The incidence is currently stable in Western countries.^{4,5} However, over the past decade, the incidence of IBD in the East has gradually increased, led by Asia and other recently developed and

developing countries such as China, Korea and India.^{3,6} In China, the number of IBD cases increased by 911,000 from 1990 to 2019. Due to the large population and the serious aging problem, the burden of IBD in China is expected to continue to grow in the next 25 years, and the number of IBD-related deaths will rise to about 7.57 million in 2044.⁷ According to the latest statistics, the hospitalization rate of IBD patients in China showed an upward trend from 2013 to 2018.⁸ In 2018, there were 166,000 hospitalized IBD patients in China, and the total hospitalization cost was US \$426.37 million.⁸ This greatly increases the financial and psychological stress of patients and imposes a huge financial and resource burden on the Chinese healthcare system.^{5,9} In addition, IBD is usually diagnosed in early adulthood and is currently incurable with characteristics of prolonged disease duration as well as alternating remission and recurrence, which negatively affects patients' physical function, psychosocial health, and compromises their quality of life.^{10–12}

The impacts of IBD on psychosocial health involve disease-related and general stress, depressive and anxiety symptoms, impaired daily functioning, work disruption, and social withdrawal.¹³ A systematic review showed that the pooled prevalence of anxiety symptoms and depressive symptoms in IBD patients was 1.95% and 2.22%, respectively.¹⁴ In addition, IBD patients are prone to experience a combination of abnormal psychological symptoms such as obsessive-compulsive disorder, paranoia, and hostility.¹⁵ These symptoms may lead to decreased psychosocial adaptation of IBD patients and affect their quality of life.¹⁶ Psychosocial adaptation was described by Londono & McMillan¹⁷ as a continuous process in which internal and external interactions reflect the changes individuals experience in adapting to their situation. Research suggests that psychosocial adaptation is crucial for patients' active involvement in chronic disease management¹⁸ and exerts influence on their well-being in intrapersonal, interpersonal and extrapersonal domains.¹⁹ Current studies about psychosocial adaptation were mainly conducted among cancer patients,^{20,21} adolescents,^{16,22} patients after surgery^{23,24} and patients with chronic illnesses.²⁵ Nevertheless, there are relatively few studies on the psychosocial adaptation of IBD patients.²⁶

Based on the characteristics of IBD, Wang²⁷ defined the psychosocial adaptation to IBD as the emotional experience, self-evaluation and attitude of IBD patients after diagnosis, as well as the process of adjusting individual behaviors to adapt to various social groups and norms. Different IBD patients may experience various patterns of psychosocial adaptation that suggests heterogeneity. Nevertheless, the majority of previous studies employed a variable-centered approach and measured the level of psychosocial adaptation as a composite score, which could not accurately reflect the differences between groups with various levels of psychosocial adaptation, and thus provide limited insights into related interventions. By contrast, latent profile analysis (LPA) is a person-centered approach that can classify individuals in a heterogeneous population into smaller and more homogeneous subgroups based on their values on continuous variables.²⁸ In addition, LPA can simplify the otherwise complex higher-order interactions among variables in the variable-centered analyses into a brief and simple representation.^{29,30} For this reason, LPA analysis results provide better referential value than variable-centered approach when developing tailored interventions for sub-populations to better match their needs.³¹ Accordingly, this study selected LPA to identify patterns of psychosocial adaptation among IBD patients.

Livneh¹⁹ proposed the psychosocial adaptation to chronic illness and disability framework which asserted that biophysiological status (eg, age, gender, and course of disease), psychological characteristics (eg, resilience, benefit finding, stigma, and coping strategies), and environmental features (eg, socioeconomic status) are the key factors in the process of psychosocial adaptation. Previous studies revealed the predictive effects of marriage, occupation, social support, stigma, medical coping styles and self-efficacy on psychosocial adjustment among Chinese nasopharynx cancer survivors, and head and neck cancer survivors after radiotherapy.^{32,33} In relation to IBD, a systematic review demonstrated that personality traits (eg, neuroticism and perfectionism), interpersonal traits (eg, attachment style), stress and coping strategies, emotional processing, and IBD-related cognition (eg, feeling stigmatized) were significantly associated with psychosocial adjustment among adults with IBD.³⁴ Personal resilience, family functioning and disease conditions were reported as the contributing factors of psychosocial adaptation in Chinese IBD patients.²⁶ These studies shed light on the associated factors of psychosocial adaptation in IBD patients, whereas the majority focused on a limited range of psychological factors. Furthermore, most studies used a variable-centered approach and thus probably cannot represent the influencing factors of psychosocial adaptation patterns in IBD patients.

Given limited research on a person-centered approach to explore psychosocial adaptation, this study aimed to identify the distinct profiles of psychosocial adaptation in Chinese IBD patients using LPA. Furthermore, based on the psychosocial adaptation to chronic illness and disability framework,¹⁹ this study also aimed to analyze predictors of

psychosocial adaptation latent profile membership in IBD patients by including biophysiological, psychological and environmental factors. Specifically, these factors consist of sociodemographic and disease-related information, resilience, benefit finding, stigma, medical coping styles and disease burden. The findings are expected to provide implications for healthcare providers to formulate targeted intervention programs for improving psychosocial adaptation of patients.

Materials and Methods

Design, Participants and Procedure

This study used a cross-sectional design with latent profile analysis. From July 2022 to April 2023, patients receiving treatment in the IBD specialist clinic of a tertiary hospital in Shandong Province were consecutively selected as the participants. The inclusion criteria were: (1) aged ≥ 18 years old, (2) diagnosed as IBD according to “Chinese Consensus on the diagnosis and treatment of inflammatory bowel disease”,³⁵ and (3) being conscious and able to complete the questionnaire independently or with the assistance of researchers. Exclusion criteria were: (1) duration of IBD < 3 months, (2) complicated with other serious diseases of heart, brain, kidney and other organs; and (3) was participating in other research.

