Huang *et al.*
Health and Quality of Life Outcomes (2025) 23:60
https://doi.org/10.1186/s12955-025-02392-w

Health and Quality of Life Outcomes

RESEARCH

Open Access

Latent profile analysis of health-related quality of life and its associated factors in postoperative aortic dissection patients: a cross-sectional study

Wanbing Huang[1,2], Qiansheng Wu[2], Yufen Zhang[2] and Hongmei Zhu[1*]

Abstract

Background Aortic dissection (AD) is a rare but dangerous cardiovascular condition, and research on the health-related quality of life (HRQOL) of postoperative patients after discharge is limited. This study aimed to classify patterns of HRQOL among this population, and to examine the psychological and social factors associated with different HRQOL categories based on the common sense model of self-regulation and the social-cognitive processing model.

Methods A cross-sectional study was conducted in two tertiary general hospitals in Wuhan from January 2022 to August 2022. HRQOL was assessed via the validated Patient-Reported Outcomes Measurement Information System 29-item Profile. Characteristic categories of HRQOL were identified through exploratory latent profile analysis. Univariate analysis and multinominal logistic regression were employed to explore the factors associated with HRQOL.

Results Among the 379 patients, the mean health utility was 0.36 ± 0.17. A total of 35.4% and 32.5% of the patients had obvious anxiety and depression, respectively. The patients were divided into three HRQOL subgroups: "high psychological distress-pain group" (29.0%), "mild functional impairment-anxiety group" (49.3%), and "mild functional impairment-adaptation group" (21.6%). Significant factors associated with HRQOL included age, AD type, illness cognitive representation, fear of disease progression, daily life management and exercise ($P < 0.05$).

Conclusions The self-reported health status of postoperative AD patients is concerning. HRQOL within this population displays significant heterogeneity, and stratified care tailored to each group is recommended. Interventions targeting cognitive representations and fear reduction may enhance HRQOL. Continuous care to facilitate self-management behaviors is essential for improving health outcomes for postoperative AD patients. These findings require further longitudinal and interventional studies to confirm.

Keywords Aortic dissection, Health-related quality of life, Patient-reported outcome , Latent profile analysis, Associated factors

Introduction

Clinical background and research importance

Aortic dissection (AD) is a rare but life-threatening cardiovascular emergency characterized by a tear in the aortic intima, which disrupts blood flow and may lead to malperfusion or rupture [1, 2]. Thanks to advancements in prehospital care, diagnostics, and surgical treatment, long-term survival has improved significantly.

*Correspondence:
Hongmei Zhu
hongmeizhu@jhun.edu.cn
[1] School of Nursing, Jianghan University, Wuhan, Hubei, China
[2] Department of Nursing, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China

The 5-year and 10-year survival rates of acute type A AD patients can reach 83.9% and 70.7%, respectively [3]. However, postoperative recovery remains challenging. Many patients continue to experience fatigue, pain, and mobility limitations months after discharge [4, 5]. Only 24.8% of patients with acute type A AD return to work within one year [6], reflecting difficulties in adapting to new or changed interpersonal roles, which may compromise their social well-being [7]. Psychological distress is also common, with anxiety and depression affecting over 30% of patients [5, 8]. These issues highlight the need for holistic long-term care that addresses not only survival, but also the patient's overall quality of life.

Health-related quality of life and research gaps

Health-related quality of life (HRQOL) provides a comprehensive indicator of patients' physical, psychological, and social recovery after surgery. Lower HRQOL is associated with increased readmission and mortality, as well as higher caregiver and system burdens [9, 10]. Despite its clinical importance, HRQOL in AD patients remains underexplored.

Existing research has primarily focused on AD survival and complications, with limited attention to patient-reported outcomes. Even in studies involving HRQOL, most have employed variable-centered statistical methods, focusing on average scores while ignoring population-level heterogeneity. This approach fails to capture distinct subgroups of patients who may experience different recovery trajectories. Person-centered analyses are urgently needed to identify meaningful heterogeneity and facilitate the development of stratified interventions. Latent profile analysis (LPA), as a powerful and widely used person-centered approach, can classify phenotypes based on latent variable modeling to reveal distinct HRQOL patterns within populations [11, 12]. However, no study has thus far applied LPA to examine HRQOL in AD patients.

In terms of influencing factors, existing studies have typically focused on biological or clinical predictors (e.g., disease type, surgical variables), with insufficient integration of psychological and social factors that may explain variations in HRQOL. In the limited available research, several valuable psychosocial variables associated with HRQOL or behaviors in AD patients have been identified—such as cognitive factors [13], emotional factors [14, 15], medication adherence [16], and social support [17]. However, this body of evidence remains fragmented, with few efforts to examine these variables concurrently or within an integrated model. Furthermore, most research lack a theoretical framework to systematically guide variable selection and interpretation of findings. The absence of a solid conceptual foundation limits the explanatory power of studies regarding the relevance and interplay of variables, and their reflection of patients' experiences, ultimately undermining the development of effective, targeted strategies to enhance HRQOL of AD patients.

Theoretical framework

To address these gaps, the present study adopts a theoretical framework grounded in the common sense model of self-regulation (CSM) and the social-cognitive processing model (SCPM). According to the CSM, individuals are self-regulating systems that form cognitive and emotional representations of illness in response to health threats, based on stimuli such as physical symptoms or external information [18]. These illness perceptions influence coping responses, which in turn affect health outcomes [19]. The CSM has demonstrated strong clinical utility, with studies showing that CSM-based interventions can improve adherence and outcomes in patients with heart disease [20]. In the context of AD, which is characterized by sudden onset and profound life disruption, the CSM is well-suited to explore psychological factors associated with HRQOL in this population following discharge.

Considering that the CSM does not fully explain the impact of social-contextual factors on individuals' adaptation to illness, this study incorporates the SCPM [21] to complement the theoretical framework. From the perspective of the SCPM, supportive interactions promote adaptive processing and facilitate psychological recovery; while poorer social relationships can inhibit disclosure and reinforce avoidant behaviors, worsening health outcomes [21, 22].

The SCPM has been applied to a variety of chronic and traumatic health conditions, and may help to elucidate how social factors influence HRQOL in AD survivors.

Aim of the present study

This study aimed to explore HRQOL heterogeneity among postoperative AD patients using LPA and to identify psychological and social correlates based on CSM and SCPM. Variable selection was theory-informed and refined through prior qualitative work to ensure clinical relevance and feasibility. By bridging theory and person-centered analytics, this study offers novel evidence to guide risk stratification and individualized post-discharge support for AD patients. We hypothesized that: (1) distinct HRQOL profiles would emerge among postoperative AD patients; and (2) psychological and social variables derived from the CSM and SCPM would be significantly associated with HRQOL class membership.

Methods

Participants

This study recruited AD patients who underwent surgical treatment at the cardiovascular surgery departments of two large teaching hospitals in Wuhan between January and August 2022. The inclusion criteria were as follows: (a) first-time diagnosis of AD, confirmed by CTA, MRA, or color Doppler ultrasonography; (b) adult (≥ 18 years); (c) informed consent obtained; (d) ability to understand and communicate in Mandarin; and (e) underwent surgery and required long-term antihypertensive medications. The exclusion criteria were as follows: (a) pregnancy or traumatic AD; (b) comorbidity with Marfan syndrome, Ehlers–Danlos syndrome, or malignant tumors; (c) presence of dementia, delirium, or other mental disorders; and (d) inability to cooperate due to critical illness.

Sample size

Previous studies have suggested that a sample size between 200 and 500 is generally adequate for LPA [23, 24]. Additionally, for multivariable regression analysis, Norman et al. [25] proposed a commonly used rule of thumb whereby the sample size should be 5 to 20 times the number of independent variables. Based on the 10-times rule and 27 predictor variables, a minimum of 270 participants would be required for valid analysis. Considering an estimated response rate of 80%, a total of at least 338 participants were planned for recruitment. Ultimately, 379 participants were included, which met the requirements for both analyses.

Measures

Sociodemographic characteristics included sex, age, body mass index (BMI), marital status, cohabitation status, education level, occupation, work status, household monthly income, financial burden, place of residence, and type of health insurance. Occupational physical activity was classified as sedentary (e.g., cashiers, secretaries), light (e.g., teachers, clerks), moderate (e.g., domestic workers, cooks, nurses), or heavy (e.g., porters, cleaners, farm workers). Financial burden was assessed by a single item asking about the perceived economic strain of medical care, rated on a 5-point scale from 1 (none) to 5 (very heavy). Health insurance types included urban rural resident basic medical insurance, urban employee basic medical insurance insurance, and others. The clinical characteristics included the type of AD, surgical procedure, postoperative complications, hypertension, length of hospitalization, and smoking and drinking habits. Postoperative complications included acute respiratory insufficiency, neurological complications, renal failure, bleeding, and infection. The Charlson Comorbidity Index (CCI) was used to assess the burden of comorbidities [26].

The Patient-Reported Outcomes Measurement Information System 29-item Profile (PROMIS-29) was used to measure HRQOL in AD patients. It comprises 7 health dimensions: physical function, anxiety, depression, fatigue, sleep disturbance, ability to participate in social roles and activities (hereafter referred to as social roles), and pain interference. Each dimension includes 4 items rated on a 5-point Likert scale, with higher scores indicating a greater degree of the measured trait. The 29 th item evaluates pain intensity on a 0–10 scale. The raw scores were converted to T-scores, which have a mean of 50 and a standard deviation (SD) of 10 in the U.S. reference population. Health-related distress severity (normal, mild, moderate, and severe) was classified based on established PROMIS® score cut points, as defined by HealthMeasures guidelines [27]. The PROMIS-Preference (PROPr) score, reflecting overall health utility, was calculated following the recommended algorithm [28].

The Brief Illness Perception Questionnaire (BIPQ) was used to assess patients' perceptions of illness. Developed by Broadbent et al. [29], the BIPQ quickly evaluates cognitive and emotional illness representations and is widely used in clinical settings. Studies have shown that it has good reliability and validity across various disease populations [30]. Only the first 8 items of the BIPQ were measured in this study, and all the items were scored on a 0–10 scale. Higher total scores indicate greater perceptions of illness severity and harmful impacts. The Cronbach's α for this scale in this study was 0.723.

The Fear of Progression Questionnaire-Short Form (FoP-Q-SF) [31] was used to assess patients' fear of disease progression. It is tailored specifically for patients with acute diseases. The FoP-Q-SF has demonstrated good reliability and validity, with a Cronbach's α of 0.771. It consists of 9 items covering physical health as well as social and family dimension. The items are scored on a 5-point Likert scale, with higher scores indicating greater fear of disease progression. A cutoff of 26 points was used to identify a high level of fear. In this study, the Cronbach's α for the FoP-Q-SF was 0.816.

The 5-item ENRICHD Social Support Inventory (ESSI) was used to measure social support in postoperative AD patients. The questionnaire has good measurement properties, with an internal consistency coefficient of 0.87 [32]. Higher total scores indicate greater perceived social support. Low perceived social support was defined as a total score of ≤ 18 and scores of ≤ 3 on at least two items [33]. The Cronbach's α for this scale in this study was 0.845.

The Somatic Symptom Scale-8 (SSS-8) was used to assess the patient's baseline somatic symptom distress.

The scale consists of 8 items that evaluate the patient's condition over the past week. Each item was rated on a 5-point scale, with a total score ranging from 0–32 [34]. The Cronbach's α for this scale in this study was 0.702.

The 8-item Morisky Medication Adherence Scale (MMAS-8) was used to measure patients' medication adherence. The scale consists of 8 questions, with higher total scores indicating better adherence. The Cronbach's α for this scale in this study was 0.787. The daily life management dimension of the Postoperative Self-Management Scale for AD Patients [35] was used to assess patients' lifestyle behaviors, with four items rated on a 5-point Likert scale. A higher total score reflects better daily life management. Additionally, exercise participation was assessed with a single item.

Design and procedure

A cross-sectional study using convenience sampling was conducted between January 2022 and August 2022. Sociodemographic and clinical data, somatic symptom distress, and social support data were collected before patients were discharged from the hospital. One month after discharge, data on HRQOL and other factors were collected.

Data processing and statistical analysis

Excel was used to establish the database, and IBM SPSS 20.0, Amos Graphics 21.0, and R 4.1.0 were employed for data analysis. The statistical test level was set at 0.05. Harman's single-factor test was conducted to assess the presence of common method bias. Means and SDs were used to describe normally distributed data, whereas medians and quartiles were used for nonnormally distributed data. Frequencies and percentages were used to describe categorical data. The proportion of missing data was low and limited to demographic and psychosocial variables. Therefore, listwise deletion was applied for cases with missing values to ensure the integrity of multivariate analyses.

In LPA, the average T-scores of the seven dimensions of the PROMIS-29 were used as exogenous variables to construct the model, with the aim of classifying participants into homogeneous subgroups. Several models have been tested to identify the most suitable model. Starting with the initial model, the number of classes was gradually increased until a 4-class model was used. Model selection was based on the following criteria: the Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted-BIC (aBIC), entropy, and bootstrap likelihood ratio test (BLRT). For the AIC, BIC, and aBIC, lower values indicate a better model fit. The entropy index ranges from 0 to 1, with higher values indicating better separation between classes. A P value < 0.05 in the BLRT indicates a significant improvement in model fit for the k-class model compared with the k-1-class model [36].

Comparisons of categorical variables were conducted via the chi-square (χ^2) test or Fisher's exact probability test. The t-test, one-way ANOVA, Mann–Whitney U test or Kruskal–Wallis H test was performed for numerical variables, as appropriate. In the multivariate analysis, only variables with a P value < 0.05 in the univariate analysis were included in the multinominal logistic regression model, with latent class membership of HRQOL as the dependent variable. A stepwise method was applied for variable selection.

Results

Description of the sample

According to Harman's single-factor test, 17 factors had eigenvalues greater than 1, and the first factor explained 26.89% of the variance, which is below the 40% threshold [37]. Therefore, common method bias was not observed in this study. A total of 413 patients were recruited, with 392 questionnaires returned and 379 deemed valid. The participants' characteristics are summarized in Table 1. The average age was 53.93 ± 11.76 years (ranging from 21–81), and the majority of patients were male (82.3%). Approximately two-thirds (63.1%) of the respondents had a junior high school education or below. More than half of the patients were employed in jobs involving moderate-to-heavy manual labor. The mean score for financial burden was 3.49 ± 0.98. Among the participants, 260 were diagnosed with Stanford type B AD, representing 68.6% of the cases. Additionally, 292 patients (77%) were hypertensive, and 17% had a high comorbidity burden (CCI ≥ 3).

Levels of HRQOL

HRQOL outcomes are presented in Table 2. Compared with the reference population, this sample of patients presented higher levels of anxiety (55.86 ± 9.13), depression (53.80 ± 10.25), sleep disturbances (50.57 ± 7.81), and pain interference (51.45 ± 8.92), along with poorer physical function (41.82 ± 5.87) and social roles (48.68 ± 6.34). As shown in Fig. 1, moderate to severe depression and anxiety were observed in 35.4% and 32.5% of patients, respectively. The PROPr scores ranged from −0.01 to 0.84, with an average of 0.36 ± 0.17.