By using G*Power 3.1.9 software and based on multiple regression analysis, the minimum sample size was calculated as 198, with effect size of 0.15, significance level of 0.05, power of 0.90 and 22 variables. With consideration of 20% non-response rate, the target sample size was 248. In addition, previous studies suggested a minimum sample size of 250 for LPA studies,³⁶ and a minimum profile in a large sample needs to include enough individuals (30–60) to support generalizations.³⁷ Finally, 263 patients were included in this study.

After obtaining permission from the IBD specialist clinic, two trained researchers recruited IBD patients who met the inclusion and exclusion criteria on the spot and used consistent instructions to explain the purpose and process of the study to the patients. With informed consent of the patients, the paper questionnaires were distributed and retrieved on the spot. In the meantime, with the consent and support of IBD specialized healthcare professionals, the researchers approached the potential participants online through sending a recruitment poster in the IBD patient Wechat group that was established and managed by IBD specialized healthcare professionals. The researchers distributed an electronic questionnaire via Wechat and followed the same steps with paper questionnaires to guide patients to fill out the questionnaire. When the questionnaires were returned, the researchers checked the completeness and eliminated invalid questionnaires that were featured with response time < 10 minutes and regular response patterns.

Measures

Socio-Demographic and Disease Related Questionnaire

The study collected demographic information, including sex, age, education level, marital status, permanent residence, lifestyle, occupational status, annual household income, and health care payment method. IBD-related information were also gathered, including disease type, course of disease, number of hospitalizations, history of surgery, current disease status, presence or absence of associated complications, current drug therapy, and presence or absence of comorbidity.

Inflammatory Bowel Disease Psychosocial Adaptation Questionnaire

The questionnaire developed by Chinese scholars³⁸ includes 29 items in six dimensions to specifically assess psychosocial adaptation of IBD patients. The dimensions are anxiety/depression (10 items), sleep disorder (4 items), self-efficacy (5 items), body image (3 items), social support (3 items) and attitude (4 items). The response options were quantified using a 5-point Likert scale, ie, “never”, “rarely”, “sometimes”, “often” and “always”. Higher total scores represent better overall psychosocial adaptation in IBD patients. To be noted, higher scores in anxiety/depression, sleep disorder and body image dimensions indicate lower levels of anxiety and depression, sleep disorder and body image distress, respectively. The Cronbach's α of the questionnaire was 0.941 in the present study.

Resilience Scale for Inflammatory Bowel Disease

The scale compiled by Luo³⁹ was used to measure the psychological resilience level of IBD patients during the process of coping with the disease. The scale consists of 25 items in six dimensions of disease management, active coping with difficulties, positive cognition, emotional regulation, family support and peer support. The scale used 5-point Likert

scoring method, with responses of “never” to “always” being assigned 1 to 5 points, respectively. The total score ranges from 25 to 125 points, and a higher score indicates a higher level of psychological resilience. The Cronbach’s α coefficient of the scale in this study was 0.935.

Chinese Benefit Finding Scale

The scale was adapted by Weaver et al⁴⁰ and was translated into Chinese version by Liu et al⁴¹ to evaluate patients’ perceived positive benefits as a result of experiencing adversity during disease diagnosis and treatment. The scale includes six dimensions: acceptance (3 items), family relationship (2 items), world outlook (4 items), personal growth (7 items), social relationship (3 items) and health behavior (3 items). The total score ranges from 22 to 110, with a higher score signifying the stronger benefit finding. The Cronbach’s α coefficient of the scale in this study was 0.949.

Stigma Scale for Chronic Illnesses

The scale was developed by Rao et al⁴² to measure the stigma of patients with chronic illnesses. It includes two parts: extrinsic stigma (11 items) and internal stigma (13 items). Each item was rated by 5-point Likert scale of “never”, “rarely”, “sometimes”, “often” and “always”. The total score ranges from 24 to 120 points, with a higher score suggesting a higher level of perceived stigma. The Cronbach’s α coefficient of the scale in this study was 0.950.

Medical Coping Modes Questionnaire

The questionnaire was compiled by Feifel,⁴³ and was adapted into Chinese version⁴⁴ to assess the characteristics of coping styles that patients applied in the face of diseases. The questionnaire consists of three subscales: confrontation (8 items), avoidance (7 items) and acceptance-resignation (5 items). The higher score of the subscale indicates the more likelihood of the patients adopting a certain coping style. The Cronbach’s α coefficients of the three subscales in the present study were 0.740, 0.404 and 0.875, respectively.

Inflammatory Bowel Disease-Disk

The scale was developed by Ghosh et al⁴⁵ and translated into Chinese by Liu.⁴⁶ It contains 10 items to assess the burden of IBD in ten domains, namely joint pain, abdominal pain, defecation-related problems, interpersonal communication, education and work, sleep, energy, mood, body image, and sexual function. Each item was assessed on a visual analogue scale from 0 to 10, with 0 indicating “strongly disagree”, 5 indicating “neither agree nor disagree”, and 10 indicating “strongly agree”. The total score of the scale is 0–100, with a score greater than 40 indicating a greater burden of disease and a lower quality of life. The Cronbach’s α coefficient of the scale in this study was 0.840.