LPA of HRQOL

For the LPA, latent classes ranging from 1 to 4 were estimated sequentially, with model fit statistics presented in Table 3. The AIC, BIC, and aBIC values decreased as the number of classes increased. In all the models, the proportion of cases in each category exceeded 5% of the

Table 1 Sociodemographic and clinical characteristics of AD patients ($n = 379$)

Variables	Category	Number of Cases	Percentage (%)
Gender	Male	312	82.3
	Female	67	17.7
Age (years)	< 45	77	20.3
	45 ~ 64	227	59.9
	≥ 65	75	19.8
BMI ≥ 28 (kg/m^2)	No	306	80.7
	Yes	73	19.3
Marital Status	Unmarried/Divorced/Widowed	40	10.6
	Married	339	89.4
Living Alone	No	349	92.1
	Yes	30	7.9
Education level	Junior high school or below	239	63.1
	High school or equivalent	80	21.1
	College and above	60	15.8
Occupation	Sedentary	60	15.8
	Light physical labor	123	32.5
	Moderate physical labor	90	23.7
	Heavy physical labor	106	28.0
Work Status	Employed	176	46.4
	Retired or unemployed	203	53.6
Household monthly income (yuan)	< 3000	223	58.8
	3000 ~ 4999	111	29.3
	≥ 5000	45	11.9
Place of Residence	Urban	227	59.9
	Rural	152	40.1
Type of health insurance	Urban Rural Resident Basic Medical Insurance	185	61.7
	Urban Employee Basic Medical Insurance	154	27.7
	Others	40	10.6
Type of AD	Stanford A	119	31.4
	Stanford B	260	68.6
Surgical procedure	Thoracotomy	103	27.2
	Endovascular repair	276	72.8
Postoperative Complications	No	245	64.6
	Yes	134	35.4
Combined with hypertension	No	87	23.0
	Yes	292	77.0
CCI	0	68	17.9
	1	138	36.4
	2	108	28.5
	≥ 3	65	17.2
Length of Hospital Stay (days)	< 7	110	29.0
	7 ~ 13	116	30.6
	≥ 14	153	40.4
Smoking	No	188	49.6
	Yes	191	50.4
Drinking	No	207	54.6
	Yes	172	45.4

Table 2 PROMIS-29 domain scores of AD patients ($n = 379$)

Dimension	Minimum	Maximum	Mean ± SD
Physical function	22.60	57.00	41.82 ± 5.87
Anxiety	40.30	81.40	55.86 ± 9.13
Depression	41.00	79.30	53.80 ± 10.25
Fatigue	33.70	75.80	49.91 ± 8.84
Sleep disturbance	32.00	73.30	50.57 ± 7.81
Social roles	27.50	64.20	48.68 ± 6.34
Pain interference	41.60	67.80	51.45 ± 8.92
Total Physical Health Score	23.50	58.70	42.76 ± 5.85
Total Mental Health Score	27.00	64.40	48.54 ± 7.31
PROPr	−0.01	0.84	0.36 ± 0.17

total sample. The entropy values for all the models were greater than 0.8, reaching their maximum value (0.914) in the 3-class solution, which then decreased in the 4-class solution. Compared to the two-class model, which may oversimplify the heterogeneity, and the four-class model, which did not substantially improve model fit and reduced parsimony, the three-class solution emerged as a more balanced and parsimonious alternative. Thus, the 3-class model was determined to be the best. Furthermore, the average latent class probabilities for the most likely profile memberships were all above the 0.80 threshold [38] (ranging from 0.95–0.99), indicating strong model distinction.

Beyond statistical fit, the 3-class model also demonstrated superior clinical interpretability. The PROMIS-29 scores of the three latent classes are shown in Fig. 2. Significant differences in scores across the three subgroups were observed in each dimension. Class 1 ($n = 110$, 29%) exhibited the highest levels of anxiety and depression, with pain interference above the normal range, along with the worst physical function and social roles. This group was labeled the "high psychological distress-pain group." Class 2 ($n = 110$, 29%) patients had elevated anxiety and mild impairment of physical function. This group was therefore named the "mild functional impairment-anxiety group." In Class 3 ($n = 82$, 21.6%), the physical function T-score (42.61 ± 5.27) was between those of the other two groups, whereas the mean T-scores for the remaining six dimensions were within the normal range, leading to its classification as the "mild functional

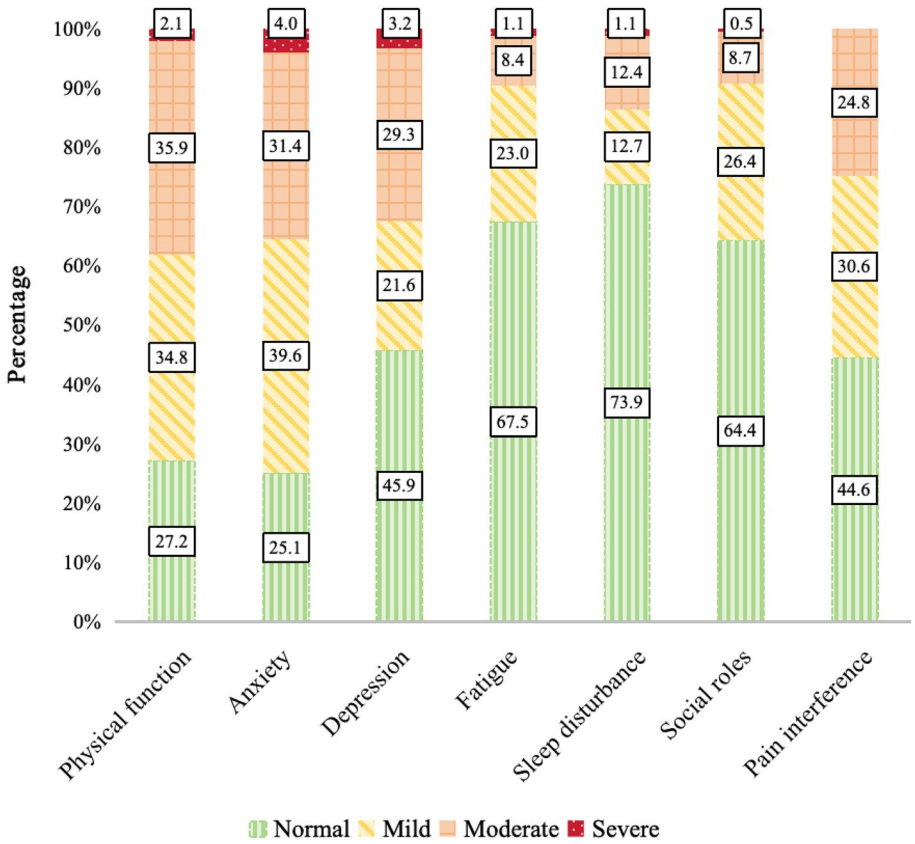

Fig. 1 PROMIS-29 scores in each dimension. Note: For anxiety, depression, fatigue, sleep disturbance, and pain interference, higher scores indicate worse health status. In contrast, higher scores in physical function and social roles indicate better health [27]

Table 3 Fit indices for LPA of HRQOL in AD patients ($n = 379$)

Model	AIC	BIC	aBIC	Entropy	*P*(BLRT)	Proportion of Cases	
						Minimum	Maximum
Class = 1	18,601.584	18,656.709	18,612.290	-	-	-	-
Class = 2	17,966.489	18,053.115	17,983.313	0.823	0.010	37.7%	62.3%
Class = 3	**17,693.885**	**17,812.011**	**17,716.827**	**0.914**	**0.010**	**21.6%**	**49.3%**
Class = 4	17,633.106	17,782.733	17,662.167	0.840	0.010	21.1%	27.4%

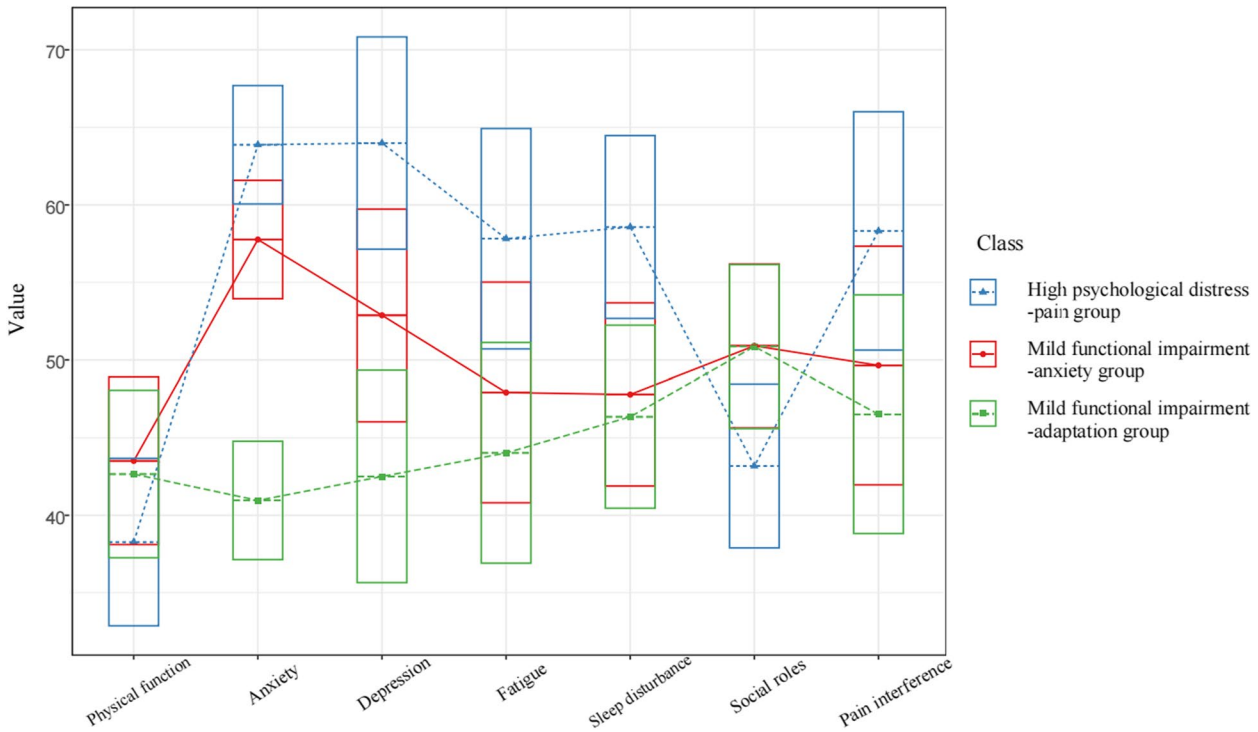

Fig. 2 Latent profile models of HRQOL in AD patients

impairment-adaptation group." The identified subgroups clearly represent distinct patient profiles, each with unique needs that can be targeted in clinical practice. This model provides a practical approach, capturing the essential heterogeneity among patients while avoiding unnecessary complexity that could hinder practical application. Therefore, the 3-class model was retained for subsequent analysis.

Univariate analysis of latent classes of HRQOL

The results of the univariate analysis are summarized in Table 4. Statistically significant differences ($P < 0.05$) were observed among patients in different HRQOL classes with respect to age, work status, average household monthly income, financial burden, AD type, surgical procedure, postoperative complications, CCI ≥ 3, and length of hospitalization. Additionally, significant differences ($P < 0.001$) were found in seven psychosocial factors across the HRQOL classes.

Multivariate analysis of latent classes of HRQOL

All factors with a significant P value from the univariate analysis were included in the multivariate model. No collinearity was detected among the variables, as all tolerance scores were greater than 0.10 and the variance inflation factors ranged from 1.123–3.561. Initially, an ordinal multinomial logistic regression model was fitted; however, the test of parallel lines for the proportional hazards assumption failed ($P = 0.030$). Therefore, a nominal multinomial logistic regression analysis was performed. The χ^2 value of the final model was 199.599 ($P < 0.001$). Using stepwise forward elimination, eight statistically significant variables were retained in the model: age, AD type, baseline somatic symptom distress, social

Table 4 Univariate analysis of factors by HRQOL latent classes in AD patients ($n = 379$)

Variable	Grouping	Total ($n = 379$)	G1 ($n = 110$)	G2 ($n = 187$)	G3 ($n = 82$)	χ^2/F	P^*
Gender	Male	312(82.3)	86(78.2)	156(83.4)	70(85.4)	1.973	0.373
	Female	67(17.7)	24(21.8)	31(16.6)	12(14.6)		
Age (years old)	< 45	77(20.3)	21(19.1)	47(25.1)	9(11.0)	18.621	**0.001**
	45 ~ 64	227(59.9)	67(60.9)	115(61.5)	45(54.9)		
	≥ 65	75(19.8)	22(20.0)	25(13.4)	28(34.1)		
BMI ≥ 28 (kg/m^2)	No	306(80.7)	86(78.2)	153(81.8)	67(81.7)	0.652	0.772
	Yes	73(19.3)	24(21.8)	34(18.2)	15(18.3)		
Marital Status	Unmarried/ Divorced/ Widowed	40(10.6)	11(10.0)	17(9.1)	12(14.6)	1.906	0.386
	Married	339(89.4)	99(90.0)	170(90.9)	70(85.4)		
Living Alone	No	349(92.1)	101(91.8)	173(92.5)	75(91.5)	0.101	0.951
	Yes	30(7.9)	9(8.2)	14(7.5)	7(8.5)		
Educational Level	Junior high school or below	239(63.1)	66(60)	115(61.5)	58(70.7)	8.676	0.070
	High school or equivalent	80(21.1)	29(26.4)	34(18.2)	17(20.7)		
	College and above	60(15.8)	15(13.6)	38(20.3)	7(8.5)		
Occupation	Non-heavy physical labor	273(72.0)	79(71.8)	136(72.7)	58(70.7)	0.116	0.944
	Heavy physical labor	106(28.0)	31(28.2)	51(27.3)	24(29.3)		
Work Status	Employed	176(46.4)	40(36.4)	97(51.9)	39(47.6)	6.75	**0.034**
	Retired or unemployed	203(53.6)	70(63.6)	90(48.1)	43(52.4)		
Household monthly income (yuan)	< 3000	223(58.8)	68(61.8)	98(52.4)	57(69.5)	11.510	**0.021**
	3000 ~ 4999	111(29.3)	27(24.5)	69(36.9)	15(18.3)		
	≥ 5000	45(11.9)	15(13.6)	20(10.7)	10(12.2)		
Financial Burden	-	3.49 ± 0.98	3.88 ± 0.99	3.33 ± 0.93	3.30 ± 0.95	13.472	**< 0.001**
Place of Residence	Urban	227(59.9)	67(60.9)	114(61)	46(56.1)	0.628	0.730
	Rural	152(40.1)	43(39.1)	73(39)	36(43.9)		
Type of health insurance	Urban Rural Resident Basic Medical Insurance	185(61.7)	63(57.3)	110(58.8)	61(74.4)	7.893	0.098
	Urban Employee Basic Medical Insurance	154(27.7)	33(30.0)	55(29.4)	17(20.7)		
	Others	40(10.6)	14(12.7)	22(11.8)	4(4.9)		
Type of AD	Stanford A	119(31.4)	56(50.9)	46(24.6)	17(20.7)	27.785	**< 0.001**
	Stanford B	260(68.6)	54(49.1)	141(75.4)	65(79.3)		
Surgical procedure	Thoracotomy	103(27.2)	50(45.5)	38(20.3)	15(18.3)	26.28	**< 0.001**
	Endovascular repair	276(72.8)	60(54.5)	149(79.7)	67(81.7)		
Postoperative Complications	No	245(64.6)	59(53.6)	132(70.6)	54(65.9)	8.775	**0.012**
	Yes	134(35.4)	51(46.4)	55(29.4)	28(34.1)		
Combined with hypertension	No	87(23.0)	26(23.6)	43(23.0)	18(22.0)	0.076	0.963
	Yes	292(77.0)	84(76.4)	144(77.0)	64(78.0)		
CCI ≥ 3	No	314(82.8)	85(77.3)	164(87.7)	65(79.3)	6.245	**0.044**
	Yes	65(17.2)	25(22.7)	23(12.3)	17(20.7)		
Length of Hospital Stay (days)	< 7	110(29.0)	18(16.4)	68(36.4)	24(29.3)	23.509	**< 0.001**
	7 ~ 13	116(30.6)	28(25.5)	60(32.1)	28(34.1)		
	≥ 14	153(40.4)	64(58.2)	59(31.6)	30(36.6)		
Smoking	No	188(49.6)	63(57.3)	89(47.6)	36(43.9)	3.956	0.138
	Yes	191(50.4)	47(42.7)	98(52.4)	46(56.1)		
Drinking	No	207(54.6)	63(57.3)	105(56.1)	39(47.6)	2.137	0.343
	Yes	172(45.4)	47(42.7)	82(43.9)	43(52.4)		
Baseline somatic symptom distress	-	5.12 ± 3.43	6.66 ± 3.64	4.37 ± 3.10	4.74 ± 3.21	17.480	**< 0.001**
Social support	-	18.60 ± 4.23	16.17 ± 4.59	19.71 ± 3.37	19.32 ± 4.22	29.563	**< 0.001**