Data Analyses

SPSS 26.0 and Mplus8.3 software was applied to analyze the data. For scales with several dimensions that contain different items, the mean score of items was calculated for analysis. Enumeration data were described by the number of cases and percentage. The chi-squared test or Fisher exact probability method was used for comparing classified disordered variables, and the Kruskal–Wallis H -test was used for comparing ordered variables. Continuous data were described as mean (M) \pm standard deviation (SD). In the post hoc multiple comparisons of chi-squared test, the test level was corrected by chi-square segmentation, and $p < 0.017$ was considered statistically significant. By using Mplus 8.3 software, LPA was conducted to identify subgroups of psychological adaptation of IBD patients, with the item mean scores in the six dimensions of psychosocial adaptation as the explicit variables. The model fitting indices including Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted BIC (aBIC) and Entropy (0–1) were used to evaluate the accuracy of classification. In the LPA, the values of AIC, BIC and aBIC were smaller, and the entropy value is closer to 1, indicating a better fit of the model. Entropy >0.800 suggests that the accuracy of classification is 90%. The Lo-Mendell-Rubin (LMR) and the Bootstrap Likelihood Ratio test (BLRT) were applied to evaluate the fitting differences of the latent profile model. If all p -values reached the significant level ($p < 0.05$), it indicates that the model with k categories was significantly better than the model with $k-1$ categories.³⁶ Apart from the indices, the actual meaning of the profile was also considered when determining the number of profiles. Subsequently, Three-step (R3STEP) command in Mplus was performed to model the predictors of profile membership. This command

enables a series of multinomial logistic regressions that assess whether an increase in an independent variable results in a higher probability of a person belonging to one profile over another.^{47,48}

Ethical Considerations

The study complied with the Declaration of Helsinki and was approved by the Ethics Committee of Medical College of Qingdao University (approval No.: QDU-HEC-2022195). All the participants signed informed consent.

Results

Tests for Common Method Bias and Multicollinearity

Given that the data were collected by self-report methods, Harman's univariate test was performed prior to data analysis using exploratory factor analysis to detect common method bias. The results showed that five factors had eigenvalues greater than 1, explaining 68.05% of the variance. The first factor explained 37.89% of the variance, which was below the critical value of 40%.⁴⁹ Therefore, there was no significant common method bias in this study.

For predictive analysis, multicollinearity diagnosis among observed variables was performed. The results showed that the tolerance index of each model was less than 1, and the variance inflation factors (VIF) of independent variables (ie, psychological resilience, benefit finding, stigma, medical coping and IBD burden) were 1.283–5.464. According to the common rule of thumb that a VIF of 10 or above as a cutoff value for a large multicollinearity problem,⁵⁰ the results indicate that there is no significant multicollinearity problem among the independent variables involved in the five scales in the present study.

Participant Characteristics

In this study, a total of 270 questionnaires were distributed while seven invalid questionnaires were removed, and thus 263 valid questionnaires were retained, with an effective response rate of 97.41%. The age of 263 IBD patients was (43.71±14.60) years old. The majority of the patients were diagnosed as UC (74.9%) and 25.1% were CD. At investigation, 71.1% of the patients reported that they were in remission stage and 28.9% were in recurrence stage. The other information is shown in [Table 1](#).

Item Mean Score, Standard Deviation and Correlation of Variables

The item mean scores, standard deviations, and correlations of the studied variables are shown in [Table 2](#). Except medical coping style and its two dimensions (ie, confrontation and avoidance), other variables including psychological resilience and its dimensions, benefit finding and its dimensions, stigma, acceptance-resignation coping, and IBD burden were significantly correlated with overall psychosocial adaptation as well as its six dimensions ($p < 0.01$). Of these correlations, psychological resilience and benefit finding were positively correlated with psychosocial adaptation.

Selection of Profile

The fitting indices for the different latent profile structures are shown in [Table 3](#). As the number of profiles increased, lower Loglikelihood (LL), AIC, BIC, aBIC and significant BLRT were presented until the number reached 8. The 4-profile categories were selected because it provided lower LL, AIC, BIC, and aBIC, along with significant LMR and BLRT values, which indicated a significant improvement in the fit index compared to the k-1 categories (ie, the three-profile). Simultaneously, its Entropy value was >0.8 , suggesting that the model containing 4 potential profiles can fully describe the category information of psychosocial adaptation in IBD patients with high reliability. Although five or more profiles have better fitting indices in terms of LL, AIC, BIC, aBIC, and entropy with significant BLRT values, their LMR values were insignificant. In addition, within five or more profiles, some profile sizes were less than 30 and accounted for below 5% of the total sample, which influenced their representation. Therefore, four-profile model of psychosocial adaptation was the best categorization.

Table I General Information of Patients with Inflammatory Bowel Disease and Their Differences in Psychosocial Adaptation Latent Profile [N=263, Cases (Percentage, %)]

Variables		n (%)	Profiles				$\chi^2/IH/F$	p
			C1 (n=37)	C2 (n=67)	C3 (n=79)	C4 (n=80)		
Sex	Male	138 (52.500)	19 (51.400)	33 (49.300)	47 (59.500)	39 (48.800)	2.303 ^b	0.512
	Female	125 (47.500)	18 (48.600)	34 (50.700)	32 (40.500)	41 (51.200)		
Age(years)	18~	123 (46.800)	21 (56.800)	34 (50.700)	38 (48.100)	30 (37.500)	6.337 ^c	0.096
	41~	97 (36.900)	12 (32.400)	28 (41.800)	24 (30.400)	33 (41.300)		
	≥60	43 (16.300)	4 (10.800)	5 (7.500)	17 (21.500)	17 (21.300)		
Education	Primary school	15 (5.700)	2 (5.400)	2 (3.000)	6 (7.600)	5 (6.300)	0.267 ^c	0.966
	Junior middle school	58 (22.100)	8 (21.600)	15 (22.400)	19 (24.100)	16 (20.000)		
	High school or equivalent	62 (23.600)	7 (18.900)	16 (23.900)	17 (21.500)	22 (27.500)		
	Associate degree	40 (15.200)	8 (21.600)	14 (20.900)	10 (12.700)	8 (10.000)		
	Bachelor degree or above	88 (33.500)	12 (32.400)	20 (29.900)	27 (34.200)	29 (36.300)		
Marital status	Unmarried	50 (19.000)	9 (24.300)	13 (19.400)	18 (22.800)	10 (12.500)	3.618 ^b	0.306
	Married	213 (81.000)	28 (75.700)	54 (80.600)	61 (77.200)	70 (87.500)		
Residence	Urban area	200 (76.000)	32 (86.500)	50 (74.600)	53 (67.100)	65 (81.300)	6.957 ^b	0.073
	Rural area	63 (24.000)	5 (13.500)	17 (25.400)	26 (32.900)	15 (18.800)		
Living arrangement	Living alone	28 (10.600)	6 (16.200)	10 (14.900)	8 (10.100)	4 (5.000)	8.538 ^d	0.180
	Living with family	219 (83.300)	28 (75.700)	52 (77.600)	69 (87.300)	70 (87.500)		
	Living in school or work dormitory	16 (6.100)	3 (8.100)	5 (7.500)	2 (2.500)	6 (7.500)		
Occupation	Student	20 (7.600)	4 (10.800)	4 (6.000)	4 (5.100)	8 (10.000)	9.037 ^d	0.700
	Full time job	167 (63.500)	24 (64.900)	43 (64.200)	51 (64.600)	49 (61.300)		
	Farmer	15 (5.700)	2 (5.400)	5 (7.500)	6 (7.600)	2 (2.500)		
	Unemployment	16 (6.100)	3 (8.100)	6 (9.000)	3 (3.800)	4 (5.000)		
	Retirement	45 (17.100)	4 (10.800)	9 (13.400)	15 (19.000)	17 (21.300)		
Annual household income (ten thousand yuan)	<3	53 (20.200)	10 (27.000)	16 (23.900)	16 (20.300)	11 (13.800)	4.804 ^c	0.187
	3~	76 (28.900)	11 (29.700)	18 (26.900)	23 (29.100)	24 (30.000)		
	5~	75 (28.500)	11 (29.700)	20 (29.900)	23 (29.100)	21 (26.300)		
	>10	59 (22.400)	5 (13.500)	13 (19.400)	17 (21.500)	24 (30.000)		
Medical payment method	Self-payment	34 (12.900)	7 (18.900)	10 (14.900)	8 (10.100)	9 (11.300)	2.168 ^b	0.538
	Medical insurance	229 (87.100)	30 (81.100)	57 (85.100)	71 (89.900)	71 (88.800)		