Table 4 (continued)

Variable	Grouping	Total ($n=379$)	G1 ($n=110$)	G2 ($n=187$)	G3 ($n=82$)	χ^2/F	P^*
Illness cognitive representations	-	26.91 ± 7.01	31.21 ± 7.21	25.94 ± 5.96	23.38 ± 6.17	39.574	**< 0.001**
Fear of disease progression	-	23.58 ± 8.17	28.90 ± 8.77	21.41 ± 6.67	21.40 ± 7.20	39.507	**< 0.001**
Daily life management	-	15.63 ± 2.39	13.98 ± 2.26	16.28 ± 2.10	16.37 ± 2.09	45.819	**< 0.001**
Exercise	-	2.65 ± 1.28	2.05 ± 1.22	2.80 ± 1.27	3.13 ± 1.08	21.632	**< 0.001**
Medication adherence	-	7.04 ± 1.47	6.26 ± 1.83	7.41 ± 1.12	7.20 ± 1.24	24.648	**< 0.001**

G1 is"high psychological distress-pain group", G2 is"mild functional impairment-anxiety group", G3 is"mild functional impairment-adaptation group"; * is the *P*-value for comparison among the three classes

support, illness cognitive representations, fear of disease progression, daily life management, and exercise. See Table 5.

The "mild functional impairment-adaptation group," which had the optimal health status, was taken as the reference, and the other groups were compared accordingly. The results are presented in Table 6. Patients aged < 45 years had a 3.707-fold increased risk of being categorized into the "high psychological distress-pain group" ($P = 0.032$) compared with those aged ≥ 65 years, suggesting that younger patients may be more vulnerable to psychological burden after surgery and should be targeted for early psychological screening and intervention. Patients with type A AD were at an increased risk of being in the "high psychological distress-pain group" compared with those with type B AD (OR = 2.408, $P = 0.025$), possibly due to the severity of the condition or surgical complexity, underscoring the importance of tailored post-discharge follow-up for this group. Cognitive representations of illness were positively associated with HRQOL categories and served as a common predictor for both the "high psychological distress-pain group" and the "mild functional impairment-anxiety group," with ORs of 1.121 ($P < 0.001$) and 1.093 ($P = 0.001$), respectively. These findings suggest that more negative illness representations are linked to poorer HRQOL in AD patients, highlighting the potential value of cognitive interventions targeting maladaptive beliefs to enhance recovery outcomes. High levels of fear of disease progression were a predictor of being categorized in the "high psychological distress-pain group" (OR = 1.062, $P = 0.025$), suggesting the need for fear-reduction strategies and illness education to reduce emotional and physical distress. Furthermore, higher scores in daily life management and exercise were associated with a lower likelihood of being in the "high psychological distress-pain group," with ORs of 0.726 ($P = 0.001$) and 0.658 ($P = 0.016$), respectively. These findings suggest that strengthening patients' self-care abilities and promoting regular physical activity may improve psychological recovery and overall HRQOL.

Several other psychosocial factors, including baseline somatic symptom distress, social support and medication adherence, did not reach statistical significance in the likelihood ratio test or final model. Although these factors showed group differences in univariate comparisons, their effects may have been less detectable in the multivariate model due to the limitations of the cross-sectional design, which may not fully reflect their long-term impact. Future research could explore their potential mediating or moderating roles using longitudinal approaches.

Table 5 Results of likelihood ratio test for multinomial logistic regression of HRQOL latent classes

Variable	Model Fitting Conditions	Likelihood Ratio Test		
	−2 Log—likelihood Value	χ^2	Degrees of Freedom	*P*
Age	608.332	20.520	4.000	**< 0.001**
Type of AD	596.891	9.080	2.000	**0.011**
Baseline Somatic Symptom Distress	595.495	7.684	2.000	**0.021**
Social Support	595.447	7.635	2.000	**0.022**
Illness cognitive representations	603.550	15.739	2.000	**< 0.001**
Fear of disease progression	599.327	11.516	2.000	**0.003**
Daily Life management	613.771	25.960	2.000	**< 0.001**
Exercise	596.160	8.348	2.000	**0.015**

Table 6 Multivariate analysis results of HRQOL latent classes ($n = 379$)

Class	Variable	*B*	Standard Error	*P*	*OR*	95% Confidence Interval of OR	
						Lower Limit	Upper Limit
G1[a]	Intercept	1.097	1.968	0.577			
	Age (years old)						
	< 45	1.310	0.611	**0.032**	3.707	1.119	12.283
	45 ~ 64	0.894	0.446	**0.045**	2.445	1.020	5.861
	≥ 65	0[b]					
	Type of AD						
	Stanford A	0.879	0.392	**0.025**	2.408	1.116	5.194
	Stanford B	0[b]					
	Baseline somatic symptom distress	0.066	0.058	0.254	1.068	0.954	1.196
	Social Support	−0.048	0.047	0.306	0.953	0.870	1.045
	Illness cognitive representations	0.115	0.032	**< 0.001**	1.121	1.053	1.194
	Fear of disease progression	0.060	0.027	**0.025**	1.062	1.007	1.119
	Daily life management	−0.320	0.094	**0.001**	0.726	0.604	0.874
	Exercise	−0.419	0.174	**0.016**	0.658	0.468	0.926
G2[a]	Intercept	−3.085	1.762	0.080			
	Age (years old)						
	< 45	1.993	0.489	**< 0.001**	7.337	2.816	19.116
	45 ~ 64	1.249	0.360	**0.001**	3.487	1.723	7.058
	≥ 65	0[b]					
	Type of AD						
	Stanford A	−0.049	0.344	0.886	0.952	0.485	1.868
	Stanford B	0[b]					
	Baseline somatic symptom distress	−0.064	0.049	0.189	0.938	0.852	1.032
	Social Support	0.055	0.043	0.206	1.056	0.970	1.150
	Illness cognitive representations	0.089	0.027	**0.001**	1.093	1.037	1.151
	Fear of disease progression	−0.014	0.023	0.524	0.986	0.943	1.030
	Daily life management	0.078	0.077	0.313	1.081	0.929	1.257
	Exercise	−0.369	0.139	**0.008**	0.691	0.526	0.908

a, the reference class is"mild functional impairment-adaptation group", G1 is"high psychological distress-pain group", G2 is"mild functional impairment-anxiety group"; b is the reference group for variables, thus the parameter is set to zero

Discussion

To our knowledge, this is the first study to apply the PROMIS profile to assess HRQOL subgroups among postoperative AD patients. Although the psychometric properties of PROMIS-29 have been previously tested in this population [39], the emerging discipline of clinimetrics provides a complementary perspective for HRQOL assessment. Clinimetrics, the science of clinical measurements, emphasizes practical applicability and sensitivity in routine healthcare practice. Recent clinimetric validations, such as the Mental Pain Questionnaire [40] and tools for assessing psychological well-being in systemic sclerosis [41], have offered important implications. Integrating clinimetric approaches may improve the detection of subtle distress and inform more tailored follow-up strategies in postoperative AD management.