(Continued)

Table 1 (Continued).

Variables		n (%)	Profiles				χ^2 /H/F	p
			C1 (n=37)	C2 (n=67)	C3 (n=79)	C4 (n=80)		
Diagnosis	Ulcerative colitis	197 (74.900)	27 (73.000)	47 (70.100)	62 (78.500)	61 (76.300)	1.494 ^b	0.684
	Crohn's Disease	66 (25.100)	10 (27.000)	20 (29.900)	17 (21.500)	19 (23.800)		
Duration of disease	3 months ~	23 (8.700)	1 (2.700)	6 (9.000)	7 (8.900)	9 (11.300)	7.879 ^d	0.546
	1 year~	123 (46.800)	22 (59.500)	29 (43.300)	36 (45.600)	36 (45.000)		
	5 years~	61 (23.200)	10 (27.000)	13 (19.400)	19 (24.100)	19 (23.800)		
	>10 years	56 (21.300)	4 (10.800)	19 (28.400)	17 (21.500)	16 (20.000)		
Number of hospitalizations (times)	≤5	176 (66.900)	23 (62.200)	45 (67.200)	55 (69.600)	53 (66.300)	4.725 ^d	0.581
	5~	64 (24.300)	13 (35.100)	14 (20.900)	17 (21.500)	20 (25.000)		
	>10	23 (8.700)	1 (2.700)	8 (11.900)	7 (8.900)	7 (8.800)		
Surgery	Yes	32 (12.200)	1 (2.700)	10 (14.000)	9 (11.400)	12 (15.000)	4.515 ^d	0.209
	No	231 (87.800)	36 (97.300)	57 (85.100)	70 (88.600)	68 (85.000)		
Current disease status	Remission	187 (71.100)	24 (64.900)	42 (62.700)	57 (72.200)	64 (80.000)	6.135 ^b	0.105
	Recurrence	76 (28.900)	13 (35.100)	25 (37.300)	22 (27.800)	16 (20.000)		
Complications	Yes	49 (18.600)	8 (21.600)	21 (31.300)	12 (15.200)	8 (10.000) ^a	11.909 ^b	0.008
	No	214 (81.400)	29 (78.400)	46 (68.700)	67 (84.800)	72 (90.000) ^a		
Medications	Yes	258 (98.100)	37 (100.000)	65 (97.000)	78 (98.700)	78 (97.500)	1.249 ^d	0.814
	No	5 (1.900)	0	2 (3.000)	1 (1.300)	2 (2.500)		
Comorbidities	Yes	67 (25.500)	9 (24.300)	27 (40.300)	14 (17.700) ^a	17 (21.300)	11.034 ^b	0.012
	No	196 (74.500)	28 (75.700)	40 (59.700)	65 (82.300) ^a	63 (78.800)		

Notes: ^aCompared with C2, the difference was statistically significant ($p < 0.017$); ^b χ^2 value; ^cH value; ^dFisher's exact test.

Abbreviations: C1=Low level psychosocial adaptation profile; C2=Medium level psychosocial adaptation-High body image distress profile; C3=Medium level psychosocial adaptation-Low body image distress profile; C4=High level psychosocial adaptation profile.

Profile Characteristics

The profile characteristics of psychosocial adaptation in IBD patients are shown in Figure 1. The four profiles were labeled based on their characterizing patterns of psychosocial adaptation. The “Low level psychosocial adaptation” profile accounted for the smallest proportion of the participants (14.1%) and exhibited the lowest level of psychosocial adaptation across the six dimensions. The “High level psychosocial adaptation” profile comprised 30.4% of the participants, which was featured by the highest scores in the six dimensions. The other two profiles were at medium level of psychosocial adaptation. Because the two profiles differed the most in the body image dimension, they were labeled as “Medium level psychosocial adaptation - High body image distress” group and “Medium level psychosocial adaptation-Low body image distress” group, respectively. The two profiles accounted for 25.5% and 30.0% of the participants, respectively.