The present study revealed that postoperative AD patients experienced substantial impairments in physical, psychological, and social function. The mean PROPr score was low, indicating reduced overall health utility. One prior study using the EQ-5D to assess patients with type A AD at 28.2 months after discharge reported a higher HRQOL index of 0.854 [42]; this discrepancy may be due to differences in instrument sensitivity and timing of measurement. Among the PROMIS-29 dimensions, physical function had the lowest T-scores. Fatigue, sleep disturbance, and pain interference were also reported in a considerable proportion of patients. These findings are consistent with a recent study [5], which found similarly impaired physical function and elevated fatigue using PROMIS short forms at three months after type A AD surgery. The observed functional decline may be due to surgical trauma, prolonged bed rest, and insufficient

rehabilitation, which together limit physical recovery. Fear of recurrence may also cause some patients to restrict activity unnecessarily, thereby exacerbating both functional and psychological distress.

As shown in Fig. 1, anxiety and depression were prevalent, affecting 74.9% and 54.1% of patients, respectively, with moderate to severe symptoms in roughly one-third. These results align with previous reports showing high levels of psychological distress in AD survivors [5, 8]. Such psychological burden may negatively influence hemodynamic stability and increase the risk of adverse cardiovascular events. Overall, these findings highlight the need for integrated postoperative management strategies that include early screening, mental health support, and structured rehabilitation to improve long-term outcomes in this vulnerable population.

Potential classes of HRQOL

In this study, significant heterogeneity in HRQOL was observed among AD patients, with patients being classified into three subgroups. Thus, the first hypothesis was validated. Previous studies have only examined the overall HRQOL distribution in postoperative AD patients without delving deeper into group heterogeneity [5, 43]. Comparable research is lacking. HRQOL heterogeneity has been explored in other populations via the PROMIS instruments. For example, Mo et al. [44] conducted LPA in patients with moderate-to-severe hand trauma and identified three HRQOL categories. A recent study using the PROMIS Profile-57 and latent class analysis identified three health condition subgroups among older patients with coronary heart disease after stent implantation [45], further supporting the applicability of HRQOL subgrouping based on PROMIS domains. The identification of distinct HRQOL subgroups in our study suggests that postoperative recovery among AD patients is not uniform, but instead follows multiple trajectories shaped by differing combinations of physical, psychological, and behavioral factors. The subgroup-based approach moves beyond average scores and enables more nuanced understanding of patient needs. This study provides clearer insights into AD patients' needs, enabling healthcare professionals to better understand and tailor rehabilitation care. For example, patients in the "high psychological distress-pain group" should receive pain and sleep management, psychological support, and functional exercise to aid in reintegration into society. In contrast, "mild functional impairment-anxiety group" patients should focus on improving physical function and mental health. Although our study did not develop a specific screening tool, the identification of distinct HRQOL subgroups based on PROMIS-29 profiles provides an empirical foundation for future clinical application. Given the standardized structure and validated use of PROMIS instruments, selected domains (e.g., anxiety, pain interference, physical function) could potentially serve as rapid indicators for stratifying AD patients post-discharge. Future research should explore long-term prognosis, disease progression, and HRQOL trends across these subgroups, deepening the knowledge of AD recovery and informing targeted prevention and intervention strategies.

Associated factors of potential classes of HRQOL

Younger patients were more likely to be classified into the poor HRQOL subgroups, consistent with a prior study reporting lower mental health scores among younger AD survivors [46]. This may reflect greater role disruption, higher expectations for recovery, and more psychological reactivity in younger adults. Compared with type B AD patients, type A AD patients had a greater risk of being classified into the "high psychological distress-pain group", which is consistent with expectations. Type B AD usually presents with more stable conditions, is often treated with minimally invasive procedures, and generally has a better prognosis [47], contributing to better HRQOL outcomes.

Our second hypothesis was partially verified. Among all the psychosocial variables of interest, only illness cognitive representations, fear of disease progression, daily life management, and exercise were significantly associated with HRQOL categories in postoperative AD patients after discharge ($P < 0.05$). In contrast, baseline somatic symptom distress, social support, and medication adherence were not significant factors in the multivariate regression model. Their potential impact may be delayed or context-dependent and should be further explored, particularly through longitudinal or interventional research designs. The baseline somatic symptom distress was identified through in-depth interviews based on the "stimuli" proposed by the CSM [20], which play a key role in patients' self-regulation process. Although not independently significant in the model, physical symptom distress may still contribute to HRQOL through more complex or indirect pathways. Therefore, timely postoperative management of somatic symptoms remains clinically important to prevent maladaptive coping and deterioration in HRQOL.

Illness cognitive representations were significantly associated with HRQOL, with more negative perceptions corresponding to lower HRQOL. The influence of illness-related cognitive representations on health has been widely documented. For instance, Kim and Ryu [48] reported that illness perceptions were significantly associated with depression and HRQOL in hemodialysis patients, which aligns with the findings of this study.

Similarly, Pereira et al. [49] reported a strong positive correlation (r = 0.571, $P < 0.001$) between illness cognitive representations and the Dermatology Life Quality Index in Portuguese skin tumor patients. Consequently, healthcare providers should regularly evaluate illness perceptions in AD patients, address overly negative or inaccurate views, and promote positive coping strategies to enhance HRQOL.

This study revealed that 34.6% of AD patients experienced significant levels of fear, which was much greater than the 16.7% reported by Gao [50] in patients with acute myocardial infarction, suggesting that fear of disease progression may be more pronounced in AD patients. Multivariate analysis confirmed that a greater level of fear of disease progression was significantly associated with HRQOL in the "high psychological distress-pain group" (OR = 1.062, $P = 0.025$), indicating that greater fear is linked to worse HRQOL outcomes in AD patients. While previous research has largely focused on the fear of disease progression in cancer patients, recent studies have highlighted elevated levels of this psychological distress in patients with cardiovascular conditions, revealing its harmful effects on health outcomes. For example, Hu et al. [51] reported a significant negative correlation between the fear of disease progression and HRQOL in young and middle-aged patients with acute myocardial infarction (r = −0.620, $P < 0.001$). Similarly, a study of 256 acute myocardial infarction patients in Guangzhou [52] showed that fear of disease progression was significantly associated with posttraumatic stress disorder (B = 0.652, $P < 0.001$). These findings emphasize the importance of addressing the fear of disease progression in postdischarge care for AD patients. Healthcare providers should implement comprehensive interventions to help patients manage their psychological state, including psychoeducation, emotional support, and cognitive reframing strategies, to reduce the negative impact of fear on HRQOL.