Comparison of Different Profiles in Sociodemographic and Disease Data

As displayed in Table 1, whether suffering from complications and comorbidities showed significant difference among the four profiles of IBD patients. The results of post hoc multiple comparisons evinced a significant difference between “High level psychosocial adaptation” profile and “Medium level psychosocial adaptation-High body image distress” profile with respect to whether patients having complications or not ($p=0.001$). Simultaneously, “Medium level

Table 2 Item Means, Standard Derivations, and Correlations of All Variables (N = 263)

Variables	M(SD)	Attitude	Body Image	Anxiety / Depression	Sleep Disorders	Self-efficacy	Social Support	Total Scores
Total score of psychosocial adaptation	3.451 (0.750)	0.753**	0.846**	0.931**	0.719**	0.546**	0.500**	–
Attitude	3.240 (0.912)							
Body image	3.858 (1.202)	0.571**	–					
Anxiety /Depression	3.313 (1.052)	0.595**	0.809**	–				
Sleep disorders	3.322 (0.954)	0.448**	0.591**	0.658**	–			
Self-efficacy	3.878 (0.682)	0.443**	0.327**	0.338**	0.200**	–		
Social Support	3.246 (1.042)	0.381**	0.272**	0.319**	0.145*	0.434**	–	
Total score of psychological resilience	3.649 (0.716)	0.631**	0.635**	0.630**	0.454**	0.571**	0.563**	0.765**
Family support	4.189 (0.868)	0.261**	0.339**	0.289**	0.260**	0.279**	0.372**	0.382**
Peer support	2.889 (1.230)	0.232**	0.236**	0.244**	0.159**	0.212**	0.457**	0.323**
Disease self-management	3.912 (0.716)	0.481**	0.458**	0.434**	0.268**	0.678**	0.364**	0.572**
Positive cognition	3.691 (0.986)	0.635**	0.675**	0.696**	0.503**	0.484**	0.457**	0.784**
Regulation of emotion	3.562 (0.990)	0.586**	0.551**	0.574**	0.410**	0.422**	0.449**	0.669**
Active coping with difficulties	3.606 (0.855)	0.573**	0.547**	0.521**	0.389**	0.530**	0.459**	0.656**
Total score of benefit finding	2.734 (0.877)	0.328**	0.327**	0.307**	0.241**	0.436**	0.466**	0.435**
Acceptance	2.866 (1.146)	0.352**	0.288**	0.292**	0.264**	0.336**	0.368**	0.400**
Family relations	3.171 (1.237)	0.212**	0.159**	0.185**	0.154*	0.244**	0.321**	0.263**
World view	2.172 (1.000)	0.181**	0.227**	0.191**	0.153*	0.218**	0.316**	0.267**
Personal growth	2.636 (1.086)	0.278**	0.319**	0.288**	0.233**	0.399**	0.420**	0.402**
Social relations	2.498 (1.003)	0.260**	0.218**	0.192**	0.151*	0.248**	0.434**	0.300**
Health behaviors	3.522 (1.086)	0.301**	0.288**	0.290**	0.160**	0.616**	0.361**	0.415**
Total IBD stigma score	1.744 (0.691)	–0.428**	–0.613**	–0.685**	–0.416**	–0.312**	–0.271**	–0.666**
Internal stigma	2.095 (0.909)	–0.469**	–0.662**	–0.750**	–0.458**	–0.320**	–0.270**	–0.720**
External stigma	1.328 (0.560)	–0.255**	–0.381**	–0.460**	–0.242**	–0.227**	–0.212**	–0.411**
Total score of medical coping modes	2.246 (0.312)	–0.202**	–0.345**	–0.431**	–0.271**	0.095	0.089	–0.319**
Confrontation	2.356 (0.569)	0.099	0.062	–0.001	–0.028	0.365**	0.383**	0.135*
Avoidance	2.315 (0.461)	0.067	–0.111	–0.090	–0.002	0.052	0.009	–0.041**
Acceptance-resignation	1.973 (0.800)	–0.484**	–0.521**	–0.605**	–0.391**	–0.312**	–0.306**	–0.621**
Total score of IBD burden	3.260 (2.289)	–0.509**	–0.599**	–0.671**	–0.559**	–0.319**	–0.266**	–0.695**

Notes: * $p < 0.05$, ** $p < 0.01$.

Abbreviations: M, mean; SD, Standard deviation.

Table 3 The Fitting Indices of Latent Profile Model of Psychosocial Adaptation in Patients with Inflammatory Bowel Disease

No. of Profiles	LL	FP	AIC	BIC	aBIC	Entropy	LMR(p)	BLRT(p)	Probability of Profile
1	-2171.389	12	4366.779	4409.645	4371.599	—	—	—	
2	-1923.658	19	3885.315	3953.186	3892.947	0.896	<0.001	<0.001	0.600/0.400
3	-1844.977	26	3741.955	3834.831	3752.398	0.841	0.0013	<0.001	0.255/0.383/0.391
4	-1792.161	33	3650.322	3768.203	3663.577	0.866	0.029	<0.001	0.142/0.247/0.304/0.305
5	-1765.325	40	3610.650	3753.536	3626.717	0.897	0.414	<0.001	0.102/0.068/0.319/0.217/0.293
6	-1718.300	47	3530.600	3698.491	3549.479	0.945	0.269	<0.001	0.057/0.202/0.103/0.106/0.217/0.316
7	-1697.851	54	3503.702	3696.599	3525.393	0.918	0.433	<0.001	0.106/0.027/0.209/0.213/0.057/0.209/0.179
8	-1679.360	61	3480.719	3698.621	3505.221	0.922	0.446	<0.001	0.053/0.122/0.110/0.198/0.099/0.027/0.186/0.205

Abbreviations: LL, log-likelihood; FP, free parameters; AIC, Akaike information criteria; BIC, Bayesian information criteria; aBIC, adjusted BIC; LMR =Lo-Mendell-Rubin; BLRT, bootstrapped likelihood ratio tests.

psychosocial adaptation – Low body image distress” profile and “Medium level psychosocial adaptation – High body image distress” profile were significantly different in the presence or absence of comorbidities ($p=0.002$).

Predictors of Latent Profile Membership

Table 4 presents the R3STEP results of predictive factors of psychosocial adaptation profile membership. Using the “Low level psychosocial adaptation” profile as the reference group, the “Medium level psychosocial adaptation-High body image distress” profile had a higher level of overall psychological resilience and positive cognition, while “Medium level psychosocial adaptation – Low body image distress” profile had a higher level of overall psychological resilience, family support, and positive cognition, lower internal stigma, less avoidance coping mode and acceptance-resignation coping

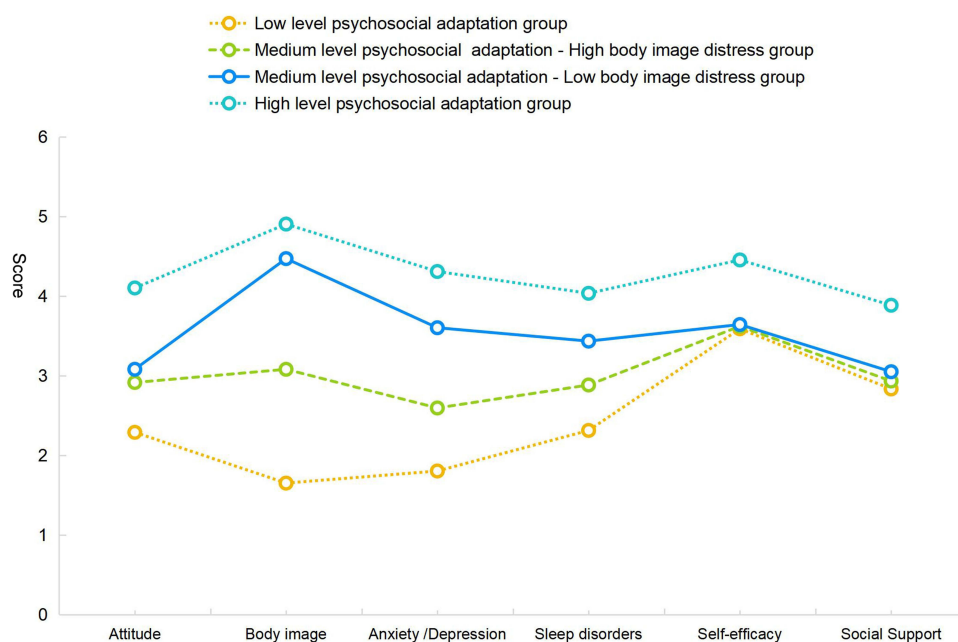
**Figure 1** Characteristics of four latent profiles of psychological adaptation in patients with inflammatory bowel disease.

Table 4 Three-Step Results of Predictors of Latent Profiles

Profile Comparison	C2 vs C1 (OR, 95% CI, p)	C3 vs C1 (OR, 95% CI, p)	C4 vs C1 (OR, 95% CI, p)	C3 vs C2 (OR, 95% CI, p)	C4 vs C2 (OR, 95% CI, p)	C4 vs C3 (OR, 95% CI, p)
Complications	0.426	−0.326	−0.940	−0.754	−1.366** (0.255, 1.437–8.858, 0.008)	−0.613
Comorbidities	0.764	−0.370	−0.002	−1.134* (0.322, 0.166–0.776, 0.012)	−0.766	0.369
Total score of psychological resilience	2.590* (1.925, 0.031–0.369, 0.019)	3.882*** (1.979, 0.008–0.136, 0.001)	6.776*** (1.832, 0.000–0.016, 0.001)	1.292* (1.054, 0.106–0.839, 0.029)	4.186*** (1.183, 0.006–0.107, 0.001)	2.895*** (1.109, 0.028–0.257, 0.001)
Family support	0.232	0.753* (2.123, 1.092–4.802, 0.029)	0.016	0.520* (1.682, 1.099–3.754, 0.038)	−0.216	−0.736
Peer support	0.207	0.001	0.078	−0.207	−0.129	0.078
Disease self-management	0.136	−0.217	1.184	−0.353	1.048	1.401* (2.058, 1.814–2.551, 0.037)
Positive cognition	1.304* (3.684, 0.108–0.844, 0.014)	2.013*** (2.487, 1.096–10.661, 0.001)	4.173*** (2.930, 0.017–0.305, 0.001)	0.709	2.869*** (2.624, 1.267–3.789, 0.001)	2.160** (1.323, 0.971–3.628, 0.05)
Regulation of emotion	−0.078	−0.024	0.065	0.053	0.142	0.089
Active coping with difficulties	0.981	0.887	1.404	−0.094	0.425	0.519
Total score of benefit finding	0.275	−0.132	0.138	−0.407	−0.137	0.270
Acceptance	0.034	−0.170	0.588	−0.204	0.554	0.758* (2.058, 1.814–2.551, 0.037)
Family relations	−0.020	−0.111	−0.132	−0.091	−0.112	−0.021
World view	1.745	1.449	1.275	−0.296	−0.470	−0.174
Personal growth	0.222	0.536	0.276	0.314	0.054	−0.260
Social relations	−0.044	−0.089	−0.162	−0.045	−0.118	−0.073
Health behaviors	−0.118	−0.016	0.924** (2.520, 0.191–1.358, 0.001)	0.102	1.042*** (1.415, 0.253–1.422, 0.001)	0.940*** (2.560, 0.352–1.405, 0.001)
Total IBD stigma score	0.518	−1.373	−4.582** (0.010, 0.003–0.118, 0.001)	−1.891*** (0.151, 0.068–0.436, 0.001)	−5.100*** (0.006, 0.002–0.072, 0.001)	−3.209** (0.040, 0.017–0.342, 0.005)
Internal stigma	−0.035	−2.006*** (0.135, 0.043–0.420, 0.001)	−4.492*** (0.011, 0.003–0.075, 0.001)	−1.971*** (0.139, 0.048–0.313, 0.001)	−4.457*** (0.012, 0.003–0.059, 0.001)	−2.487*** (0.122, 0.052–0.276, 0.001)
External stigma	0.362	0.503	−0.128	0.141	−0.490	−0.631