As measured by the ESSI scale, 39.3% of AD patients were classified as having low social support, which is higher than the 33.5% reported by Blumenthal et al. [53] in heart failure patients. The regression model did not reveal revealed a significant impact of social support on the HRQOL of AD patients. While the importance of social support for cardiovascular disease patients has gained attention in recent years, research specifically focusing on AD patients remains limited. A comprehensive review of cardiac patients identified a lack of social support as a major risk factor for poor prognosis [54]. Similarly, Staniute et al. [55] reported that perceived social support is positively and independently associated with HRQOL in coronary artery disease patients. In contrast, the impact of social support in the present study may have been masked by stronger psychosocial constructs such as illness perception or fear of disease progression, which may be more directly related to patients' subjective experiences and coping processes. In this context, perceived support may exert its influence indirectly, by shaping emotional responses or buffering stress, rather than being independently associated with HRQOL categories.

Higher levels of daily life management and exercise were found to reduce the likelihood of postoperative AD patients being classified into the "high psychological distress-pain group", suggesting that self-management behaviors positively impact HRQOL. However, medication adherence was not a significant factor in the multivariate model, although it has been consistently highlighted in previous research as essential for maintaining blood pressure control and preventing vascular complications after discharge [16]. One possible explanation is that medication adherence may affect HRQOL via clinical mediators, for example, by improving blood pressure control or reducing the risk of rehospitalization. These effects may not be detectable in short-term HRQOL assessments but could emerge in long-term follow-up. By using HRQOL as an outcome measure, this study provides valuable empirical evidence. For patients with poor self-management behaviors, further research is needed to identify the underlying causes and develop strategies to increase their HRQOL.

Limitations

Several study limitations should be noted. First, the data were sourced solely from tertiary hospitals in Wuhan, limiting the representativeness of the sample and reducing the generalizability of the findings. Future research could include AD patients from other regions in China to investigate potential differences in HRQOL status, category characteristics, and influencing factors. Second, the cross-sectional design of the study is a limitation. Data were collected at a single time point, which restricts the ability to draw conclusions about causal relationships. Longitudinal studies are recommended to better clarify the causal relationships and temporal changes among variables. Additionally, future research should focus on developing a Chinese utility scoring system for the PROMIS-29 to accommodate localized investigations.

Conclusions

This study revealed that the self-reported health status of postoperative AD patients was concerning. HRQOL within this population displayed significant heterogeneity, with patients being categorized into three distinct subgroups. It is recommended that healthcare providers move away from a one-size-fits-all approach

and instead adopt stratified care tailored to the unique HRQOL characteristics of each group. Such an approach would optimize resource allocation, reduce healthcare professionals' workload, and improve team efficiency and satisfaction. Factors such as age, AD type, illness cognitive representations, fear of disease progression, daily life management and exercise were identified as key factors related to different HRQOL categories among postoperative AD patients. Given the cross-sectional nature of this study, causal relationships could not be established. Future longitudinal and interventional studies are essential to validate these findings, clarify temporal relationships, and assess whether modifying key psychosocial and behavioral factors can improve HRQOL in this population.

Abbreviations

AD	Aortic dissection
HRQOL	Health-related quality of life
CSM	Common sense model of self-regulation
SCPM	social-cognitive processing model
BMI	body mass index
CCI	Charlson Comorbidity Index
PROMIS-29	Patient-Reported Outcomes Measurement Information System 29-item Profile
SD	standard deviation
PROPr	PROMIS-Preference
BIPQ	Brief Illness Perception Questionnaire
FoP-Q-SF	Fear of Progression Questionnaire-Short Form
ESSI	ENRICHD Social Support Inventory
SSS-8	Somatic Symptom Scale-8
MMAS-8	8-Item Morisky Medication Adherence Scale
LPA	Latent profile analysis
AIC	The Akaike information criterion
BIC	Bayesian information criterion
aBIC	Adjusted-BIC
BLRT	Bootstrap likelihood ratio test

Acknowledgements
We would like to acknowledge all study staff as well as study participants.

Authors' contributions
Wanbing Huang conceptualized, designed the project, collected and gathered data, performed the statistical analyses, wrote and revised the manuscript; Qiansheng Wu and Yufen Zhang collected the data, designed the project, reviewed and revised the manuscript; Hongmei Zhu provided scientific support and professional guidance, reviewed and revised the manuscript. All the authors proofread and approved the manuscript.

Funding
This work was supported by the Wuhan Nursing Association (WHHL202423).

Data availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study adhered to both local and international ethical standards, including those set forth in the Declaration of Helsinki. The ethics approval was obtained from the Medical Ethical Committee of Tongji Medical College, Huazhong University of Science and Technology (registration number 2021S122). Written or verbal informed consent was obtained from all participants or their legally authorized representatives for the publication of anonymized patient information in this article.

Consent for publication
The findings presented in this document have not been published before, nor are they under consideration by any other publisher.

Competing interests
The authors declare no competing interests.

Received: 2 April 2025 Accepted: 2 June 2025
Published online: 07 June 2025

References

1. Braverman AC. Acute aortic dissection: clinician update. Circulation. 2010;122:184–8.
2. Evangelista A, Isselbacher EM, Bossone E, et al. Insights From the International Registry of Acute Aortic Dissection: A 20-Year Experience of Collaborative Clinical Research. Circulation. 2018;137:1846–60.
3. Russo CF, Mariscalco G, Colli A, et al. Italian multicentre study on type A acute aortic dissection: a 33-year follow-up†. Eur J Cardiothorac Surg. 2016;49:125–31.
4. Lang X, Huang S, Wang Q, et al. Discomfort of postoperative patients with aortic dissection after discharge: telephone follow-up analysis of a cross-sectional study. J Cardiothorac Surg. 2022;17:31.
5. Norton EL, Wu KHH, Rubenfire M, et al. Cardiorespiratory Fitness After Open Repair for Acute Type A Aortic Dissection - A Prospective Study. Semin Thorac Cardiovasc Surg. 2022;34:827–39.
6. Lin Y, Chen Y, Zhang H, et al. Predictors of return to work after open triple-branched stent graft placement for acute type A aortic dissection. Interact Cardiovasc Thorac Surg. 2020;30:99–106.
7. Lu Y, Liu C, Liu H, et al. The status quo and influencing factors of social alienation in patients after aortic dissection surgery. Practical Journal of Clinical Medicine. 2022;19:9–12.
8. Chaddha A, Kline-Rogers E, Braverman AC, et al. Survivors of Aortic Dissection: Activity, Mental Health, and Sexual Function. Clin Cardiol. 2015;38:652–9.
9. Mejhert M, Kahan T, Persson H, et al. Predicting readmissions and cardiovascular events in heart failure patients. Int J Cardiol. 2006;109:108–13.
10. Phyo AZZ, Freak-Poli R, Craig H, et al. Quality of life and mortality in the general population: a systematic review and meta-analysis. BMC Public Health. 2020;20:1596.
11. Asparouhov T, Muthén B. Auxiliary Variables in Mixture Modeling: Three-Step Approaches Using Mplus. Struct Equ Modeling. 2014;21:329–41.
12. Keaver L, McLaughlin C. Understanding the Diverse Experiences of Those Living with and Beyond Cancer: Implications for Personalised Care from a Latent Profile Analysis of HRQoL. Cancers. 2025;17:1698.
13. Martin G, Patel N, Grant Y, et al. Antihypertensive medication adherence in chronic type B aortic dissection is an important consideration in the management debate. J Vasc Surg. 2018;68:693-699.e2.
14. Zhang Y, Huang W, Hu K, et al. Impacts of psychological status and somatic symptom on quality of life among patients after surgery for aortic dissection. J Nurs Sci. 2022;37:87–90.
15. Zhang Y, Wang H, Hu K, et al. Qualitative Study on Psychological Experience of Patients Discharged after Aortic Dissection Surgery. Shanghai Nursing. 2022;22:7–12.
16. Zhang L, Pan Q, Peng Y, et al. Postoperative self-management experiences among patients with aortic dissection: a phenomenological approach. BMC Cardiovasc Disord. 2025;25:4.
17. Pierre ECS, Orelaru F, Naeem A, et al. Quality of Life Worsens After Surgical Repair of Acute Type A Aortic Dissection. Semin Thorac Cardiovasc Surg. 2021;34:399–407.
18. Leventhal H, Nerenz D R, Steele D J. Illness Representations and Coping With Health Threats. In: Handbook of Psychology and Health. Hillsdale: Erlbaum, 1984, pp. 219–252.
19. Leventhal H, Meyer D, Nerenz DR. The common sense representation of illness danger. New York: Pergamon, pp. 7–30.

20. Hagger MS, Koch S, Chatzisarantis NLD, et al. The common sense model of self-regulation: Meta-analysis and test of a process model. Psychol Bull. 2017;143:1117–54.
21. Lepore SJ. A social–cognitive processing model of emotional adjustment to cancer. In: *Psychosocial interventions for cancer*. Washington, DC, US: American Psychological Association, 2001, pp. 99–116.
22. Lepore SJ, Kernan WD. Positive life change and the social context of illness: An expanded social-cognitive processing model. In: Medical illness and positive life change: Can crisis lead to personal transformation? Washington, DC, US: American Psychological Association, 2009, pp. 139–152.
23. Meyer JP, Morin AJS. A person-centered approach to commitment research: Theory, research, and methodology. J Organ Behav. 2016;37:584–612.
24. Nylund KL, Asparouhov T, Muthén BO. Deciding on the Number of Classes in Latent Class Analysis and Growth Mixture Modeling: A Monte Carlo Simulation Study. Struct Equ Modeling. 2007;14:535–69.
25. Norman G, Monteiro S, Salama S. Sample size calculations: should the emperor's clothes be off the peg or made to measure? BMJ. 2012;345: e5278.
26. Callahan A, Fries JA, Ré C, et al. Medical device surveillance with electronic health records. NPJ Digit Med. 2019;2:94.
27. PROMIS® Score Cut Points, https://www.healthmeasures.net/score-and-interpret/interpret-scores/promis/promis-score-cut-points (accessed 9 April 2023).
28. Dewitt B, Jalal H, Hanmer J. Computing PROPr Utility Scores for PROMIS® Profile Instruments. Value Health. 2020;23:370–8.
29. Broadbent E, Petrie KJ, Main J, et al. The brief illness perception questionnaire. J Psychosom Res. 2006;60:631–7.
30. Broadbent E, Wilkes C, Koschwanez H, et al. A systematic review and meta-analysis of the Brief Illness Perception Questionnaire. Psychol Health. 2015;30:1361–85.
31. Ma S, Yang X, Xiang S, et al. Psychometric validation of the fear of progression questionnaire-short form in acute pancreatitis patients. Heliyon; 9. Epub ahead of print 1 August 2023. https://doi.org/10.1016/j.heliyon.2023.e19060.
32. Mitchell PH, Powell L, Blumenthal J, et al. A Short Social Support Measure for Patients Recovering From Myocardial Infarction: THE ENRICHD SOCIAL SUPPORT INVENTORY. J Cardiopulm Rehabil Prev. 2003;23:398–403.
33. The ENRICHD investigators. Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD): Study design and methods. Am Heart J. 2000;139:1–9.
34. Gierk B, Kohlmann S, Kroenke K, et al. The somatic symptom scale-8 (SSS-8): a brief measure of somatic symptom burden. JAMA Intern Med. 2014;174:399–407.
35. Zhang L, Pan Q, Peng Y, et al. Compilation of a self-management assessment scale for postoperative patients with aortic dissection. Open Medicine. 2024;19:20240939.
36. Wang M, Bi X. Latent variable modeling using Mplus. Chongqing University Press, 2018.
37. Podsakoff PM, MacKenzie SB, Lee J-Y, et al. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol. 2003;88:879–903.
38. Răducu C-M, Stănculescu E. Teachers' Burnout Risk During the COVID-19 Pandemic: Relationships With Socio-Contextual Stress—A Latent Profile Analysis. Front Psychiatry. 2022;13: 870098.
39. Huang W, Wu Q, Zhang Y, et al. Preliminary evaluation of the Chinese version of the patient-reported outcomes measurement information system 29-item profile in patients with aortic dissection. Health Qual Life Outcomes. 2022;20:94.
40. Cosci F, Carrozzino D, Patierno C, et al. Mental Pain Questionnaire: Clinimetric Properties of a Potential Global Person-Centred Outcome Measure. Clin Psychol Psychother. 2024;31: e70022.
41. Carrozzino D, Christensen KS, Guiducci S, et al. The assessment of psychological well-being in systemic sclerosis: a clinimetric validation. BMC Psychology. 2025;13:498.
42. Campbell-Lloyd AJM, Mundy J, Pinto N, et al. Contemporary results following surgical repair of acute type A aortic dissection (AAAD): a single centre experience. Heart Lung Circ. 2010;19:665–72.
43. Adam U, Habazettl H, Graefe K, et al. Health-related quality of life of patients after surgery for acute Type A aortic dissection. Interact Cardiovasc Thorac Surg. 2018;27:48–53.
44. Mo L, Fu Y, Mao L, et al. Identifying typologies of quality of life in patients with moderate to severe hand trauma based on patient-reported outcomes. Ann Palliat Med. 2021;10:9810–9.
45. Wang Q, Yang J, Li S, et al. Heterogeneous subgroups of psychological, physical and social condition and their predictors in Chinese older patients with coronary heart disease after stent implantation. Geriatr Nurs. 2024;60:408–17.
46. Endlich M, Hamiko M, Probst C, et al. Quality of life after acute aortic dissection type A: Younger patients are stronger impaired in the longterm course. Thoracic and Cardiovascular Surgeon. 2013;61:OP191.
47. Luo S, Zhu Y, Xie E, et al. Influence of Sex on Outcomes After Thoracic Endovascular Repair for Type B Aortic Dissection. Angiology. 2021;72:556–64.
48. Kim S, Ryu E. Control Effect of Illness Perception on Depression and Quality of Life in Patients with Hemodialysis: Using Structural Equation Modeling. J Korean Biol Nurs Sci. 2018;20:221–7.
49. Pereira MG, Ponte M, Ferreira G, et al. Quality of life in patients with skin tumors: the mediator role of body image and social support. Psychooncology. 2017;26:815–21.
50. Gao Y. The Study of The Influencing Factors of The Fear of Progression in Patients with Acute Myocardial Infarction. Master Dissertation, North China University of Science and Technology, 2018.
51. Hu G, Yang Y, Xu D, et al. Investigation and influencing factors of fear of progression in young and middle-aged patients with acute myocardial infarction. Modern Nurse. 2021;28:9–13.
52. Zeng K, Chen X, Tu Y, et al. Correlation between fear of disease progress and post-traumatic stress disorder among patients with acute myocardial infarction. Chin Nurs Res. 2020;34:380–3.
53. Blumenthal JA, Zhu Y, Koch GG, et al. The Modifying Effects of Social Support on Psychological Outcomes in Patients with Heart Failure. Health Psychol. 2019;38:502–8.
54. Compare A, Zarbo C, Manzoni GM, et al. Social support, depression, and heart disease: a ten year literature review. Front Psychol. 2013;4:384.
55. Staniute M, Brozaitiene J, Bunevicius R. Effects of social support and stressful life events on health-related quality of life in coronary artery disease patients. J Cardiovasc Nurs. 2013;28:83–9.

Publisher's Note