Total score of medical coping modes	−0.303	−1.340	−1.181	−1.037	−0.877	0.160
Confrontation	0.377	−0.408	0.352	−0.786* (0.315, 0.243–1.218, 0.001)	−0.026	0.760
Avoidance	−0.345	−1.294** (0.274, 0.121–2.530, 0.008)	−0.684	−0.949	−0.339	0.610
Acceptance-resignation	−0.244	−1.400*** (0.247, 0.217–1.608, 0.001)	−2.905*** (0.055, 0.209–3.200, 0.001)	−1.156** (0.315, 0.243–1.218, 0.001)	−2.661*** (0.070, 0.225–2.518, 0.001)	−1.505* (0.222, 0.502–3.819, 0.011)
Total score of IBD burden	−0.130	−0.524** (0.592, 0.433–0.854, 0.003)	−0.899** (0.407, 0.298–0.698, 0.006)	−0.394** (0.674, 0.531–0.889, 0.006)	−0.769* (0.463, 0.360–0.737, 0.012)	−0.375

Notes: Values in the table are estimates through the R3STEP logistic regression analyses using Mplus. Positive values indicate that the antecedent makes an individual more likely to be classified into the first latent profile than the second latent profile; Negative values indicate the opposite. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Abbreviations: C1, Low level psychosocial adaptation profile; C2, Medium level psychosocial adaptation-High body image distress profile; C3, Medium level psychosocial adaptation -Low body image distress profile; C4, High level psychosocial adaptation profile.

mode, and a lower degree of disease burden. In the meantime, the “High level psychosocial adaptation” profile had a higher level of overall psychological resilience and positive cognition, more health behaviors, a lower level of overall stigma and internal stigma, less acceptance-resignation coping mode and a lower degree of disease burden. Compared with the “Medium level psychosocial adaptation-High body image distress” profile, the “Medium level psychosocial adaptation – Low body image distress” profile had fewer comorbidities, a higher level of overall psychological resilience and family support, a lower degree of overall stigma and internal stigma, less acceptance-resignation coping mode and a lower degree of disease burden. The “High level psychosocial adaptation” profile had fewer IBD complications, a higher level of overall psychological resilience, and positive cognition, more health behaviors, a lower degree of overall stigma and internal stigma, less acceptance-resignation coping mode and a lower degree of disease burden. Compared with the “Medium level psychosocial adaptation – Low body image distress” profile, the “High level psychosocial adaptation” profile had a higher level of overall psychological resilience and disease self-management, more acceptance and health behaviors, a lower degree of overall stigma, and less acceptance-resignation coping style.

Discussion

The psychosocial adaptation of IBD patients was classified into four distinct latent profiles, revealing significant heterogeneity in the level of psychosocial adaptation of IBD patients. The study showed that 14.2% of the patients belong to the Low level psychosocial adaptation profile while the remaining were in the High level or Medium level profiles, indicating that most IBD patients had a moderate-high level of psychosocial adaptation. In particular, two profiles were characterized by body image. These results suggest that healthcare providers including nurses need to identify the heterogeneity of psychosocial adaptation among IBD patients and take a personalized approach to promoting their psychosocial adaptation in practice.

The Relationship Between Comorbidities, Complications, Body Image, Stigma and Psychosocial Adaptation in IBD

Comorbidities and complications were the significant variables in profile comparisons by using chi-squared tests. In particular, the results of R3STEP showed that IBD patients with complications were more likely to be classified into the Medium level psychosocial adaptation-High body image distress profile, which is consistent with the findings of Archer et al.⁵¹ This suggests that most IBD patients with complications had a moderate level of psychosocial adaptation, while they were greatly troubled by body image. This may be related to the side effects of long-term medications, including immunosuppressants and hormones, leading to impaired body image in patients, such as weight gain, alopecia, and moon face.⁵² Hypogonadism, gastrointestinal fistula, permanent stoma, short bowel syndrome, gastrointestinal and extra-intestinal dysplasia or cancer are also complications that cause body image disturbance in IBD patients.^{53–55} In addition, studies have shown that comorbidities such as surgery and obesity can cause impaired body image of IBD patients, leading to patients’ poor psychosocial adaptation.^{56,57} Furthermore, the four profiles of psychosocial adaptation in IBD patients differed most prominently in the dimension of body image, suggesting that the levels of body image distress in IBD patients substantially affect their psychosocial adaptation.⁵⁸ Besides, the body image distress partially contributed to feelings of stigma in IBD patients, along with the embarrassing symptoms of IBD (eg, urgency of defecation and hyperactivity of bowel sounds) and perceived public awareness of the disease.⁵⁹ In the present study, patients in the “High level psychosocial adaptation” profile had a lower level of IBD disease stigma especially internal stigma, compared to the other three profiles. Research showed that more body image dissatisfaction increased higher levels of perceived stigma⁶⁰ that can lead to poor psychosocial adjustment of patients.⁶¹

Supported by previous research, the present study demonstrate that the psychosocial adaptation profile of IBD patients is closely related to comorbidities, complications, body image distress and stigma, which need to be recognized early for timely taking effective measures. To be specific, focus on addressing body image distress and stigma for IBD patients in the Low level psychosocial adaptation profile and Medium level psychosocial adaptation-High body image distress profile could be the intervention target for improving psychosocial adaptation in these patients. One study showed that more knowledge about the symptoms and complications of IBD was positively associated with reduced stigma.⁶² In addition, emotional control, social

support, and disease control are conducive to reducing stigma.⁵⁹ Therefore, healthcare providers can make efforts to enable IBD patients in the Low level psychosocial adaptation profile and Medium level psychosocial adaptation-High body image distress profile to obtain a well understanding of IBD to attenuate associated stigma. For instance, for patients with impaired body image due to long-term hormone intake, healthcare providers including nurses could timely deliver health education around management of medication side effects, such as supply of high-quality protein food and high potassium fruits and vegetables to reduce edema.⁶³ Additionally, prevention of complications for IBD patients is recommended through a multidisciplinary approach involving surgeons, dietitians, radiologists, pathologists and consultants in infectious diseases.⁶⁴ Studies have shown that early diagnosis and prompt treatment are the cornerstone for improving outcomes and maximizing mental health status for IBD patients.¹⁰ Importantly, the risk stratification of IBD disease severity according to clinical symptoms, complications and comorbidities is beneficial to guiding the selection of first-line treatment,¹⁰ and addressing the factors causing body image disturbance promptly, which could effectively reduce patients' stigma and thus improve their psychosocial adaptation.

The Relationship Between Anxiety/Depression, Psychological Resilience and Psychosocial Adaptation in IBD

The latent profile analysis showed that anxiety/depression were predictors of the level of psychosocial adaptation in IBD patients, which aligns with the findings of Bannon et al.⁶⁵ Compared with the general population, there is an increased risk of anxiety and depression among IBD patients,⁶⁶ whereas high psychological resilient IBD patients had lower incidences of anxiety and depression.⁶⁷ Psychological resilience serves as a protective factor against the development of anxiety and depression.⁶⁸ In the present study, patients in the "High level psychosocial adaptation" profile had a higher level of overall psychological resilience and positive cognition compared to the other three profiles. In view of this, promoting psychological resilience could benefit IBD patients with low levels of psychosocial adaptation and anxiety/depression. Furthermore, family support and positive cognition of IBD were the predictors of Low level psychosocial adaptation profile and the Medium level psychosocial adaptation – high body image distress profile. Research reported that the implementation of family-centered intervention effectively improved the negative emotions of IBD patients and improved their psychological resilience.⁶⁹ Therefore, healthcare providers need to encourage family members to actively participate in the patient's treatment decision-making, and equip family members to be competent caregivers for boosting IBD patients' psychosocial adaptation. Furthermore, positive disease cognition and disease self-management ability were predictors of Medium level psychosocial adaptation-Low body image distress profile. In the digital health times, Young et al⁷⁰ reported that the use of mobile e-health technology can effectively improve the self-management ability of patients with type 2 diabetes. This provides implications for healthcare professionals to offer remote health guidance for IBD patients through mobile electronic health information technology to improve their cognition of the disease and self-management ability, that help patients achieve a high level of psychosocial adaptation.

The Predictive Effects of Benefit Finding, Medical Coping Modes, Disease Burden on Psychosocial Adaptation Profiles

IBD patients in the Medium psychosocial adaptation-Low body image distress profile, Medium psychosocial adaptation-High body image distress profile and Low level psychosocial adaptation profile had less health behaviors, more avoidance as well as acceptance-resignation medical coping styles, and higher levels of disease burden than those in the High level psychosocial adaptation profile. Studies have shown that cognitive behavioral therapy (CBT) can improve avoidance behavior and benefit finding in patients with Parkinson's disease.⁷¹ CBT can effectively improve the coping ability and psychosocial adaptation of patients with gastrointestinal diseases.⁷² Bennebroek et al⁷³ illustrated that IBD-specific CBT encompassing a cognitive intervention on illness beliefs, dysfunctional attitudes, and relapse-prevention plans, was effective in improving quality of life by reducing disease burden among IBD patients. Healthcare professionals could draw on these evidence to apply CBT to help IBD patients in the Low level psychosocial adaptation profile and Medium psychosocial adaptation-High body image distress profile to understand the nature of IBD from a positive perspective, to enhance disease-related health behaviors and correct medical coping styles, in order to strengthen their psychosocial adaptation. However, some research suggested that the positive psychological effects of CBT on IBD

patients are short-term, and there is insufficient evidence to prove that CBT can continuously improve the psychosocial status of IBD patients.⁷⁴ Consequently, multiple digital interventions including web-based, computer-based, telephone, video conferencing, automated self-management systems, mobile applications, and text messaging can be adopted in the future to achieve long-term effects in improving psychosocial adaptation of IBD patients.⁷⁵

Limitations

There are several limitations to be recognized in the present study. Firstly, most of the patients in this study were young and middle-aged patients, and largely recruited from one tertiary hospital that may result in a Berkson bias. These limit the generalization of the study results. In future research, multi-center and larger sample investigation from community settings could be carried out to reduce the limitations of the single-center design and Berkson bias. In addition, no dose–response relationship was present across the different profiles in the horizontal direction of the two influencing factors of complication and comorbidity in this study due to their dichotomous attribute.⁷⁶ Future studies could refine the variables in terms of including complication and comorbidity in the criteria of disease severity to compare the differences between profiles to show a dose–response gradient and more specific results. Furthermore, the study was cross-sectional and thus could not measure the change of psychosocial adaptation over time. Given that IBD is a progressive and complex immune-mediated disorder, a longitudinal research design deserves to be employed to explore trajectory of psychosocial adaptation by following IBD patients over a period to uncover the dynamics of psychosocial adaptation profiles. Moreover, although certain bio physiological and psychological characteristics were measured as antecedents of psychosocial adaptation profiles in the study, some objective indicators such as validated biomarkers (eg, faecal calprotectin, C-reactive protein, oncostatin M)⁷⁷ need to be included in future research for analyzing their predictive effects on the psychosocial adaptation profile of IBD patients to supplement patient-reported outcomes.

Conclusion

From a person-centered perspective, latent profile analysis revealed four distinct profiles of psychosocial adaptation among IBD patients. Given the significant heterogeneity in the level of psychosocial adaptation in IBD patients, healthcare providers need to attend to the patterns of psychosocial adaptation of IBD patients, and formulate personalized intervention programs to improve their psychosocial adaptation. Simultaneously, it is worthy for healthcare providers to recognize the predictors influencing the profile membership including psychological resilience, benefit find, stigma, medical coping styles and disease burden when implementing tailored interventions.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

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Disclosure

The authors report no conflicts of interest in this work.

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